Single Output Isolated 25-Watt DC/DC Converters





#### **FEATURES**

- Cost effective small footprint DC/DC converter, ideal for high current applications
- Industry standard 0.96" x 1.1" x 0.33" open frame package and pinout
- Input voltage range of 36-75 Vdc
- 3.3V, 5V, or 12Vdc fixed output voltages
- Isolation up to 2250 VDC (basic)
- Up to 25 Watts total output power with extensive self-protection shutdown features
- High efficiency synchronous rectifier forward topology up to 91%
- Stable operation with no required external components
- Usable -40 to 85°C temperature range (with derating)
- Certified to UL 60950-1, CAN/CSA-C22.2 No. 60950-1, IEC60950-1, safety approvals, 2nd edition

Output (V)	Current (A)	Nominal Input (V)
3.3	7.5	48
5	5	48
12	2.1	48

### **PRODUCT OVERVIEW**

Featuring a full 25 Watt output in one square inch of board area, the UEI25 series isolated DC/DC converter family offers efficient regulated DC power for printed circuit board mounting. The 0.96" x 1.1" x 0.33" (24.4 x 27.9 x 8.4 mm) converter accepts a 2:1 input voltage range of 36 to 75 Volts DC, ideal for telecom equipment. The industry-standard pinout fits larger 1" x 2" converters. The fixed output voltage is tightly regulated. Applications include small instruments, area-limited microcontrollers, data communications equipment, remote sensor systems, telephone equipment, vehicle and portable electronics.

The UEI25 series includes full magnetic and optical isolation with Basic protection up to 2250 Volts DC. For powering digital systems, the outputs offer fast settling to step transients and will accept higher

capacitive loads. Excellent ripple and noise specifications assure compatibility to noise-susceptible circuits. For systems requiring controlled startup/shutdown, an external remote On/Off control may use a switch, transistor or digital logic.

A wealth of self-protection features avoid both converter and external circuit faults. These include input undervoltage lockout and overtemperature shutdown. The outputs current limit using the "hiccup" autorestart technique and the outputs are shortcircuit protected. Additional features include output overvoltage and reverse conduction elimination. The high efficiency offers minimal heat buildup and "no fan" operation.



Typical topology is shown. Murata Power Solutions recommends an external fuse.



# **UEI25 Series**

Single Output Isolated 25-Watt DC/DC Converters

PERFORMANCE SPEC	IFICAT	IONS S	UMMA	RY AND C	RDERIN	IG GUIDE (	D 3									
				Outp	out				Inj	out						
				R/N (m	Vp-p)	Regulati	on (Max.)			lin,	lin,	Effici	ency	F	ackage, C75	
	Vout	lout (A,	Total Power					Vin Nom.	Range	min. Ioad	full load					
Root Models ①	(V)	max)	(W)	Тур.	Max.	Line	Load	(V)	(V)	(mA)	(A)	Min.	Тур.	Case (inches)	Case (mm)	Pinout
UEI25-033-D48 ④	3.3	7.5	25	50	80	±0.1%	±0.2%	48	36-75	75	0.58	87.0%	89.5%	0.96x1.1x0.33	24.4x27.9x8.4	P85
UEI25-050-D48	5	5	25	50	80	±0.1%	±0.2%	48	36-75	30	0.57	89.0%	91%	0.96x1.1x0.33	24.4x27.9x8.4	P85
UEI25-120-D48	12	2.1	25.2	95	120	±0.1%	±0.1%	48	36-75	20	0.6	86.0%	87.5%	0.96x1.1x0.33	24.4x27.9x8.4	P85

#### Notes:

- Please refer to the part number structure for additional options and complete ordering part numbers.
- 2 Ripple and Noise is shown at 20 MHz bandwidth.
- ③ All specifications are at nominal line voltage and full load, +25 °C. unless otherwise noted. See detailed specifications for full conditions.

Output capacitors are 1  $\mu\text{F}$  ceramic in parallel with 10  $\mu\text{F}$  electrolytic. The input cap is 4.7  $\mu\text{F}$  ceramic, low ESR.

I/O caps are necessary for our test equipment and may not be needed for your applica-

④ Minimum load is 10% for rated specifications.



 $\ensuremath{\mathbbmm{O}}$  Special quantity order is required; samples available with standard pin length only.

**©SMT (M)** versions not available in sample quantities.

③Some model number combinations may not be available. See website or contact your local Murata sales representative.

MPS Part Number	Product Status	LTB Date
UEI25-033-D48N-C	Discontinued	3/31/2022
UEI25-033-D48NM-C	Discontinued	3/31/2022
UEI25-033-D48P-C	Discontinued	3/31/2022
UEI25-033-D48PM-C	Discontinued	3/31/2022
UEI25-050-D48N-C	In Production	N/A
UEI25-050-D48NL1-C	To be discontinued	3/31/2024
UEI25-050-D48NM-C	In Production	N/A
UEI25-050-D48NM-QNT	To be discontinued	3/31/2024
UEI25-050-D48P-C	Discontinued	3/31/2022
UEI25-050-D48PM-C	Discontinued	3/31/2022
UEI25-120-D48N-C	In Production	N/A
UEI25-120-D48NL2-C	To be discontinued	3/31/2024
UEI25-120-D48NM-C	To be discontinued	3/31/2024
UEI25-120-D48P-C	Discontinued	3/31/2022
UEI25-120-D48PM-C	Discontinued	3/31/2022

# **UEI25 Series**

Single Output Isolated 25-Watt DC/DC Converters

#### FUNCTIONAL SPECIFICATIONS - MODEL UEI25-033-D48

ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Input Voltage, Continuous	Full power operation	0		80	Vdc
Input Voltage, Transient	Operating or non-operating, 100 mS max. duration	0		100	Vdc
solation Voltage	Input to output			2250	Vdc
nput Reverse Polarity	None, install external fuse		None		Vdc
Dn/Off Remote Control	Power on or off, referred to -Vin	0		15	Vdc
utput Power		0		25.25	W
Dutput Current	Current-limited, no damage, short-circuit protected	0		7.5	A
Storage Temperature Range	Vin = Zero (no power)	-55		125	°C
	re of devices to greater than any of these conditions may adv		reliability Proper operation up		-
the Performance/Functional Specifications Tabl		orbory anoor long torn	reliability. Troper operation an		
INPUT					
Operating voltage range		36	48	75	Vdc
Recommended External Fuse	Fast blow	50	40	1.5	A
Start-up threshold	Rising input voltage	34	35.2	36	Vdc
•					
Undervoltage shutdown	Falling input voltage	32	34.0	35.2	Vdc
Overvoltage shutdown			None		Vdc
Reverse Polarity Protection	None, install external fuse		None		Vdc
nternal Filter Type			LC		
Input current					
Full Load Conditions	Vin = nominal		0.58	0.60	A
Low Line	Vin = minimum		0.79	0.81	A
Inrush Transient			0.05		A2-Sec.
Output in Short Circuit			50	100	mA
No Load	lout = minimum, unit=ON		75	100	mA
Standby Mode (Off, UV, OT)			1	2	mA
Reflected (back) ripple current ②	Measured at input with specified filter		30		mA, RMS
Pre-biased startup	External output voltage < Vset		Monotonic		
GENERAL and SAFETY			Monotorile		
denenae and sarerr	Vin=48V, full load	87	89.5		%
Efficiency	Vin=46V, full load	86.5	87.5		%
Isolation	VIII=SOV, IUII IOdu	00.0	07.3		70
	land the submit southers	0050			) ( ala
Isolation Voltage	Input to output, continuous	2250			Vdc
Insulation Safety Rating			basic		
Isolation Resistance		10			Mohm
Isolation Capacitance			1000		pF
Safety	Certified to UL-60950-1, CSA-C22.2 No.60950-1, IEC60950-1, 2nd edition		Yes		
Calculated MTBF	Per MIL-HDBK-217F, ground benign, Tambient=+30°C		TBD		Hours x 10 <sup>6</sup>
Calculated MTBF	Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient=+40°C		2		Hours x 10 <sup>6</sup>
DYNAMIC CHARACTERISTICS			· · · · · · · · · · · · · · · · · · ·		·
Fixed Switching Frequency		300	330	360	KHz
Startup Time	Power On to Vout regulated			50	mS
Startup Time	Remote ON to Vout regulated			50	mS
Dynamic Load Response	50-75-50% load step, settling time to within ±2% of Vout		180	250	μSec
Dynamia load di/dt				2	
Dynamic load di/dt	aomo co obevo		. 20		A/µSec
Dynamic Load Peak Deviation	same as above		±30	±100	mV
FEATURES and OPTIONS					
Remote On/Off Control ④					
"N" suffix					,
Negative Logic, ON state	ON = Ground pin or external voltage	-0.7		1.2	V
Negative Logic, OFF state	OFF = Pin open or external voltage	10		15	V
Control Current			1		mA
"P" suffix	· · ·				
Positive Logic, ON state	ON = Pin open or external voltage	10		15	V
•			+		-
Positive Logic, OFF state	OFF = Ground nin or external voltage	-() 7		12	
Positive Logic, OFF state Control Current	OFF = Ground pin or external voltage	-0.7	1	1.2	V mA

