R6025FNZ

Nch 600V 25A Power MOSFET Datasheet

V_{DSS}	600V
$R_{DS(on)}$ (Max.)	0.18Ω
I_D	25A
P_D	150W

●Outline

TO-3PF

●Features

1) Low on-resistance.

2) Fast switching speed.

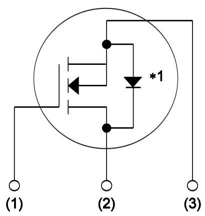
3) Gate-source voltage (V_{GSS}) guaranteed to be ±30V.

4) Drive circuits can be simple.

5) Parallel use is easy.

6) Pb-free lead plating ; RoHS compliant

●Inner circuit



(1) Gate
(2) Drain
(3) Source

∗1 BODY DIODE

●Application

Switching Power Supply

●Packaging specifications

Type	Packaging	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	360
	Taping code	C8
	Marking	R6025FNZ

●Absolute maximum ratings(T_a = 25°C)

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	600	V
Continuous drain current	T_c = 25°C	I_D *1	±25	A
	T_c = 100°C	I_D *1	±12	A
Pulsed drain current		$I_{D,pulse}$ *2	±100	A
Gate - Source voltage		V_{GSS}	±30	V
Avalanche energy, single pulse		E_{AS} *3	42.1	mJ
Avalanche energy, repetitive		E_{AR} *4	9.7	mJ
Avalanche current		I_{AR} *3	12.5	A
Power dissipation (T_c = 25°C)		P_D	150	W
Junction temperature		T_j	150	°C
Range of storage temperature		T_{stg}	–55 to +150	°C
Reverse diode dv/dt		dv/dt *5	15	V/ns

●Absolute maximum ratings

Parameter	Symbol	Conditions	Values	Unit
Drain - Source voltage slope	dv/dt	V_{DS} = 480V, I_D = 25A T_j = 125°C	50	V/ns

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R_{thJC}	-	-	0.83	°C/W
Thermal resistance, junction - ambient	R_{thJA}	-	-	40	°C/W
Soldering temperature, wavesoldering for 10s	T_{sold}	-	-	265	°C

●Electrical characteristics(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 1mA	600	-	-	V
Drain - Source avalanche breakdown voltage	$V_{(BR)DS}$	V_{GS} = 0V, I_D = 12.5A	-	700	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} = 600V, V_{GS} = 0V T_j = 25°C	-	0.1	100	μA
		T_j = 125°C	-	-	100	mA
Gate - Source leakage current	I_{GSS}	V_{GS} = ±30V, V_{DS} = 0V	-	-	±100	nA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} = 10V, I_D = 1mA	3	-	5	V
Static drain - source on - state resistance	$R_{DS(on)}$ *6	V_{GS} = 10V, I_D = 12.5A T_j = 25°C	-	0.14	0.18	Ω
		T_j = 125°C	-	0.28	-	Ω
Gate input resistance	R_G	f = 1MHz, open drain	-	3.3	-	Ω

●Electrical characteristics(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	g_{fs} *6	V_{DS} = 10V, I_D = 12.5A	9	18	-	S
Input capacitance	C_{iss}	V_{GS} = 0V	-	3500	-	pF
Output capacitance	C_{oss}	V_{DS} = 25V	-	2200	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	45	-	
Effective output capacitance, energy related	$C_{o(er)}$	V_{GS} = 0V V_{DS} = 0V ~ 480V	-	111	-	pF
Effective output capacitance, time related	$C_{o(tr)}$		-	364	-	
Turn - on delay time	$t_{d(on)}$ *6	$V_{DD} \simeq$ 300V, V_{GS} = 10V	-	57	-	ns
Rise time	t_r *6	I_D = 12.5A	-	115	-	
Turn - off delay time	$t_{d(off)}$ *6	R_L = 24Ω	-	150	300	
Fall time	t_f *6	R_G = 10Ω	-	72	144	

●Gate Charge characteristics(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *6	$V_{DD} \simeq$ 300V	-	85	-	nC
Gate - Source charge	Q_{gs} *6	I_D = 25A	-	25	-	
Gate - Drain charge	Q_{gd} *6	V_{GS} = 10V	-	35	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} \simeq$ 300V, I_D = 25A	-	7.1	-	V

*1 Limited only by maximum temperature allowed.