# **UEI25 Series**

Single Output Isolated 25-Watt DC/DC Converters

#### FUNCTIONAL SPECIFICATIONS (CONT.) – MODEL UEI25-033-D48

OUTPUT	Conditions ① ③	Minimum	Typical/Nominal	Maximum	Units
Total Output Power	See Derating	0.0	25.0	25.25	W
Voltage	*				
Nominal Output Voltage	No trim	3.267	3.30	3.333	Vdc
Setting Accuracy	ing Accuracy At 50% load			+1	% of Vset.
Output Voltage Range	User-adjustable	-10		+10	% of Vnom.
Overvoltage Protection	Via magnetic feedback	4.2	5	5.7	Vdc
Current	•		· · ·		
Output Current Range		0.7575	7.575	7.575	A
Minimum Load 3			10% minimum load		% of lout
Current Limit Inception	98% of Vnom., after warmup	8.5	10	11	A
Short Circuit			1		J
Short Circuit Current	Hiccup technique, autorecovery			0.3	А
Short Circuit Duration (remove short for			0		
recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
Regulation (5)	•				
Line Regulation	Vin=min. to max., Vout=nom., 50% load			±0.1	% of Vout
Load Regulation	lout=min. to max., Vin=48V			±0.2	% of Vout
Ripple and Noise	5 Hz- 20 MHz BW		50	80	mV pk-pk
Temperature Coefficient	At all outputs		0.02		% of Vnom./°C
Maximum Capacitive Loading (10% ceramic,		0		0000	
90% Oscon)	Cap. ESR= $<0.02\Omega$ , full resistive load	0		2000	μF
MECHANICAL (Through Hole Models)	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Outline Dimensions (no baseplate)	C75 case		0.9x1.1x0.33		Inches
(Please refer to outline drawing)	WxLxH		22.86x27.9x8.4		mm
(Please refer to outline drawing) Weight			22.86x27.9x8.4 0.32		mm Ounces
(					
Weight			0.32		Ounces
(			0.32 9.07		Ounces Grams
Weight			0.32 9.07 0.04		Ounces Grams Inches
Weight Through Hole Pin Diameter			0.32 9.07 0.04 1.016		Ounces Grams Inches
Weight Through Hole Pin Diameter Through Hole Pin Material	WxLxH		0.32 9.07 0.04 1.016 Copper alloy		Ounces Grams Inches mm
Weight Through Hole Pin Diameter Through Hole Pin Material	WxLxH Nickel subplate		0.32 9.07 0.04 1.016 Copper alloy 50		Ounces Grams Inches mm 
Weight Through Hole Pin Diameter Through Hole Pin Material TH Pin Plating Metal and Thickness ENVIRONMENTAL	WxLxH Nickel subplate Gold overplate With derating, 200 LFM	-40	0.32 9.07 0.04 1.016 Copper alloy 50	85	Ounces Grams Inches mm 
Weight Through Hole Pin Diameter Through Hole Pin Material TH Pin Plating Metal and Thickness	WxLxH Nickel subplate Gold overplate	-40 -40	0.32 9.07 0.04 1.016 Copper alloy 50	<u>85</u> 70	Ounces Grams Inches mm u-inches µ-inches
Weight Through Hole Pin Diameter Through Hole Pin Material TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Storage Temperature	WxLxH Nickel subplate Gold overplate With derating, 200 LFM		0.32 9.07 0.04 1.016 Copper alloy 50		Ounces Grams Inches mm u-inches u-inches u-inches
Weight Through Hole Pin Diameter Through Hole Pin Material TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range	WxLxH Nickel subplate Gold overplate With derating, 200 LFM No derating, 200 LFM	-40	0.32 9.07 0.04 1.016 Copper alloy 50	70	Ounces Grams Inches mm µ-inches µ-inches C °C
Weight Through Hole Pin Diameter Through Hole Pin Material TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Storage Temperature	WxLxH Nickel subplate Gold overplate With derating, 200 LFM No derating, 200 LFM Vin = Zero (no power)	-40 -55	0.32 9.07 0.04 1.016 Copper alloy 50 5	70 125	Ounces Grams Inches mm µ-inches µ-inches C °C °C
Weight Through Hole Pin Diameter Through Hole Pin Material TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference Conducted, EN55022/CISPR22	WxLxH Nickel subplate Gold overplate With derating, 200 LFM No derating, 200 LFM Vin = Zero (no power) Measured in center	-40 -55	0.32 9.07 0.04 1.016 Copper alloy 50 5	70 125	Ounces Grams Inches mm µ-inches µ-inches C °C °C
Weight Through Hole Pin Diameter Through Hole Pin Material TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference	WxLxH Nickel subplate Gold overplate With derating, 200 LFM No derating, 200 LFM Vin = Zero (no power) Measured in center	-40 -55	0.32 9.07 0.04 1.016 Copper alloy 50 5 5	70 125	Ounces Grams Inches mm μ-inches μ-inches °C °C °C °C °C
Weight Through Hole Pin Diameter Through Hole Pin Material TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference Conducted, EN55022/CISPR22	WxLxH Nickel subplate Gold overplate With derating, 200 LFM No derating, 200 LFM Vin = Zero (no power) Measured in center	-40 -55	0.32 9.07 0.04 1.016 Copper alloy 50 5 5	70 125	Ounces Grams Inches mm µ-inches µ-inches °C °C °C °C °C °C °C
Weight Through Hole Pin Diameter Through Hole Pin Material TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference Conducted, EN55022/CISPR22 Radiated, EN55022/CISPR22	WxLxH Nickel subplate Gold overplate With derating, 200 LFM No derating, 200 LFM Vin = Zero (no power) Measured in center External filter is required	-40 -55 110	0.32 9.07 0.04 1.016 Copper alloy 50 5 5	70 125 120	Ounces Grams Inches mm µ-inches µ-inches °C °C °C °C °C °C °C
Weight Through Hole Pin Diameter Through Hole Pin Material TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference Conducted, EN55022/CISPR22 Radiated, EN55022/CISPR22 Relative humidity, non-condensing	WxLxH Nickel subplate Gold overplate With derating, 200 LFM No derating, 200 LFM Vin = Zero (no power) Measured in center External filter is required To +85°C	-40 -55 110 	0.32 9.07 0.04 1.016 Copper alloy 50 5 5	70 125 120 90	Ounces Grams Inches mm µ-inches µ-inches °C °C °C °C °C °C °C Class Class Class

#### **Notes**

- $\textcircled$  Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load. General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow. All models are tested and specified with external parallel 1  $\mu F$  and 10  $\mu F$  multi-layer ceramic output capacitors. The external input capacitor is 4.7  $\mu F$  ceramic. All capacitors are low-ESR types wired close to the converter. These capacitors are necessary for our test equipment and may not be needed in the user's application.
- @ Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220  $\mu F,$  Cin=33  $\mu F$  and Lbus=12  $\mu H.$
- ③ All models are stable and regulate to specification under minimum (10%) load. Operation under no load will not damage the converter but may increase regulation, output ripple, and noise.
- ④ The Remote On/Off Control is referred to -Vin.
- S Regulation specifications describe the output voltage changes as the line voltage or load current is varied from its nominal or midpoint value to either extreme.

# **UEI25 Series**

Single Output Isolated 25-Watt DC/DC Converters

#### FUNCTIONAL SPECIFICATIONS - MODEL UEI25-050-D48

ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
nput Voltage, Continuous	Full power operation	0		80	Vdc
nput Voltage, Transient	Operating or non-operating, 100 mS max. duration	0		100	Vdc
solation Voltage	Input to output			2250	Vdc
nput Reverse Polarity	None, install external fuse		None		Vdc
n/Off Remote Control	Power on or off, referred to -Vin	0		15	Vdc
Dutput Power		0		25.25	W
Dutput Current	Current-limited, no damage, short-circuit protected	0		5	A
Storage Temperature Range	Vin = Zero (no power)	-55		125	D°
	of devices to greater than any of these conditions may adv		raliability Proper operation up		-
he Performance/Functional Specifications Table is		reisely alleut long-term	rreliability. Froper operation un		
INPUT			10	75	
Operating voltage range	5.111	36	48	75	Vdc
Recommended External Fuse	Fast blow			1.5	A
Start-up threshold	Rising input voltage	34	35	36	Vdc
Indervoltage shutdown	Falling input voltage	32	33.5	34.5	Vdc
vervoltage shutdown			None		Vdc
Reverse Polarity Protection	None, install external fuse		None		Vdc
nternal Filter Type			LC		
nput current	·				*
Full Load Conditions	Vin = nominal		0.57	0.59	A
Low Line	Vin = minimum		0.76	0.79	A
Inrush Transient			0.05		A2-Sec.
Output in Short Circuit			50	100	mA
No Load	lout = minimum, unit=ON		30	50	mA
Standby Mode (Off, UV, OT)	iout = minimum, umt=on		1		
			1	3	mA
leflected (back) ripple current ②	Measured at input with specified filter		30		mA, RMS
Pre-biased startup	External output voltage < Vset		Monotonic		
GENERAL and SAFETY					
Efficiency	Vin=48V, full load	89	91		%
LINCIENCY	Vin=36V, full load	89	91		%
solation					
Isolation Voltage	Input to output, continuous	2250			Vdc
Insulation Safety Rating			basic		
Isolation Resistance		10			Mohm
Isolation Capacitance		10	2000		pF
	Certified to UL-60950-1, CSA-C22.2 No.60950-1,		2000		pi
Safety	IEC60950-1, 2nd edition		Yes		
Calculated MTBF	Per MIL-HDBK-217F, ground benign,		TBD		Hours x 10 <sup>6</sup>
	Tambient=+30°C				10010 X 10
Calculated MTBF	Per Telcordia SR332, issue 1, class 3, ground		2		Hours x 10 <sup>e</sup>
	fixed, Tambient=+40°C		2		TIOUIS X TO
DYNAMIC CHARACTERISTICS					
Fixed Switching Frequency		300	330	360	KHz
Startup Time	Power On to Vout regulated			50	mS
Startup Time	Remote ON to Vout regulated			50	mS
Dynamic Load Response	50-75-50% load step, settling time to within $\pm 2\%$		200		μSec
Dvnamic load di/dt	of Vout			2	A/µSec
Dynamic Load Peak Deviation	same as above		±150		mV
FEATURES and OPTIONS			100		1117
Remote On/Off Control ④					
'N" suffix			· · ·		т
Negative Logic, ON state	ON = Ground pin or external voltage	-0.7		0.7	V
		10		15	V
Negative Logic, OFF state	OFF = FIIT Open of external voltage				mA
			1		IIIA
Negative Logic, OFF state Control Current			1		IIIA
Negative Logic, OFF state Control Current 'P" suffix		10			V
Negative Logic, OFF state	ON = Pin open or external voltage OFF = Ground pin or external voltage	10 -0.7		15 0.8	