*2 $P_W \leq 10\mu s$, Duty cycle ≤ 1%

*3 L ≃ 500μH, V_{DD} = 50V, R_G = 25Ω, starting T_j = 25°C

*4 L ≃ 500μH, V_{DD} = 50V, R_G = 25Ω, starting T_j = 25°C, f = 10kHz

*5 Reference measurement circuits Fig.5-1.

*6 Pulsed

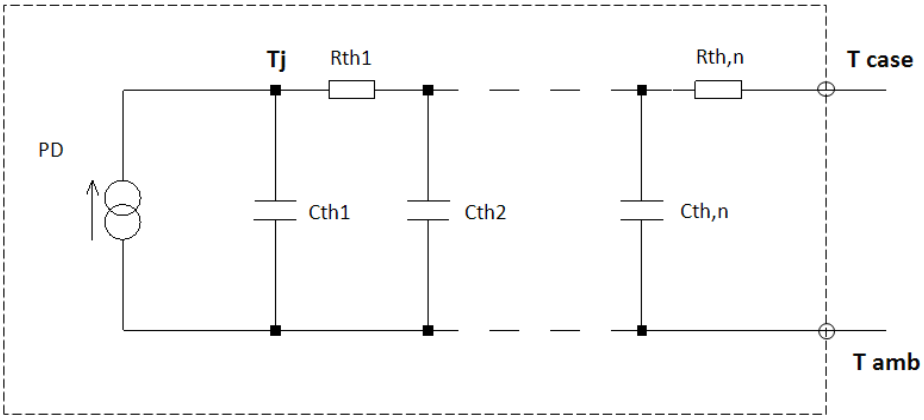
●Body diode electrical characteristics (Source-Drain)(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S *1	T_c = 25°C	-	-	25	A
Inverse diode direct current, pulsed	I_{SM} *2		-	-	100	A
Forward voltage	V_{SD} *6	V_{GS} = 0V, I_S = 25A	-	-	1.5	V
Reverse recovery time	t_{rr} *6	I_S = 25A di/dt = 100A/µs	-	120	-	ns
Reverse recovery charge	Q_{rr} *6		-	0.53	-	µC
Peak reverse recovery current	I_{rrm} *6		-	9	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt	T_j = 25°C	-	1150	-	A/µs

●Typical Transient Thermal Characteristics

Symbol	Value	Unit
R_{th1}	0.0564	K/W
R_{th2}	0.391	
R_{th3}	1.26	

Symbol	Value	Unit
C_{th1}	0.0077	Ws/K
C_{th2}	0.0779	
C_{th3}	1.13	



●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

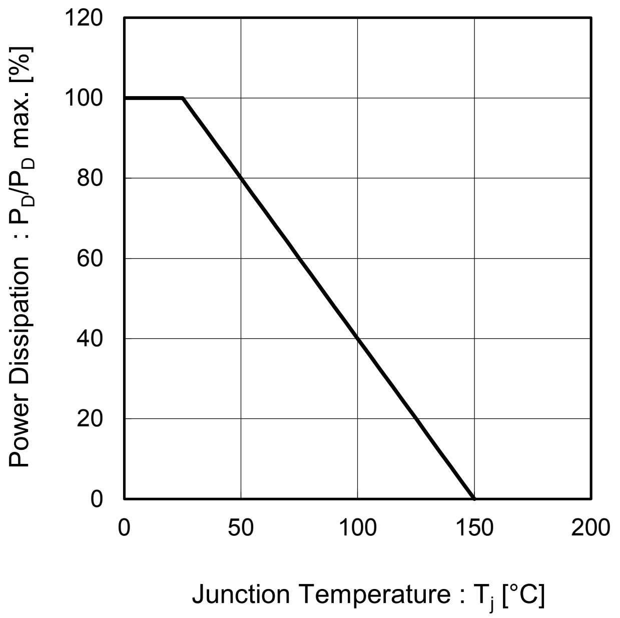


Fig.2 Maximum Safe Operating Area

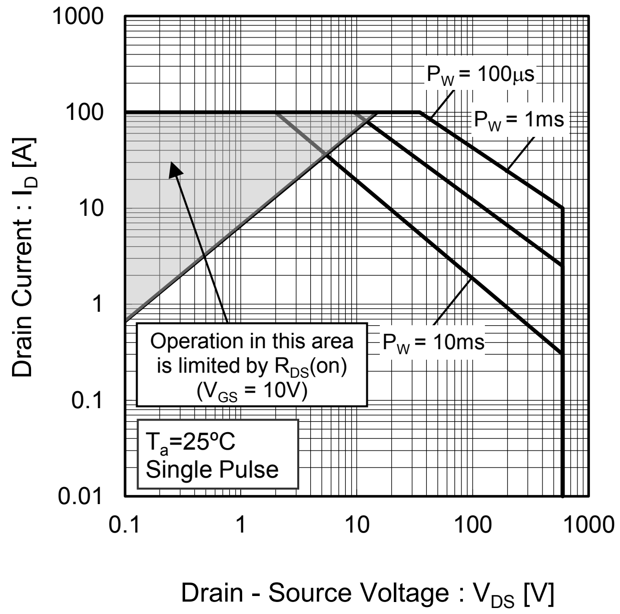
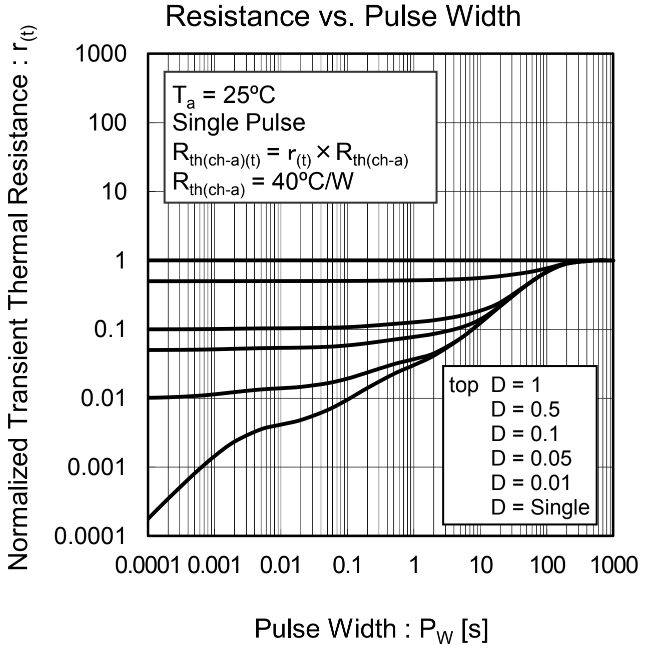


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Avalanche Current vs Inductive Load