# **UEI25 Series**

Single Output Isolated 25-Watt DC/DC Converters

#### FUNCTIONAL SPECIFICATIONS (CONT.) – MODEL UEI25-050-D48

OUTPUT	Conditions ① ③	Minimum	Typical/Nominal	Maximum	Units
Total Output Power	See Derating	0.0	25.0	25.25	W
Voltage					_
Nominal Output Voltage	No trim	4.95	5.00	5.05	Vdc
Setting Accuracy	At 50% load	-1		+1	% of Vset.
Output Voltage Range				+10	% of Vnom.
Overvoltage Protection	Via magnetic feedback	6	6.5	7.5	Vdc
Current					
Output Current Range		0	5.0	5.0	А
Minimum Load 3			No minimum load	010	% of lout
Current Limit Inception	98% of Vnom., after warmup	5.3	6.8	7.3	A
Short Circuit	56% of violit, alter warnup	0.0	0.0	1.5	Λ
Short Circuit Current	Hiccup technique, autorecovery			0.3	Α
Short Circuit Duration (remove short for				0.3	A
recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
Regulation (5)					-
Line Regulation	Vin=min. to max., Vout=nom., 50% load			±0.1	% of Vout
Load Regulation	lout=min. to max., Vin=48V			±0.2	% of Vout
Ripple and Noise	5 Hz- 20 MHz BW		50	80	mV pk-pk
Temperature Coefficient	At all outputs		0.02	00	% of Vnom./°C
Maximum Capacitive Loading (10% ceramic,	· · · · · · · · · · · · · · · · · · ·		0.02		
90% Oscon)	Cap. ESR=<0.02Ω, full resistive load	0		2000	μF
MECHANICAL (Through Hole Models)	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Outline Dimensions (no baseplate)	C75 case		0.96x1.1x0.33		Inches
(Please refer to outline drawing)	WxLxH		24.4x27.9x8.4		mm
Weight			0.32		Ounces
			9.07		Grams
Through Hole Pin Diameter			0.04		Inches
			1.016		mm
Through Hole Pin Material					
Infouun note Pin Material			Copper alloy		
	Nickel subplate		Copper alloy 50		u-inches
	Nickel subplate Gold overplate		50		µ-inches
TH Pin Plating Metal and Thickness	Nickel subplate Gold overplate				μ-inches μ-inches
TH Pin Plating Metal and Thickness ENVIRONMENTAL	Gold overplate	-40	50	85	µ-inches
TH Pin Plating Metal and Thickness ENVIRONMENTAL	Gold overplate With derating, 200 LFM	-40	50	85 82	μ-inches °C
TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range	Gold overplate With derating, 200 LFM No derating, 200 LFM, full power	-40	50	82	μ-inches °C °C
TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Operating Case Temperature Range	Gold overplate With derating, 200 LFM No derating, 200 LFM, full power No derating	-40 -40	50	82 105	μ-inches °C °C °C
TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Operating Case Temperature Range Storage Temperature	Gold overplate With derating, 200 LFM No derating, 200 LFM, full power No derating Vin = Zero (no power)	-40 -40 -55	50 5	82 105 125	µ-inches C C C C C C C C
TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Operating Case Temperature Range Storage Temperature Thermal Protection/Shutdown	Gold overplate With derating, 200 LFM No derating, 200 LFM, full power No derating Vin = Zero (no power) Measured in center	-40 -40	50	82 105	μ-inches °C °C °C
TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Operating Case Temperature Range Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference	Gold overplate With derating, 200 LFM No derating, 200 LFM, full power No derating Vin = Zero (no power)	-40 -40 -55	50 5 115	82 105 125	μ-inches  C C C C C C C C C C C C C C C C C C
TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Operating Case Temperature Range Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference Conducted, EN55022/CISPR22	Gold overplate With derating, 200 LFM No derating, 200 LFM, full power No derating Vin = Zero (no power) Measured in center	-40 -40 -55	50 5 115 B	82 105 125	μ-inches  C C C C C C C C C C C C C C C C C C
TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Operating Case Temperature Range Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference Conducted, EN55022/CISPR22 Radiated, EN55022/CISPR22	Gold overplate With derating, 200 LFM No derating, 200 LFM, full power No derating Vin = Zero (no power) Measured in center External filter is required	-40 -40 -55 110	50 5 115	82 105 125 120	μ-inches °C °C °C °C °C °C °C °C °C °C
TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Operating Case Temperature Range Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference Conducted, EN55022/CISPR22 Radiated, EN55022/CISPR22 Relative humidity, non-condensing	Gold overplate With derating, 200 LFM No derating, 200 LFM, full power No derating Vin = Zero (no power) Measured in center External filter is required To +85°C	-40 -40 -55 110 10	50 5 115 B	82 105 125 120 90	μ-inches       °C       °C
TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Operating Case Temperature Range Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference Conducted, EN55022/CISPR22 Radiated, EN55022/CISPR22 Relative humidity, non-condensing	Gold overplate With derating, 200 LFM No derating, 200 LFM, full power No derating Vin = Zero (no power) Measured in center External filter is required	-40 -40 -55 110 -500	50 5 115 B	82 105 125 120 90 10,000	µ-inches
TH Pin Plating Metal and Thickness ENVIRONMENTAL Operating Ambient Temperature Range Operating Case Temperature Range Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference Conducted, EN55022/CISPR22	Gold overplate With derating, 200 LFM No derating, 200 LFM, full power No derating Vin = Zero (no power) Measured in center External filter is required To +85°C	-40 -40 -55 110 10	50 5 115 B	82 105 125 120 90	μ-inches °C °C °C °C °C °C Class Class Class %RH

#### Notes

- $\textcircled$  Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load. General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow. All models are tested and specified with external parallel 1  $\mu$ F and 10  $\mu$ F multi-layer ceramic output capacitors. The external input capacitor is 4.7  $\mu$ F ceramic. All capacitors are low-ESR types wired close to the converter. These capacitors are necessary for our test equipment and may not be needed in the user's application.
- @ Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220  $\mu F,$  Cin=33  $\mu F$  and Lbus=12  $\mu H.$
- ③ All models are stable and regulate to specification under no load.
- ④ The Remote On/Off Control is referred to -Vin.
- S Regulation specifications describe the output voltage changes as the line voltage or load current is varied from its nominal or midpoint value to either extreme.