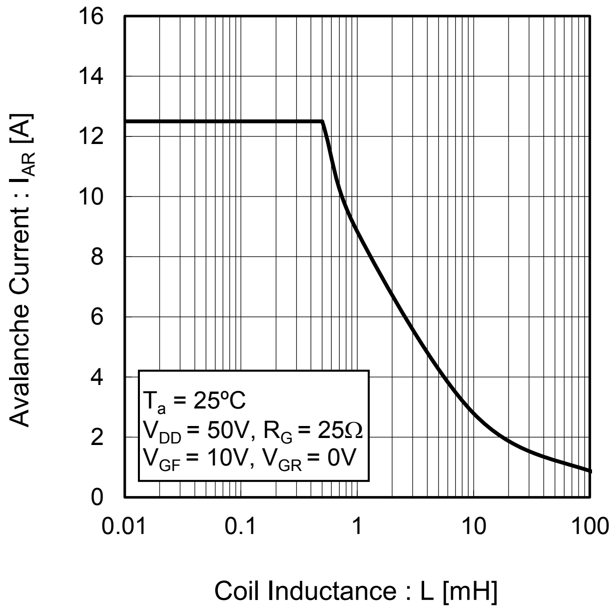


Fig.5 Avalanche Power Losses

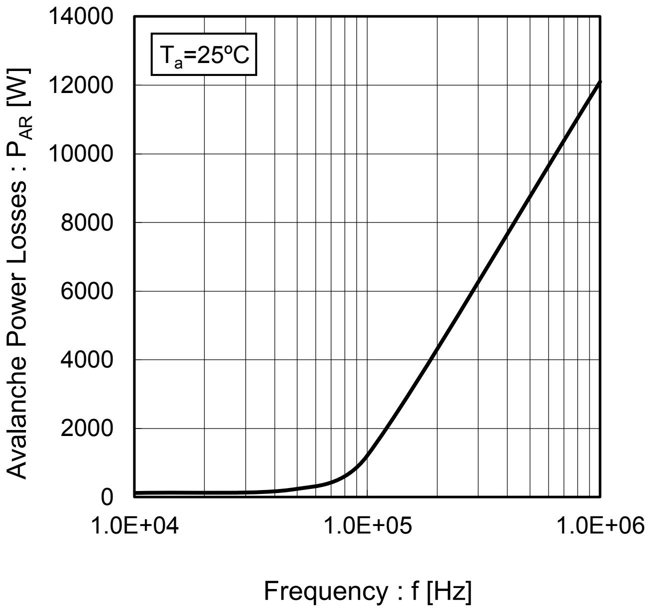
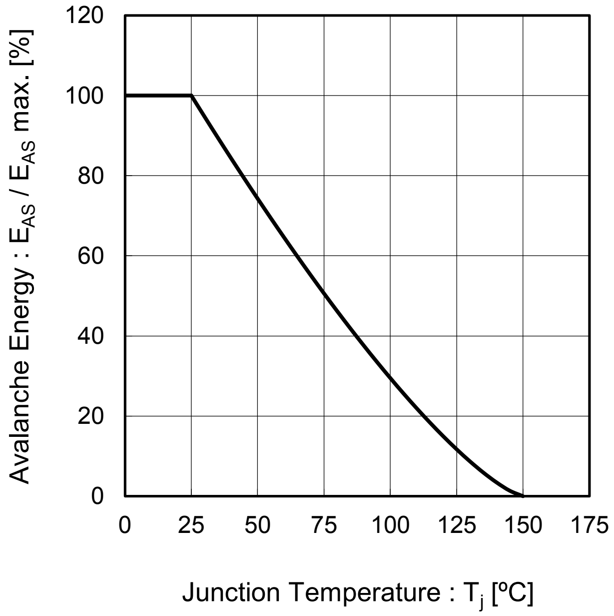


Fig.6 Avalanche Energy Derating Curve vs Junction Temperature



●Electrical characteristic curves

Fig.7 Typical Output Characteristics(I)

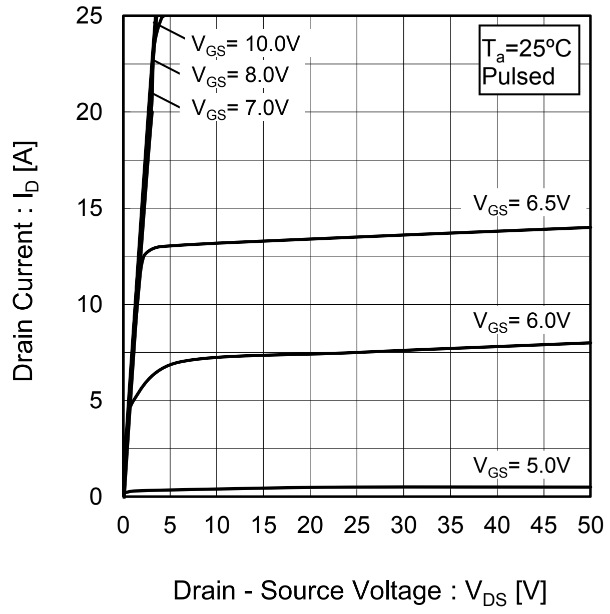


Fig.8 Typical Output Characteristics(II)

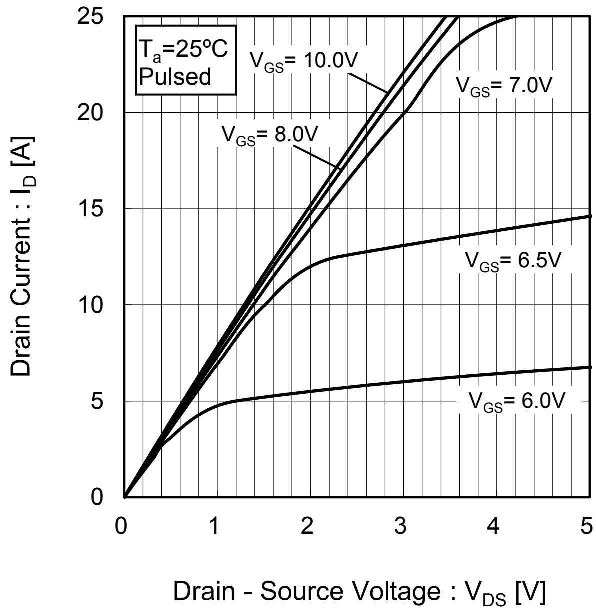


Fig.9 T_j = 150°C Typical Output Characteristics(I)

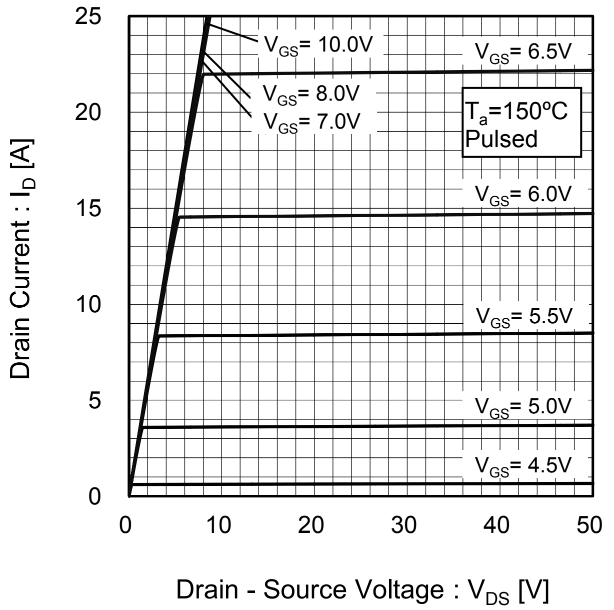
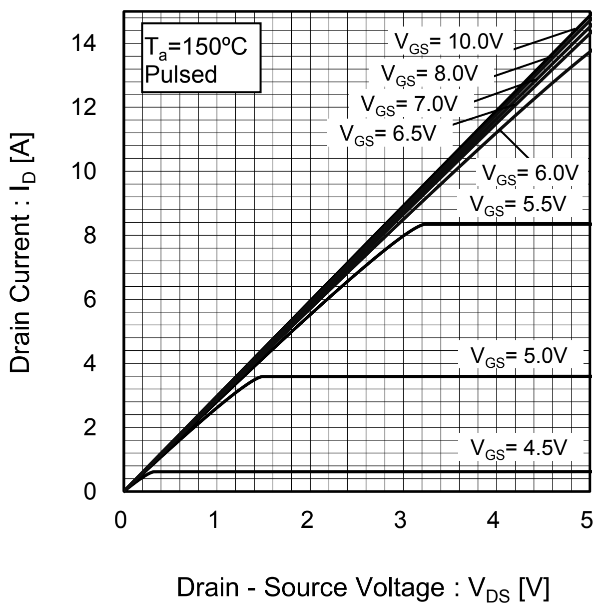
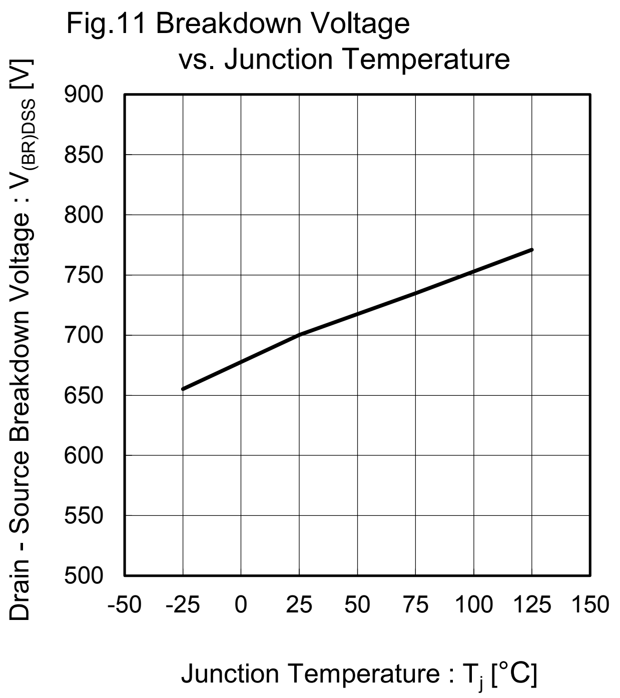
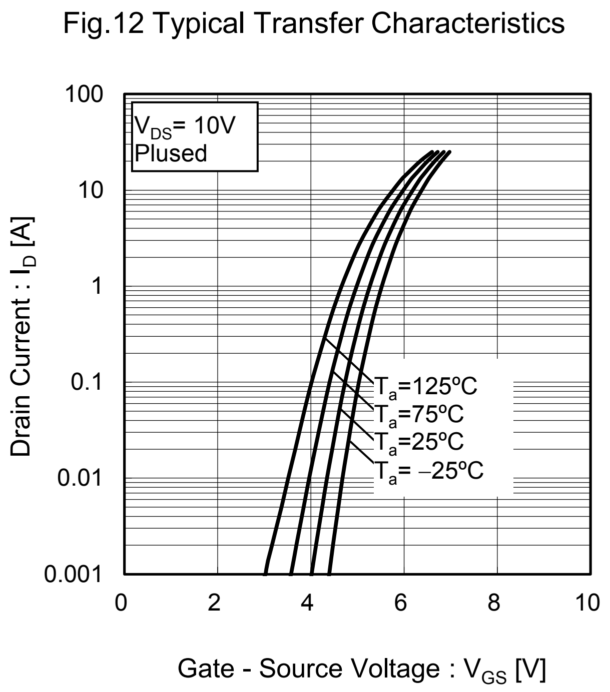