# **UEI25 Series**

Single Output Isolated 25-Watt DC/DC Converters

#### FUNCTIONAL SPECIFICATIONS - MODEL UEI25-120-D48

Pre-biased startup     External output voltage < Vset	ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Deside in Prote Sorbitage         Imput to stylpt         Imput sorbitage         Imput sorbitage         Imput sorbitage         Vide         Vide           manual Reverse Point Control         Power on or off. referred to -Vin         0         15         Vide           straget Temperature Range         Vine - Zaro to pozon         -55         125         C           straget Temperature Range         Vine - Zaro to pozon         -55         125         C           straget Temperature Range         Vine - Zaro to pozon         -55         125         C           straget Temperature Range         Fast box         36         48         75         Vide           straget Temperature Range         Fast box         36         48         75         Vide           straget Temperature Range         Fast box         36         48         75         Vide           straget Temperature Range         Fast box         36         48         75         Vide           straget Temperature Range         Fast box         36         48         75         Vide           straget Temperature Ranget Temperature Ranget Verse Construct Ranget Protocolo         Fast box         96         96         96         96         96         96         96         96	nput Voltage, Continuous	Full power operation	0		80	Vdc
indicito forbing         Imput to objuit         Imput solution         Imput solution           purp Reverse Pointy         Nore, Istall external face         Nore         Vide           purp Reverse Pointy         One         25         With Vige Tower           purp Reverse Pointy         Curret Immed, no damage, start-strong protected         0         2.1         A           purp Reverse Pointy         -55         125         With Tower         -2.1         A           protection State is on inglied or nonmediat.         Protection State is on inglied or nonmediat.         -2.1         A           INPUT         Protection State is on inglied or nonmediat.         -36         48         75         Vide control indicate fact in on mediate or nonmediat.           INPUT         Protection State is on inglied or nonmediate.         -36         48         75         Vide vide vide vide vide vide vide vide v	put Voltage, Transient	Operating or non-operating, 100 mS max. duration	0		100	Vdc
Prome to control         Prome or and rightering of the start protection         0         15.         VAC           Vight Over	solation Voltage	Input to output			2250	Vdc
mindfl Renota Control         Power on c of rightard to -Vin         0         15         Vice           upper Verment         Current limited, in garage, sind -total predeted         0         2.1         A           Strage Temperature Range         Vin = 20x (np open)         -55         125         To           Stradue Transmitumes are stress rafings. Exposure of devices to preder Than any of these conditors may accursely affect long-term initiability. Proper operation under conditions other than these lided         44         52         36         Vice           INPUT         First blow         -         36         443         7.5         Vice           Recorm Conditional State its not inplied or recommended.         -         36         443         7.5         Vice           Record and off, state its not inplied or recommended.         -         36         443         7.5         Vice           Record and state its not inplied or recommended.         -         36         443         5.2         Vice           Record and r	nput Reverse Polarity	None, install external fuse		None		Vdc
undput Current         Current-Innibit, m. dernage, stort-Graut protected         0         2.1         A           Description grant Range         Wine - Zoro (inprovin)         5.5         125         70           Datability instrumers are stress rafings. Exposure of devices to grant Prin any of these conditors may adversely affect long-term instability. Proper operation under conditions other than Those listed are deviced associations Table is not incident of instability. Proper operation under conditions other than Those listed are deviced associations. Science 2014.         70           INPUT         Fast bolw         38         48         75.         V0c.           Reparting voltage range         Fast bolw         34         35.2         360         V0c.           recommended External Fuse         Fast bolw         34         35.2         360         V0c.           indervoltage shutdown         Fast bolw         32         340         35.2         V0c.           revoltage shutdown         Fast bolw         32         340         35.2         V0c.           indervoltage shutdown         Fast bolw         32         340         35.2         V0c.           revoltage shutdown         Fast bolw         0.800         0.617         A           fut cont fast fast fast bolw         Intend fast molw fast bolw         0.800			0		15	Vdc
Uniput Current         Current-Initios, no strong, stort-focial proteint         0         2.1         A           Dispute Prange Tuber Parts         No         200         70           Dispute Prange Parts         No         200         70           Dispute Prange Parts         No         200         70           Dispute Parts         No         200         70           Dispute Parts         No         200         70           Dispute Parts         No         80         49         75         V00           Reparts         Stat Biol         36         49         75         V00           Reparts         Fast Biol         34         35.2         36         V00           Intervol transbiolitom         Fast Biol         34         35.2         36         V00           Intervol transbiolitom         Reparts         None         V00         V00         V00         V00         V00         V00         V00         V00         V00         A         V00         V00         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         <	Jutput Power	· · · · · · · · · · · · · · · · · · ·	0		25	W
Storage Temperature Range         Vin = Zaro (no power)         655         125         °C           Storage Temperature Range         Vin = Zaro (no power)         655         125         °C           Storage Temperature Aver de Vise ou generation and e conditions other than those leader the Performance/Functional Spontations other than those leader the Performance/Functional Spontational Spontationa Spontat		Current-limited, no damage, short-circuit protected	0			А
Use Use in any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than those listed is performance?//more instability. Proper operation under conditions other than those listed is performance?//more instability. Proper operation under conditions other than those listed is performance?//more instability. Proper operation under conditions other than those listed is performance?//more instability. Proper operation under conditions other than those listed is performance?//more instability. Proper operation under conditions other than those listed is performance?//more instability. Proper operation under conditions of the than those listed is performance?//more instability. Proper operation is performed in the inst						
the Performance-Functional Seguifications Table is not implied or recommended External Fuse  per ange or ange  per ange  per ange per ange per ange  per ange per				reliability Proper operation up		
INPUT         Solution         <			long anoor long torn	ronability. ropor oporation and		
operating voltage range         operating voltage         38         48         75         VMc           tart-up fiveshold         Rising input voltage         34         35.2         36         VMc           tart-up fiveshold         Rising input voltage         32         34.0         35.2         VMc           vervoltage shutdown         Palling input voltage         32         34.0         35.2         VMc           vervoltage shutdown         None         None         VMc         VMc         VMc           spat carrent         Capualities         None         VMc         VMc         VMc           spat carrent         0.0600         0.617         A         A         A         A           spat carrent         0.050         0.0817         A <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td></td<>						
Tecommende External Fuse         Fast blow	-		36	48	75	Vdc
Iart-up fineshold         Rising input voltage         34         35.2         36         V/dc           Viervoltage shutdown         Falling input voltage         32         34.0         35.2         V/dc           vervoer blanty Protection         None, install external fuse         None         V/dc         V/dc           inversite future internal filter type         capacitive         V/dc         V/dc         V/dc           put ourrent		East blow	00			
Indervoltage shutdown         Falling input voltage         32         34.0         35.2         VMc.           Inversiting shutdown         None, Install external fuse         None         VMc         VMc           Inversal Filter Type         Capacitive         VMc         VMc         VMc           Inversal Filter Type         Capacitive         VMc         VMc         VMc           Invest Transfert         0.050         0.617         A           Dow Line         VM = minimum         0.809         0.842         A           Invest Transfert         0.05         A2-Sec.         A2-Sec.           Standby Mode (Off, UV, OT)         Lot = minimum, uni=ON         2.0         3.6         mA           Standby Mode (Off, UV, OT)         External output voltage < Vsat			24	25.0		
Nerver Detailing Protection         None, install external fuse         None         Vdc.           Interna Filter Type		<u> </u>				
iewerse Polarity Protection         None, install external fuse         None         None         Vice           netmane Filter Type         capacitive         capacitive         vice           netmane Filter Type         0.660         0.617         A           networt         0.060         0.617         A           Cover Line         0.060         0.617         A           Cover Line         0.050         0.622         A           Immush Transient         0.05         A2-Sec.         A2-Sec.           Standby Mode (Off, UV, 07)         Intrast Transient         1         2         mA           Standby Mode (Off, UV, 07)         External output voltage < Vset			32		30.2	
Internal Filter Type         capacitive         capacitive           Full Laad Conditions         Vin = nominal         0.600         0.617         A           Low Line         Vin = nominal         0.600         0.617         A           Inrush Transient         0.605         0.627         A           Standby Mode (0ft, UV, 07)         1         2.0         35         mA           Standby Mode (0ft, UV, 07)         1         2.0         35         mA           Standby Mode (0ft, UV, 07)         Measured at input with specified filter         3.0         mA         Monotonic         C         RC         RC </td <td></td> <td>News install asternal form</td> <td></td> <td></td> <td></td> <td>_</td>		News install asternal form				_
ppt current         ·         <		INORE, INSTAIL EXTERNAL TUSE				Vac
Full Lack Conditions         Vin = nominal         0.600         0.617         A           Low Line         Vin = minimum         0.809         0.842         A           Insush Trasient         0.06         A2-Sec.         A           Output in Short Circuit         0.06         A2-Sec.           No Load         lout = minimum, unit=0N         20         35         mA           Standby Mode (Off, U, OT)         Measured at input with specified filter         30         mA           Referetad floads/ piple current @         Measured at input with specified filter         30         mA           Referetad floads/ piple current @         Vin=48V, full lead         86.0         87.5         %           Solation         Time-teave         Vin         Vin         Vin         Vin         Vin           Isolation Nations Stefp Rating         Input to output, continuous         2250         Vin         Vin         Mohtm           Isolation Capacitance         10         Vin         Mohtm         Vin         Mohtm         Vin           Isolation Capacitance         10         1700         pF         A         Mohtm         Mohtm         Nors x 10           Isolation Capacitance         Per Min-HDBK-217F, ground benign, Tambient=+40°C				capacitive		
Low Line         Wn = minimum         0.809         0.842         A           Inrush Transient         0.05         0.05         A2-Sec.           Output in Short Circuit         100         mA           No Load         Iout = minimum, unt=0N         20         35         mA           Standby Mode (Off, UV, OT)         1         2         mA           Standby Mode (Off, UV, OT)         External output voltage scatter         30         mA           Standby Mode (Off, UV, OT)         External output voltage scatter         Montonic         mA           Standby Mode (Off, UV, OT)         External output voltage scatter         30         mA           Standby Mode (Off, UV, OT)         External output voltage scatter         Montonic         mA           GKIERAL and SAFETY         Standby Montonic         Standby Montonic         Montonic           Standby Mode Stantage         Input to output, continuous         220         Montonic         Motonic           Isolation Resistance         Input to output, continuous         220         Mohtonic         Mohtonic           Isolation Resistance         Input the Output, Continuous         220         Mohtonic         Mohtonic           Isolation Resistance         Input the Output, Continuous         220	•	\		0.055	0.0/-	
Inrush Transient0.05A2-Sec.Output in Short Circuit0.05100mANo Loadlout = minimum, unit=0N2035mAStandby Mode (Off, UV, OT)Image: Standby Mode (Off, UV, OT)12mABifeleted (tack) ripple current @Measured at input with specified filter30mA, RMBifeleted (tack) ripple current @Measured at input with specified filter30mA, RMBifeleted (tack) ripple current @Measured at input with specified filter30mA, RMBifeleted (tack) ripple current @Vin=48V, full load86.087.5%SolationExternal output voltage < Vset						
Output in Short Circuit         Image: Circuit Short Cir		Vin = minimum			0.842	_
No Load         lout = minimum, unit=ON         20         35         mA           Standby Mode (OH, UV, OT)         I         1         2         mA           Standby Mode (OH, UV, OT)         External output with specified filter         30         mA, RMS           re-biased startup         External output voltage < Vset						
Standby Mode (Off, UV, OT)     m.     1     2     m.A.       Deflected (back) ripple current @)     Measured at input with specified filter     30     mA, RMS       CENERAL and SAFETY     30     mA, RMS       Solation     Input to output, continuous     2250     Monotonic       Isolation Voltage     Input to output, continuous     2250     basic     Vic       Isolation Resistance     Input to output, continuous     2250     basic     Monotonic       Isolation Resistance     Input to output, continuous     2250     basic     Monotonic       Isolation Resistance     Input to output, continuous     2250     basic     Monotonic       Isolation Resistance     Input to output, continuous     2250     Monotonic     Monotonic       Isolation Resistance     Input to output, continuous     2250     Monotonic     Monotonic       Isolation Resistance     Input to output, continuous     2260     Monotonic     Monotonic       Isolation Resistance     Input to output, continuous     2250     Monotonic     Monotonic       Isolation Resistance     Input to output, continuous     2250     Monotonic     Monotonic       Isolation Resistance     Per MLI-BCM-217F, ground benign, Input to Monotonic     Trop output to output, continuous     2250     Monotonic	Output in Short Circuit				100	mA
ieffected (back) ripple current ②         Measured at input with specified filter         30         mA, RMS           GENERAL and SAFETY         Monotonic         Monotonic         Monotonic         Monotonic           Edition         Selation         Selation         Selation         Selation         Selation           Insulation Safety Rating         Input to output, continuous         2250         basic         Monotonic           Isolation Gapacitance         Input to output, continuous         2250         Monotonic         Monotonic           Isolation Gapacitance         10         Monotonic         Monotonic         Monotonic           isolation Resistance         Insulation Capacitance         Not         Monotonic         Monotonic           iadeuted MTBF         Per MIL-HOBK-2717, ground benign, Tactulated MTBF         Yes         Hours x 10           DYNAMIC CHARACTERISTICS         Vita (Tartup Time         Power On to Vout regulated         10         50         mS           tartup Time         Remote ON to Vout regulated         10         50         mS         Missec           instructional Statup Time         Remote ON to Vout regulated         10         50         mS           typamic Load Response         50-75-50% load step, settling time to within ±1%         100	No Load	lout = minimum, unit=ON		20	35	mA
Tre-biased startup         External output voltage < Vset         Monotonic           GENERAL and SAFETY         GENERAL and SAFETY         Monotonic         %           Solation         solation         2250         %         %           Isolation Nottage         Input to output, continuous         2250         basic         Vdc           Isolation Resistance         10         basic         Mohm         Mc           Isolation Capacitance         10         1700         pF         Getter           iadety         Certified to UL-60950-1, IECG0950-1, IEEG0950-1, IEEG0950-1, IEEG0950-1, IEEG0950-1         Yes         Hours x 10           iadulated MTBF         Per MIL-ID6K-27F, ground benign, Tambient=+40°C         TBD         Hours x 10           otad witching Frequency         2         Hours x 10         50         mS           iadulated MTBF         Per Ielordia SR32, issue 1, class 3, ground fixed, Tambient=+40°C         2         Hours x 10           tratup Time         Power On to Vout regulated         10         50         mS           ymamic Load Response         50-75-50% load step, setting time to within ±1% of Vout regulated         100         20         µSec           ymamic Load Peak Deviation         same as above         ±250         ±350         mV </td <td>Standby Mode (Off, UV, OT)</td> <td></td> <td></td> <td>1</td> <td>2</td> <td>mA</td>	Standby Mode (Off, UV, OT)			1	2	mA
GENERAL and SAFETY       Vin=48V, full load       86.0       87.5       %         fiftciency       Insulation       86.0       87.5       %         Isolation Voltage       Input to output, continuous       2250       Vdc       Vdc         Insulation Safety Rating       0       basic       Vdc       Vdc         Isolation Resistance       10       Mohm       PF       Mohm       PF         Isolation Capacitance       10       1700       PF       PF       Per MIL+VDRX-217F; ground benign, Tambient=+30°C       TBD       Hours x 10         Valuated MTBF       Per MIL+VDRX-217F; ground benign, Tambient=+30°C       TBD       Hours x 10       PV         VNAMIC CHARACTERISTICS       Per Telocrific SR322; Issue 1, class 3, ground fixed, Tambient=+40°C       10       50       mS         Vinamic Load Response       50-75-50% load step, settling time to within ±1% of Vout regulated       100       200       µSec         Vynamic Load Response       50-75-50% load step, settling time to within ±1% of Vout regulated       100       200       µSec         Vynamic Load Response       50-75-50% load step, settling time to within ±1% of Vout regulated       100       200       µSec         Vynamic Load Response       50-75-50% load step, settling time to within ±1% of Vout regulated	leflected (back) ripple current ②	Measured at input with specified filter		30		mA, RMS
Sinteriory     Vin=48V, full load     86.0     87.5     %       solation     solation     solation     vin=48V, full load     86.0     87.5     %       Insulation Safety Rating     Input to output, continuous     2250     Vide     Vide       Isolation Nation     10     basic     Per     Vide       Isolation Capacitance     10     100     pF       Safety     Certified to UL-00950-1, CSA-C22.2 No 60950-1, IEC60950-1     Yes     Vide       Safety     Certified to UL-00950-1, CSA-C22.2 No 60950-1, IEC60950-1     Yes     Hours x 10       Salculated MTBF     Per MIL-HDRK-217F, ground benign, Iambient=+30°C     TBD     Hours x 10       Calculated MTBF     Per Telcordia SR32, issue I, class 3, ground fixed, Tambient=+40°C     2     Hours x 10       DYNAMIC CHARACTERISTICS     ************************************	Pre-biased startup	External output voltage < Vset		Monotonic		
Efficiency     Vin=48V, full load     86.0     87.5     %       solation     solation     solation     vide     vide     vide       Insulation Safety Rating     Input to output, continuous     2250     basic     Vide       Isolation Resistance     10     basic     Mohm       Isolation Capacitance     110     Mohm     pF       Safety     Certified to UL-60950-1, CSA-C22.2 No 60950-1, IEC60950-1     Yes     Wes       Salculated MTBF     Per MIL-HDBK-2176, ground benign, Tambient=+30°C     YEs     Hours x 10       Calculated MTBF     Per Follcordia R332, usue 1, class 3, ground fixed, Tambient=+40°C     2     Hours x 10       DYNAMIC CHARACTERISTICS     Test Cordia Gase, service     2     Hours x 10       Startup Time     Power On to Vout regulated     10     50     mS       Startup Time     Remote ON to Vout regulated     10     50     mS       Oynamic Load Response     50-75-50% load step, setting time to within ±1% of Vout     100     200     µSec       Organic Load Response     50-75-50% load step, setting time to within ±1% of Vout     100     2.0     #JSec       Oynamic Load Response     50-75-50% load step, setting time to within ±1% of Vout     1     Alges       Prestive Logic, ON state     ON = Ground pin or external voltage <t< td=""><td>GENERAL and SAFETY</td><td></td><td></td><td>· · ·</td><td></td><td>-</td></t<>	GENERAL and SAFETY			· · ·		-
solation         visition         Solation Voltage         Input to output, continuous         2250         Imput Solation         Vdc           Isolation Safety Rating         10         basic         Mohm           Isolation Resistance         10         Mohm         Mohm           Isolation Resistance         10         Mohm         Mohm           Isolation Resistance         Certified to UL-60950-1, CSA-C22.2 No.60950-1, IEC60950-1         Yes         Mohm           Safety         Certified to UL-60950-1, CSA-C22.2 No.60950-1, IEC60950-1         Yes         Mours x 10           Calculated MTBF         Per MIL-HDBK-217F, ground benign, Tambient=-40°C         TBD         Hours x 10           Calculated MTBF         Per Telcordia SR332, Issue 1, class 3, ground fixed, Tambient=-40°C         2         Hours x 10           Calculated MTBF         Per Telcordia SR332, Issue 1, class 3, ground fixed, Tambient=-40°C         2         Hours x 10           Calculated MTBF         Per Telcordia SR332, Issue 1, class 3, ground fixed, Tambient=-40°C         10         50         mS           Startup Time         Power On to Vout regulated         10         50         mS           Startup Time         Remote ON to Vout regulated         100         20         µSec           Organnic Load Response         50-75-5		Vin=48V full load	86.0	87.5		%
Isolation Voltage       Input to output, continuous       2250       Vdc         Insulation Safety Rating       basic       Mohm         Isolation Resistance       10       Mohm         Isolation Capacitance       10       Mohm         Isolation Capacitance       1700       pF         Safety       Certified to UL-60950-1, IEC60950-1, IEC60950-1, IEC60950-1       Yes       Mours x 10         Salculated MTBF       Per MIL-HDBK-217F, ground benign, Tambient=+30°C       TBD       Hours x 10         Charled MTBF       Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient=+40°C       2       Hours x 10         DYNAMIC CHARACTERISTICS       Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient=+40°C       10       50       msS         Startup Time       Power On to Vour regulated       100       50       msS         Dynamic Load Response       50-75-50% load step, settling time to within ±1% of Vout       100       200       µSec         Dynamic Load Response       50-75-50% load step, settling time to within ±1% of Vout       100       200       µSec         Dynamic Load Peak Deviation       same as above       ±250       ±350       mV         FEATURES and OPTIONS       Features of Vout       1       A/µSec         N* suffix						
Insulation Safety Rating         basic         Mohm           Isolation Resistance         10         Mohm           Isolation Capacitance         10         Mohm           Isolation Capacitance         10         Mohm           Isolation Capacitance         10         Mohm           Isolation Capacitance         10         Mohm           Safety         Certified to UL-60950-1, CSA-C22.2 No.60950-1, IEC60950-1         Yes         Mohrs x 10           Calculated MTBF         Per MIL-HOBK-217F, ground benign, Tambient=+40°C         TBD         Hours x 10           DYNAMIC CHARACTERISTICS         Per Telecordia SR332, issue 1, class 3, ground fixed, Tambient=+40°C         2         Hours x 10           DYNAMIC CHARACTERISTICS         2         Hours x 10         50         mS           Startup Time         Power On to Vout regulated         10         50         mS           Startup Time         Remote ON to Vout regulated         10         50         mS           Dynamic Load Response         50-75-50% load step, settling time to within ±1% of Vout         100         200         µSec           Dynamic Load Peak Deviation         same as above         ±250         ±350         mV           FEATURES and OPTIONS         Emote On/Off Control @         15 </td <td></td> <td>Input to output, continuous</td> <td>2250</td> <td></td> <td></td> <td>Vdc</td>		Input to output, continuous	2250			Vdc
Isolation Resistance         10         Mohm           Isolation Capacitance         100         1700         Pr           Safety         Certified to UL-60950-1, CSA-C22.2 No.60950-1, IEC60950-1         Yes         Pr           Salculated MTBF         Per MIL-HDBK-217F, ground benign, Tambient=+30°C         TBD         Hours x 10           Salculated MTBF         Per Telcordia SR332, sisue 1, class 3, ground fixed, Tambient=+40°C         2         Hours x 10           DYNAMIC CHARACTERISTICS         Per Telcordia SR322, sisue 1, class 3, ground fixed, Tambient=+40°C         295         325         355         KHz           Startup Time         Power On to Vout regulated         100         50         mS           Startup Time         Power On to Vout regulated         100         50         mS           tynamic Load Response         50-75-50% load step, settling time to within ±1% of Vout         100         200         µSec           Teatrue Stand Deritons         ±250         ±350         mV           Teatrue Stand Deritons         ±250         ±350         mV           Startup Time         0N = Ground pin or external voltage         0.7         V           Negative Logic, ON state         ON = Ground pin or external voltage         10         0.7         V <t< td=""><td></td><td></td><td>2200</td><td>hasic</td><td></td><td>140</td></t<>			2200	hasic		140
Isolation Capacitance       1700       pF         safety       Certified to UL-60950-1, CSA-C22.2 No.60950-1, IEC60960-1       Yes          salculated MTBF       Per MIL-HDBK-217F, ground benign, Tambient=+30°C       TBD       Hours x 10         salculated MTBF       Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient=+40°C       2       Hours x 10         DYNAMIC CHARACTERISTICS       Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient=+40°C       295       325       355       KHz         DYNAMIC CHARACTERISTICS       Exercte ON to Vout regulated       10       50       mS         itartup Time       Power On to Vout regulated       10       50       mS         lynamic Load Response       50-75-50% load step, settling time to within ±1% of Vout       100       200       µSec         lynamic Load Peak Deviation       same as above       ±250       ±350       mV         FEATURES and OPTIONS         Fatures used bioin or external voltage         N* suffix         Negative Logic, OFF state       OFF = Pin open or external voltage       1       MA         P' suffix         Postive Logic, OFF state       ON = Pin open or external voltage       10       15       V			10	bable		Mohm
Safety         Certified to UL-60950-1, CSA-C22.2 No.60950-1, IEC60950-1         Yes           Calculated MTBF         Per MIL-HDBK-217F, ground benign, Tambient=+30°C         TBD         Hours x 10           Calculated MTBF         Per Telcordia SR332, Issue 1, class 3, ground fixed, Tambient=+40°C         2         Hours x 10           DYNAMIC CHARACTERISTICS         2         Hours x 10         50         mS           Startup Time         Power On to Vout regulated         10         50         mS           Oynamic Load Response         50-75-50% load step, settling time to within ±1% of Vout         100         200         µSec           Oynamic Load Peak Deviation         same as above         ±250         ±350         mV           FEATURES and OPTIONS         Same as above         ±250         ±350         mV           Negative Logic, ON state         ON = Ground pin or external voltage         10         0.7         V           Negative Logic, ON state         OFF = Pin open or external voltage         10         15         V           Positive Logic, OFF state         OFF = Ground pin or external voltage         10         15         V			10	1700		
Safety         IEC60950-1         Yes           Calculated MTBF         Per MIL-HDBK-217F, ground benign, Tambient=+30°C         TBD         Hours x 10           Calculated MTBF         Per Telcordia SR32, issue 1, class 3, ground fixed, Tambient=+40°C         2         Hours x 10           DYNAMIC CHARACTERISTICS         Per Telcordia SR32, issue 1, class 3, ground fixed, Tambient=+40°C         295         325         355         KHz           Startup Time         Power On to Vout regulated         10         50         mS           Startup Time         Remote ON to Vout regulated         10         50         mS           Oynamic Load Response         50-75-50% load step, settling time to within ±1% of Vout         100         200         µSec           Oynamic Load Peak Deviation         same as above         ±250         ±350         mV           FEATURES and OPTIONS           1         A/µSec           W* suffix         Negative Logic, OFF state         OFF = Pin open or external voltage         10         15         V           N* suffix          1         mA         15         V           Negative Logic, OFF state         OFF = Pin open or external voltage         10         15         V           Posititve Logic, OFF state		Certified to LIL_60050_1_CSA_C22_2 No 60050_1		1760		pi
Calculated MTBF         Per MIL-HDBK-217F, ground benign, Tambient=+30°C         TBD         Hours x 10           Calculated MTBF         Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient=+40°C         2         Hours x 10           DYNAMIC CHARACTERISTICS         2         Hours x 10           Tixed Switching Frequency         295         325         355         KHz           Startup Time         Power On to Vout regulated         10         50         mS           Dynamic Load Response         50-75-50% load step, settling time to within ±1% of Vout         100         200         µSec           Dynamic Load Peak Deviation         same as above         ±250         ±350         mV           FEATURES and OPTIONS         ************************************	Safety			Yes		
Calculated WISPTambient=+30°CIBDHOURS XICCalculated MTBFPer Telcordia SR332, issue 1, class 3, ground fixed, Tambient=+40°C2Hours XICDYNAMIC CHARACTERISTICS2Hours XICExted Switching Frequency295325355KHzStartup TimePower On to Vout regulated1050mSStartup TimeRemote ON to Vout regulated1050mSOynamic Load Response50-75-50% load step, settling time to within ±1% of Vout100200µSecOynamic Load Peak Deviationsame as above±250±350mVFEATURES and OPTIONSNamic Load Peak Deviationsame as above±250±350mVFEATURES and OPTIONSVegative Logic, ON stateON = Ground pin or external voltage-0.70.7VNegative Logic, OFF stateOFF = Pin open or external voltage1015VP'' suffixVegative Logic, OFF stateON = Pin open or external voltage1015VPositive Logic, OFF stateON = Pin open or external voltage1015VPositive Logic, OFF stateON = Pin open or external voltage1015VPositive Logic, OFF stateOFF = Ground pin or external voltage0.70.8V						
Calculated MTBFPer Telcordia SR332, issue 1, class 3, ground fixed, Tambient=+40°C2Hours x 10DYNAMIC CHARACTERISTICScixed Switching Frequency295325355KHzStartup TimePower On to Vout regulated1050mSDynamic Load Response50-75-50% load step, settling time to within ±1% of Vout100200µSecDynamic Load Response50-75-50% load step, settling time to within ±1% of Vout100200µSecDynamic Load Response50-75-50% load step, settling time to within ±1% of Vout100200µSecDynamic Load Peak Deviationsame as above±250±350mVFEATURES and OPTIONSEventee On/Off Control @'N" suffixNegative Logic, OFF stateON = Ground pin or external voltage-0.70.7VNegative Logic, OFF stateOFF = Pin open or external voltage1015VPositive Logic, OFF stateOFF = Ground pin or external voltage1015VPositive Logic, OFF stateOFF = Ground pin or external voltage1015VPositive Logic, OFF stateOFF = Ground pin or external voltage1015VPositive Logic, OFF stateOFF = Ground pin or external voltage1015VPositive Logic, OFF stateOFF = Ground pin or external voltage1015V	Calculated MTBF			TBD		Hours x 10 <sup>e</sup>
Calculated WTB*fixed, Tambient=+40°C2Hours X ToDYNAMIC CHARACTERISTICSFixed Switching Frequency295325355KHzStartup TimePower On to Vout regulated1050mSStartup TimeRemote ON to Vout regulated1050mSDynamic Load Response50-75-50% load step, settling time to within ±1% of Vout100200µSecDynamic Load Peak Deviationsame as above±250±350mVFEATURES and OPTIONSFEATURES and OPTIONSStartup Time0N = Ground pin or external voltage-0.70.7VNegative Logic, OFF stateOFF = Pin open or external voltage1015VPositive Logic, ON state0N = Pin open or external voltage1015VPositive Logic, ON state0N = Pin open or external voltage1015VPositive Logic, ON state0N = Pin open or external voltage1015VPositive Logic, ON state0N = Pin open or external voltage1015VPositive Logic, OFF state0N = Pin open or external voltage1015VPositive Logic, OFF state0FF = Ground pin or external voltage1015V						
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Fixed Switching Frequency295325355KHzStartup TimePower On to Vout regulated1050mSStartup TimeRemote ON to Vout regulated1050mSOynamic Load Response50-75-50% load step, settling time to within ±1% of Vout100200µSecOynamic Load Response50-75-50% load step, settling time to within ±1% of Vout100200µSecOynamic Load Response50-75-50% load step, settling time to within ±1% of Vout100200µSecOynamic Load Peak Deviationsame as above±250±350mVFEATURES and OPTIONS*********************************		IIXeu, Iamulent=+40°C				 
Startup Time         Power On to Vout regulated         10         50         mS           Startup Time         Remote ON to Vout regulated         10         50         mS           Dynamic Load Response         50-75-50% load step, settling time to within ±1% of Vout         100         200         µSec           Dynamic Load Response         50-75-50% load step, settling time to within ±1% of Vout         100         200         µSec           Dynamic Load Peak Deviation         same as above         ±250         ±350         mV           FEATURES and OPTIONS         same as above         ±250         ±350         mV           Remote On/Off Control ③         'N' suffix         Negative Logic, ON state         0N = Ground pin or external voltage         -0.7         V           Negative Logic, OFF state         OFF = Pin open or external voltage         10         15         V           Control Current         1         mA         mA         'P'' suffix           Positive Logic, OFF state         ON = Pin open or external voltage         10         15         V           Positive Logic, OFF state         OFF = Ground pin or external voltage         10         0.8         V			005	005	955	1/11
Startup Time         Remote ON to Vour regulated         10         50         mS           Dynamic Load Response         50-75-50% load step, settling time to within ±1% of Vout         100         200         µSec           Dynamic Load Response         0         1         A/µSec           Dynamic Load Peak Deviation         same as above         ±250         ±350         mV           FEATURES and OPTIONS         mV         ####################################	• • •		295			_
Dynamic Load Response     50-75-50% load step, settling time to within ±1% of Vout     100     200     µSec       Dynamic Load Response     1     A/µSec       Dynamic Load Peak Deviation     same as above     ±250     ±350     mV       FEATURES and OPTIONS     #     #     #     #     #       Remote On/Off Control @     #     #     #     #     #       N" suffix     #     #     #     #     #       Negative Logic, OFF state     ON = Ground pin or external voltage     -0.7     V     V       Regative Logic, OFF state     OFF = Pin open or external voltage     1     mA       P" suffix     #     #     #     #     #       Positive Logic, OFF state     ON = Pin open or external voltage     10     15     V       Positive Logic, OFF state     ON = Pin open or external voltage     10     15     V						
Opmanic Load Response     Tot     200     μsec       Opmanic Load Response     1     A/μSec       Opmanic Load Peak Deviation     same as above     ±250     ±350     mV       FEATURES and OPTIONS       Remote On/Off Control ④       'N" suffix       Negative Logic, ON state     ON = Ground pin or external voltage     -0.7     V       Negative Logic, OFF state     OFF = Pin open or external voltage     10     15     V       'P" suffix       Positive Logic, ON state     ON = Pin open or external voltage     10     15     V       Positive Logic, ON state     ON = Pin open or external voltage     10     15     V       Positive Logic, OFF state     OFF = Ground pin or external voltage     10     15     V	Startup Time			10	50	mS
Dynamic load di/dt         1         A/μSec           Dynamic Load Peak Deviation         same as above         ±250         ±350         mV           FEATURES and OPTIONS           Remote On/Off Control ④           'N" suffix           Negative Logic, ON state         ON = Ground pin or external voltage         -0.7         0.7         V           Negative Logic, OFF state         OFF = Pin open or external voltage         10         15         V           Control Current         1         mA         'P' suffix         mA           Positive Logic, ON state         ON = Pin open or external voltage         10         15         V           Positive Logic, ON state         ON = Pin open or external voltage         10         15         V           Positive Logic, OFF state         OFF = Ground pin or external voltage         10         15         V	Dynamic Load Response			100	200	μSec
Dynamic Load Peak Deviation         same as above         ±250         ±350         mV           FEATURES and OPTIONS           Remote On/Off Control ④           'N" suffix           Negative Logic, ON state         ON = Ground pin or external voltage         -0.7         0.7         V           Negative Logic, OFF state         OFF = Pin open or external voltage         10         15         V           Control Current         1         mA         'P' suffix         mA           'P' suffix           Positive Logic, ON state         ON = Pin open or external voltage         10         15         V           Positive Logic, OFF state         ON = Pin open or external voltage         10         15         V	Dynamic load di/dt				1	A/uSec
FEATURES and OPTIONS         Remote On/Off Control ④         N" suffix         Negative Logic, ON state       ON = Ground pin or external voltage       -0.7       0.7       V         Negative Logic, OFF state       OFF = Pin open or external voltage       10       15       V         Control Current       0N = Pin open or external voltage       10       15       V         Positive Logic, ON state       ON = Pin open or external voltage       10       15       V         Positive Logic, OFF state       OFF = Ground pin or external voltage       10       15       V         Positive Logic, OFF state       OFF = Ground pin or external voltage       -0.7       0.8       V		same as above		+250		
Remote On/Off Control ④           IN" suffix           Negative Logic, ON state         ON = Ground pin or external voltage         -0.7         0.7         V           Negative Logic, OFF state         OFF = Pin open or external voltage         10         15         V           Control Current         1         mA           'P" suffix         ON = Pin open or external voltage         10         15         V           Positive Logic, ON state         ON = Pin open or external voltage         10         15         V           Positive Logic, OFF state         OFF = Ground pin or external voltage         10         15         V				±200	<u>+000</u>	1117
N" suffix           Negative Logic, ON state         ON = Ground pin or external voltage         -0.7         0.7         V           Negative Logic, OFF state         OFF = Pin open or external voltage         10         15         V           Control Current         1         mA           P" suffix         ON = Pin open or external voltage         10         15         V           Positive Logic, ON state         ON = Pin open or external voltage         10         15         V           Positive Logic, OFF state         OFF = Ground pin or external voltage         10         15         V						
Negative Logic, ON state         ON = Ground pin or external voltage         -0.7         0.7         V           Negative Logic, OFF state         OFF = Pin open or external voltage         10         15         V           Control Current         1         mA           P" suffix         ON = Pin open or external voltage         10         15         V           Positive Logic, ON state         ON = Pin open or external voltage         10         15         V           Positive Logic, OFF state         OFF = Ground pin or external voltage         10         15         V						
Negative Logic, OFF state         OFF = Pin open or external voltage         10         15         V           Control Current         1         mA           P" suffix          10         15         V           Positive Logic, ON state         ON = Pin open or external voltage         10         15         V           Positive Logic, OFF state         OFF = Ground pin or external voltage         -0.7         0.8         V			0 7	1	0.7	
Control Current         1         mA           'P" suffix          10         15         V           Positive Logic, ON state         ON = Pin open or external voltage         10         15         V           Positive Logic, OFF state         OFF = Ground pin or external voltage         -0.7         0.8         V						-
P" suffix           Positive Logic, ON state         ON = Pin open or external voltage         10         15         V           Positive Logic, OFF state         OFF = Ground pin or external voltage         -0.7         0.8         V		OFF = Pin open or external voltage	10		15	
Positive Logic, ON state         ON = Pin open or external voltage         10         15         V           Positive Logic, OFF state         OFF = Ground pin or external voltage         -0.7         0.8         V				1		mA
Positive Logic, OFF state         OFF = Ground pin or external voltage         -0.7         0.8         V						
	Positive Logic, ON state				15	
	Positive Logic, OFF state	OFF = Ground pin or external voltage	-0.7		0.8	V
				1		mA