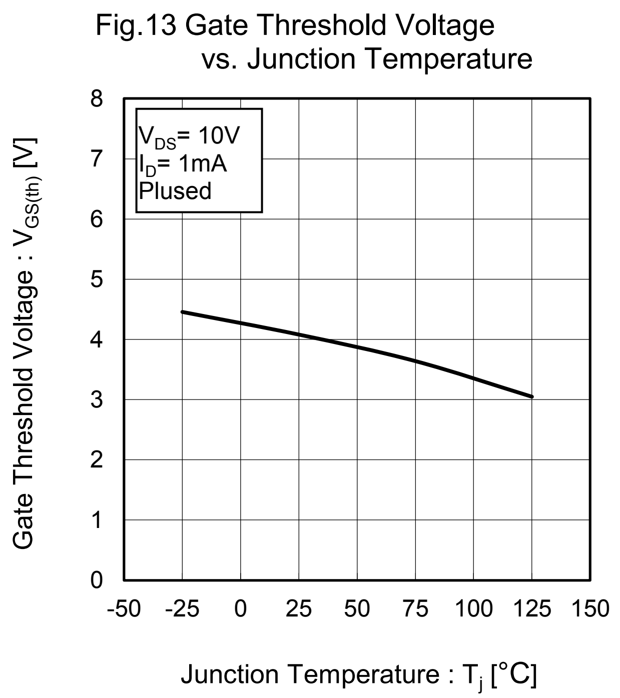
Fig.10 T_j = 150°C Typical Output Characteristics(II)