# **UEI25 Series**

Single Output Isolated 25-Watt DC/DC Converters

#### FUNCTIONAL SPECIFICATIONS (CONT.) – MODEL UEI25-120-D48

OUTPUT	Conditions ① ③	Minimum	Typical/Nominal	Maximum	Units
Total Output Power	See Derating	0.0	25.2	25.45	W
Voltage	· · · · · ·				
Nominal Output Voltage	No trim	11.88	12.00	12.12	Vdc
Setting Accuracy	At 50% load	-1		+1	% of Vset.
Output Voltage Range	User-adjustable	-10		+10	% of Vnom.
Overvoltage Protection	Via magnetic feedback	14	19	22	Vdc
Current	the magnetic recubacit		10		100
Output Current Range		0.0	2.1	2.1	А
Minimum Load 3			No minimum load		
Current Limit Inception	97% of Vnom., after warmup	2.3	3	3.4	A
Short Circuit	· · · ·				-
Short Circuit Current	Hiccup technique, autorecovery within ±1.25% of Vout			0.1	A
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
Regulation S	. • •		I		
Line Regulation	Vin=min. to max., Vout=nom., 50% load			±0.075	% of Vout
Load Regulation	lout=min. to max., Vin=48V			±0.05	% of Vout
Ripple and Noise	5 Hz- 20 MHz BW		95	120	mV pk-pk
Temperature Coefficient	At all outputs		0.02		% of Vnom./°C
Maximum Capacitive Loading (10% ceramic,		_			
90% Oscon)	Cap. ESR= $<0.02\Omega$ , full resistive load	0		470	μF
MECHANICAL (Through Hole Models)	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Outline Dimensions (no baseplate)	C75 case		0.96x1.1x0.33		Inches
(Please refer to outline drawing)	WxLxH		24.38x27.94x8.43		mm
Weight			0.32		Ounces
			9.07		Grams
Through Hole Pin Diameter			0.04		Inches
			1.016		mm
Through Hole Pin Material			Copper alloy		
TH Pin Plating Metal and Thickness	Nickel subplate		50		µ-inches
	Gold overplate		5		µ-inches
ENVIRONMENTAL					
Operating Ambient Temperature Range					
Operating Amplent Temperature hange	With derating, 200 LFM	-40		85	°C
Storage Temperature	With derating, 200 LFM Vin = Zero (no power)	-40 -55		85 125	0° 0°
			135		
Storage Temperature	Vin = Zero (no power)	-55	135	125	°C
Storage Temperature Thermal Protection/Shutdown	Vin = Zero (no power) Measured at hotspot	-55	135 B	125	°C
Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference	Vin = Zero (no power) Measured at hotspot	-55		125	0° 0°
Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference Conducted, EN55022/CISPR22	Vin = Zero (no power) Measured at hotspot	-55	В	125	°C °C Class
Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference Conducted, EN55022/CISPR22 Radiated, EN55022/CISPR22	Vin = Zero (no power) Measured at hotspot External filter is required	-55 130	В	125 150	°C °C Class Class
Storage Temperature Thermal Protection/Shutdown Electromagnetic Interference Conducted, EN55022/CISPR22 Radiated, EN55022/CISPR22 Relative humidity, non-condensing	Vin = Zero (no power) Measured at hotspot External filter is required To +85°C	-55 130 10	В	125 150 90	°C °C Class Class Class %RH

#### Notes

- $\textcircled$  Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load. General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow. All models are tested and specified with external parallel 1  $\mu F$  and 10  $\mu F$  multi-layer ceramic output capacitors. The external input capacitor is 4.7  $\mu F$  ceramic. All capacitors are low-ESR types wired close to the converter. These capacitors are necessary for our test equipment and may not be needed in the user's application.
- ② Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220 µF, Cin=33 µF and Lbus=12 µH.
- ③ All models are stable and regulate to specification under no load.
- ④ The Remote On/Off Control is referred to -Vin.
- S Regulation specifications describe the output voltage changes as the line voltage or load current is varied from its nominal or midpoint value to either extreme.



















### Single Output Isolated 25-Watt DC/DC Converters

**UEI25 Series** 

#### **UEI25-120-D48 PERFORMANCE DATA** Efficiency vs. Line Voltage and Load Current @ 25°C Power Dissipation vs. Load Current @ 25°C 89 4.46 88 3.96 87 3.46 86 2.96 s (Watts) 85 Vin = 36VEfficiency (%) Vin = 48V84 2.46 Vin = 60VLoss 83 Vin = 75V1.9 Vin = 36V82 Vin = 48V 14 Vin = 60V 81 Vin = 75V 0.96 80 79 0.46 0.6 0.8 0.9 1.3 1.6 1.8 1.9 2.1 0.4 1.1 1.4 78 Load Current (Amps) 0.4 0.6 0.8 0.9 1.1 1.3 1.4 1.6 1.8 1.9 2.1 Load Current (Amps) Maximum Current Temperature Derating @sea level Maximum Current Temperature Derating @sea level $(V_{IN} = 36V, airflow is from pin 1 to pin 3)$ $(V_{IN} = 48V, airflow is from pin 1 to pin 3)$ 2.25 2.2 2.175 22 2.15 2.15 Output Current (Amps) (Amps) 0.33 m/s (65 LFM) -0.5 m/s (100 LFM) -1.0 m/s (200 LFM) -0.33 m/s (65 LFM) 2.125 0.5 m/s (100 LFM) \* 1.0 m/s (200 LFM) \* 1.5 m/s (300 LFM) \* 2.1 Current 2.1 2.05 Output 2.075 2.0 2.05 1.95 2.025 1.9 2 65 70 75 80 85 65 70 75 80 85 Ambient temperature (°C) Ambient temperature (°C) Maximum Current Temperature Derating @sea level Thermal image with "hot spot" at full load current with 65°C ambient, air flowing at minimal rate of 65 LFM. Air is flowing across the converter from +Vo to -Vo at 48V input. Identifiable $(V_{IN} = 60V, airflow is from pin 1 to pin 3)$ and recommended maximum value to be verified in application. 137.2°C 2.2 2.175 130 2.15 Output Current (Amps) 0.33 m/s (65 LFM) 2.125 120 0.5 m/s (100 LFM) 1.0 m/s (200 LFM) 2.1 110 2.075 2 05 100 2.025 Air flow 2 90 65 70 75 80 85 Ambient temperature (°C) 85.9°C

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Single Output Isolated 25-Watt DC/DC Converters



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Single Output Isolated 25-Watt DC/DC Converters

#### MECHANICAL SPECIFICATIONS, OPEN FRAME THROUGH-HOLE MOUNT



Dimensions are in inches (mm shown for ref. only).



Tolerances (unless otherwise specified): .XX  $\pm$  0.02 (0.5) .XXX  $\pm$  0.010 (0.25) Angles  $\pm$  1°

Components are shown for reference only.

INPUT/	INPUT/OUTPUT CONNECTIONS					
Pin	Function P85					
1	+Vin					
2	-Vin					
3	+Vout					
4	Output Trim					
5	-Vout					
6	On/Off Control*					
*The Rem	*The Remote On/Off can be provided					
with eithe	r positive (P suffix) or nega-					
tive (N sut	ffix) logic					

These converters are plug-compatible to competitive units. In case of pinout numbering inconsistency, follow the pin FUNCTION, not the pin number when laying out your PC board.



Standard pin length is shown. Please refer to the Ordering Guide for alternate pin lengths.



Single Output Isolated 25-Watt DC/DC Converters







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### **UEI25 Series**

Single Output Isolated 25-Watt DC/DC Converters

#### MECHANICAL SPECIFICATIONS, SURFACE MOUNT (MSL RATING 2)



Dimensions are in inches (mm shown for ref. only).



These converters are plug-compatible to competitive units. In case of pinout numbering inconsistency, follow the pin FUNCTION, not the pin number when laying out your PC board.

with either positive (P suffix) or nega-



END VIEW

tive (N suffix) logic

# **UEI25 Series**





#### Single Output Isolated 25-Watt DC/DC Converters

#### TECHNICAL NOTES

#### **Input Fusing**

Certain applications and/or safety agencies may require fuses at the inputs of power conversion components. Fuses should also be used when there is the possibility of sustained input voltage reversal which is not current-limited. For greatest safety, we recommend a fast blow fuse installed in the ungrounded input supply line.

The installer must observe all relevant safety standards and regulations. For safety agency approvals, install the converter in compliance with the end-user safety standard.

#### **Input Reverse-Polarity Protection**

If the input voltage polarity is reversed, an internal diode will become forward biased and likely draw excessive current from the power source. If this source is not current-limited or the circuit appropriately fused, it could cause permanent damage to the converter.

#### Input Under-Voltage Shutdown and Start-Up Threshold

Under normal start-up conditions, converters will not begin to regulate properly until the rising input voltage exceeds and remains at the Start-Up Threshold Voltage (see Specifications). Once operating, converters will not turn off until the input voltage drops below the Under-Voltage Shutdown Limit. Subsequent restart will not occur until the input voltage rises again above the Start-Up Threshold. This built-in hysteresis prevents any unstable on/off operation at a single input voltage.

Users should be aware however of input sources near the Under-Voltage Shutdown whose voltage decays as input current is consumed (such as capacitor inputs), the converter shuts off and then restarts as the external capacitor recharges. Such situations could oscillate. To prevent this, make sure the operating input voltage is well above the UV Shutdown voltage AT ALL TIMES.

#### **Start-Up Delay**

Assuming that the output current is set at the rated maximum, the Vin to Vout Start-Up Delay (see Specifications) is the time interval between the point when the rising input voltage crosses the Start-Up Threshold and the fully loaded regulated output voltage enters and remains within its specified regulation band. Actual measured times will vary with input source impedance, external input capacitance, input voltage slew rate and final value of the input voltage as it appears at the converter.

These converters include a soft start circuit to moderate the duty cycle of the PWM controller at power up, thereby limiting the input inrush current.

The On/Off Remote Control interval from inception to Vout regulated assumes that the converter already has its input voltage stabilized above the Start-Up Threshold before the On command. The interval is measured from the On command until the output enters and remains within its specified regulation band. The specification assumes that the output is fully loaded at maximum rated current.

#### **Input Source Impedance**

These converters will operate to specifications without external components, assuming that the source voltage has very low impedance and reasonable input voltage regulation. Since real-world voltage sources have finite impedance, performance is improved by adding external filter components. Sometimes only a small ceramic capacitor is sufficient. Since it is difficult to totally characterize all applications, some experimentation may be needed. Note that external input capacitors must accept high speed switching currents.

Because of the switching nature of DC/DC converters, the input of these converters must be driven from a source with both low AC impedance and adequate DC input regulation. Performance will degrade with increasing input inductance. Excessive input inductance may inhibit operation. The DC input regulation specifies that the input voltage, once operating, must never degrade below the Shut-Down Threshold under all load conditions. Be sure to use adequate trace sizes and mount components close to the converter.

#### I/O Filtering, Input Ripple Current and Output Noise

All models in this converter series are tested and specified for input reflected ripple current and output noise using designated external input/output components, circuits and layout as shown in the figures below. External input capacitors (CIN in the figure) serve primarily as energy storage elements, minimizing line voltage variations caused by transient IR drops in the input conductors. Users should select input capacitors for bulk capacitance (at appropriate frequencies), low ESR and high RMS ripple current ratings. In the figure below, the CBUS and LBUS components simulate a typical DC voltage bus. Your specific system configuration may require additional considerations. Please note that the values of CIN, LBUS and CBUS may vary according to the specific converter model.

In critical applications, output ripple and noise (also referred to as periodic and random deviations or PARD) may be reduced by adding filter elements such as



Figure 2. Measuring Input Ripple Current

multiple external capacitors. Be sure to calculate component temperature rise from reflected AC current dissipated inside capacitor ESR.

#### **Floating Outputs**

Since these are isolated DC/DC converters, their outputs are "floating" with respect to their input. The essential feature of such isolation is ideal ZERO CURRENT FLOW between input and output. Real-world converters however do exhibit tiny leakage currents between input and output (see Specifications). These leakages consist of both an AC stray capacitance coupling component and a DC leakage resistance. When using the isolation feature, do not allow the isolation voltage to exceed specifications. Otherwise the converter may be damaged. Designers will normally use the negative output (-Output) as the ground return of the load circuit. You can however use the positive output (+Output) as the ground return to effectively reverse the output polarity.

### +VOUT C1 C2 SCOPE RI OAD -VOUT $C1 = 1\mu F$ $C2 = 10 \mu F$ LOAD 2-3 INCHES (51-76mm) FROM MODULE

Figure 3. Measuring Output Ripple and Noise (PARD)

#### **Minimum Output Loading Requirements**

These converters employ a synchronous rectifier design topology. All models regulate within specification and are stable from 0% load to full load conditions, unless otherwise specified. Operation under no load will not damage the converter but might, however, slightly increase regulation, output ripple, and noise.

#### **Thermal Shutdown**

To protect against thermal over-stress, these converters include thermal shutdown circuitry. If environmental conditions cause the temperature of the DC/DC's to rise above the Operating Temperature Range up to the shutdown temperature, an on-board electronic temperature sensor will power down the unit. When the temperature decreases below the turn-on threshold, the converter will automatically restart. There is a small amount of hysteresis to prevent rapid on/off cycling. CAUTION: If you operate too close to the thermal limits, the converter may shut down suddenly without warning. Be sure to thoroughly test your application to avoid unplanned thermal shutdown.

#### **Temperature Derating Curves**

The graphs in the performance data section illustrate typical operation under a variety of conditions. The Derating curves show the maximum continuous ambient air temperature and decreasing maximum output current which is acceptable under increasing forced airflow measured in Linear Feet per Minute ("LFM"). Note that these are AVERAGE measurements. The converter will accept brief increases in temperature and/or current or reduced airflow as long as the average is not exceeded.

Note that the temperatures are of the ambient airflow, not the converter itself which is obviously running at higher temperature than the outside air. Also note that "natural convection" is defined as very low flow rates which are not using fanforced airflow. Depending on the application, "natural convection" is usually about 30-65 LFM but is not equal to still air (0 LFM).

Murata Power Solutions makes Characterization measurements in a closed cycle wind tunnel with calibrated airflow. We use both thermocouples and an infrared camera system to observe thermal performance. As a practical matter, it is quite difficult to insert an anemometer to precisely measure airflow in most applications. Sometimes it is possible to estimate the effective airflow if you thoroughly understand the enclosure geometry, entry/exit orifice areas and the fan flowrate specifications.

CAUTION: If you exceed these Derating guidelines, the converter may have an unplanned Over Temperature shut down. Also, these graphs are all collected near Sea Level altitude. Be sure to reduce the derating for higher altitude.

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#### **Output Overvoltage Protection (OVP)**

This converter monitors its output voltage for an over-voltage condition using an on-board electronic comparator. The signal is optically coupled to the primary side PWM controller. If the output exceeds OVP limits, the sensing circuit will power down the unit, and the output voltage will decrease. After a time-out period, the PWM will automatically attempt to restart, causing the output voltage to ramp up to its rated value. It is not necessary to power down and reset the converter for this automatic OVP-recovery restart.

If the fault condition persists and the output voltage climbs to excessive levels, the OVP circuitry will initiate another shutdown cycle. This on/off cycling is referred to as "hiccup" mode.

#### **Output Fusing**

The converter is extensively protected against current, voltage and temperature extremes. However, your application circuit may need additional protection. In the extremely unlikely event of output circuit failure, excessive voltage could be applied to your circuit. Consider using an appropriate external protection.

#### **Output Current Limiting**

As soon as the output current increases to approximately its overcurrent limit, the DC/ DC converter will enter a current-limiting mode. The output voltage will decrease proportionally with increases in output current, thereby maintaining a somewhat constant power output. This is commonly referred to as power limiting.

Current limiting inception is defined as the point at which full power falls below the rated tolerance. See the Performance/Functional Specifications. Note particularly that the output current may briefly rise above its rated value. This enhances reliability and continued operation of your application. If the output current is too high, the converter will enter the short circuit condition.

#### **Output Short Circuit Condition**

When a converter is in current-limit mode, the output voltage will drop as the output current demand increases. If the output voltage drops too low, the magnetically coupled voltage used to develop PWM bias voltage will also drop, thereby shutting down the PWM controller. Following a time-out period, the PWM will restart, causing the output voltage to begin rising to its appropriate value. If the short-circuit condition persists, another shutdown cycle will initiate. This on/off cycling is called "hiccup mode." The hiccup cycling reduces the average output current, thereby preventing excessive internal temperatures.

#### **Trimming the Output Voltage**

The Trim input to the converter allows the user to adjust the output voltage over the rated trim range (please refer to the Specifications). In the trim equations and circuit diagrams that follow, trim adjustments use a single fixed resistor connected between the Trim input and either Vout pin. Trimming resistors should have a low temperature coefficient (±100 ppm/°C or less) and be mounted close to the converter. Keep leads short. If the trim function is not used, leave the trim unconnected. With no trim. the converter will exhibit its specified output voltage accuracy.

There are two CAUTIONs to observe for the Trim input:



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CAUTION: To avoid unplanned power down cycles, do not exceed EITHER the maximum output voltage OR the maximum output power when setting the trim. If the output voltage is excessive, the OVP circuit may inadvertantly shut down the converter. If the maximum power is exceeded, the converter may enter current limiting. If the power is exceeded for an extended period, the converter may overheat and encounter overtemperature shut down.

CAUTION: Be careful of external electrical noise. The Trim input is a sensitve input to the converter's feedback control loop. Excessive electrical noise may cause instability or oscillation. Keep external connections short to the Trim input. Use shielding if needed.

#### **Trim Equations**

Trim Up **Trim Down** UEI25-033-D48 5110 x (Vo -2.5) 12775 2050  $R_{T_{UP}}(\Omega) =$ 2050  $R_{T_{DOWN}}(\Omega) =$  $3.3 - V_0$  $V_0 - 3.3$ UEI25-050-D48 5110 x (Vo -2.5) 12775  $R_{T_{DOWN}}(\Omega) =$ 2050 2050  $R_{T_{UP}}(\Omega) =$  $V_0 - 5$  $5 - V_0$ UEI25-120-D48 10000 (Vo-2.5) 25000  $R_{T_{UP}}(\Omega) =$ 5110  $R_{T_{DOWN}}(\Omega) =$ 5110  $V_0 - 12$  $12 - V_0$ 

<Connect trim resistor <Connect trim resistor between Trim and -Vout> between Trim and +Vout>

Where Vo = Desired output voltage. Adjustment accuracy is subject to resistor tolerances and factory-adjusted output accuracy. Mount trim resistor close to converter. Use short leads.

#### **Remote On/Off Control**

On the input side, a remote On/Off Control can be specified with either positive or negative logic as follows:

Positive: Models equipped with Positive Logic are enabled when the On/Off pin is left open or is pulled high to +15Vpc with respect to -ViN. An internal bias current causes the open pin to rise to +V<sub>IN</sub>. Positive-logic devices are disabled when the On/Off is grounded or brought to within a low voltage (see Specifications) with respect to -VIN.

Negative: Models with negative logic are on (enabled) when the On/Off is grounded or brought to within a low voltage (see Specifications) with respect to -VIN. The device is off (disabled) when the On/Off is left open or is pulled high to +15Vpc Max. with respect to -ViN.

Dynamic control of the On/Off function should be able to sink the specified signal current when brought low and withstand specified voltage when brought high. Be aware too that there is a finite time in milliseconds (see Specifications) between

the time of On/Off Control activation and stable, regulated output. This time will vary slightly with output load type and current and input conditions.

There are two CAUTIONs for the On/Off Control:

CAUTION: While it is possible to control the On/Off with external logic if you carefully observe the voltage levels, the preferred circuit is either an open drain/ open collector transistor or a relay (which can thereupon be controlled by logic). The On/Off prefers to be set at approx. +15V (open pin) for the ON state, assuming positive logic.

CAUTION: Do not apply voltages to the On/Off pin when there is no input power voltage. Otherwise the converter may be permanently damaged.





Figure 4. Trim adjustments to decrease Output Voltage using a Fixed Resistor

Figure 5. Trim adjustments to increase Output Voltage using a Fixed Resistor



Figure 6. Driving the On/Off Control Pin (suggested circuit)

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#### **Emissions Performance**

Murata Power Solutions measures its products for radio frequency emissions against the EN 55022 and CISPR 22 standards. Passive resistance loads are employed and the output is set to the maximum voltage. If you set up your own emissions testing, make sure the output load is rated at continuous power while doing the tests.

The recommended external input and output capacitors (if required) are included. Please refer to the fundamental switching frequency. All of this information is listed in the Product Specifications. An external discrete filter is installed and the circuit diagram is shown below.



Figure 7. Conducted Emissions Test Circuit

#### [1] Conducted Emissions Parts List

Reference	Part Number	Description	Vendor
L1	PE-62913	1 mH, 6A	Pulse
L2	NC	4.7uH, 3.6A	Murata
C1, C2	VZ Series	Electrolytic Capacitor 22ufd, 100V	Panasonic
C3	VZ Series	Qty 2 - Electrolytic Capacitor 22ufd, 100V	Panasonic
C4, C5	Unknown	3.3nF, 1500V	Unknown
C6	VZ Series	Electrolytic Capacitor 22ufd, 100V	Panasonic

#### [2] Conducted Emissions Test Equipment Used

- Rohde & Schwarz EMI Test Receiver (9KHz 1000MHz) ESPC
- Rohde & Schwarz Software ESPC-1 Ver. 2.20
- OHMITE 25W 1 Ohm resistor combinations
- DC Source Programmable DC Power Supply Model 62012P-100-50

#### [3] Conducted Emissions Test Results



Graph 1. Conducted emissions performance with filter, Negative Line, CISPR 22, Class B, full load, for UEI25-033-D48PM-C



Graph 2. Conducted emissions performance with filter, Negative Line, CISPR 22, Class B, full load, for UEI25-050-D48NM-C



Graph 3. Conducted emissions performance without filter, Negative Line, CISPR 22, Class B, full load, for UEI25-050-D48NM-C



Graph 4. Conducted emissions performance with filter, Negative Line, CISPR 22, Class B, full load, for UEI25-120-D48P-C

#### [4] Layout Recommendations

Most applications can use the filtering which is already installed inside the converter or with the addition of the recommended external capacitors. For greater emissions suppression, consider additional filter components and/or shielding. Emissions performance will depend on the user's PC board layout, the chassis shielding environment and choice of external components.

Since many factors affect both the amplitude and spectra of emissions, we recommend using an engineer who is experienced at emissions suppression.

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Figure 8. Vertical Wind Tunnel

#### **Vertical Wind Tunnel**

Murata Power Solutions employs a computer controlled custom-designed closed loop vertical wind tunnel, infrared video camera system, and test instrumentation for accurate airflow and heat dissipation analysis of power products. The system includes a precision low flow-rate anemometer, variable speed fan, power supply input and load controls, temperature gauges, and adjustable heating element.

The IR camera monitors the thermal performance of the Unit Under Test (UUT) under static steady-state conditions. A special optical port is used which is transparent to infrared wavelengths.

Both through-hole and surface mount converters are soldered down to a host carrier board for realistic heat absorption and spreading. Both longitudinal and transverse airflow studies are possible by rotation of this carrier board since there are often significant differences in the heat dissipation in the two airflow directions. The combination of adjustable airflow, adjustable ambient heat, and adjustable lnput/Output currents and voltages mean that a very wide range of measurement conditions can be studied.

The collimator reduces the amount of turbulence adjacent to the UUT by minimizing airflow turbulence. Such turbulence influences the effective heat transfer characteristics and gives false readings. Excess turbulence removes more heat from some surfaces and less heat from others, possibly causing uneven overheating.

Both sides of the UUT are studied since there are different thermal gradients on each side. The adjustable heating element and fan, built-in temperature gauges, and no-contact IR camera mean that power supplies are tested in real-world conditions.

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#### **Through-hole Soldering Guidelines**

Murata Power Solutions recommends the TH soldering specifications below when installing these converters. These specifications vary depending on the solder type. Exceeding these specifications may cause damage to the product. Your production environment may differ; therefore please thoroughly review these quidelines with your process engineers.

Wave Solder Operations for through-hole mounted products (THMT)					
For Sn/Ag/Cu based solders:					
Maximum Preheat Temperature	115° C.				
Maximum Pot Temperature	270° C.				
Maximum Solder Dwell Time	7 seconds				
For Sn/Pb based solders:					
Maximum Preheat Temperature	105° C.				
Maximum Pot Temperature 250° C.					
Maximum Solder Dwell Time 6 seconds					

#### **SMT Reflow Soldering Guidelines**

The surface-mount reflow solder profile shown below is suitable for SAC305 type lead-free solders. This graph should be used only as a *guideline*. Many other factors influence the success of SMT reflow soldering. Since your production environment may differ, please thoroughly review these guidelines with your process engineers.



Murata Power Solutions, Inc. 129 Flanders Rd. Westborough, MA 01581, USA. ISO 9001 and 14001 REGISTERED



This product is subject to the following <u>operating requirements</u> and the <u>Life and Safety Critical Application Sales Policy</u>: Refer to: <u>https://www.murata-ps.com/requirements/</u>

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