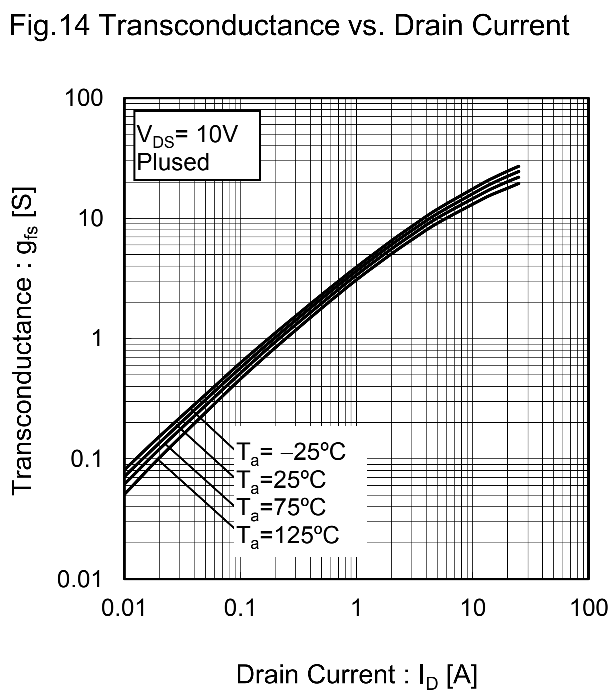


●Electrical characteristic curves









●Electrical characteristic curves

Fig.15 Static Drain - Source On - State Resistance vs. Gate Source Voltage

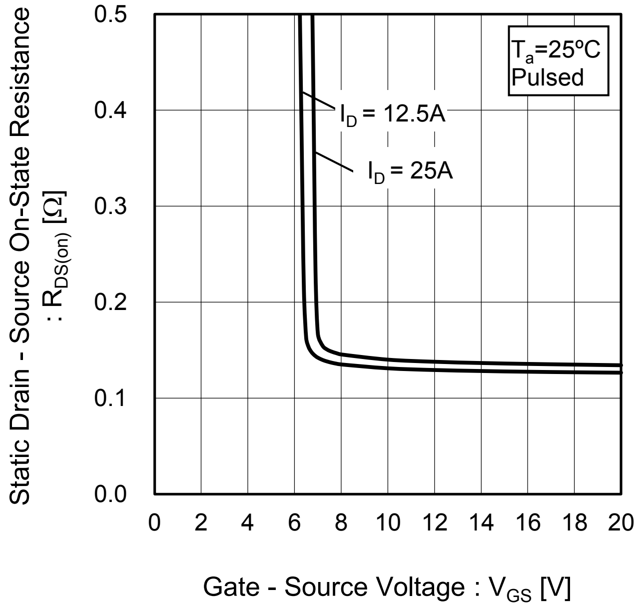


Fig.16 Static Drain - Source On - State Resistance vs. Junction Temperature

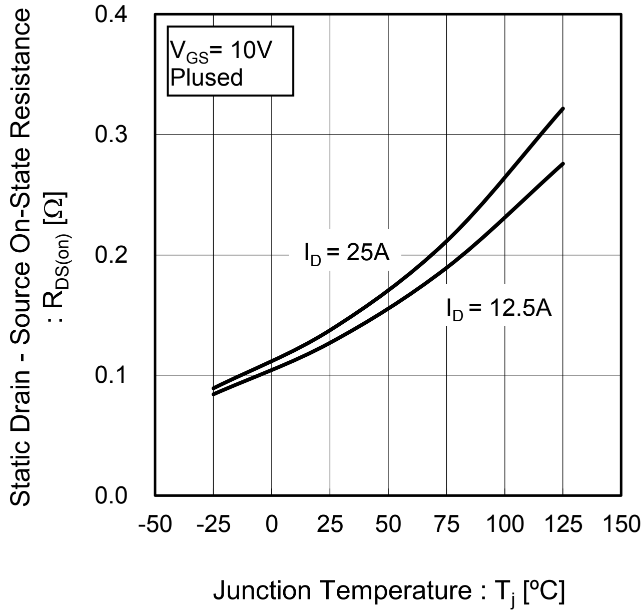
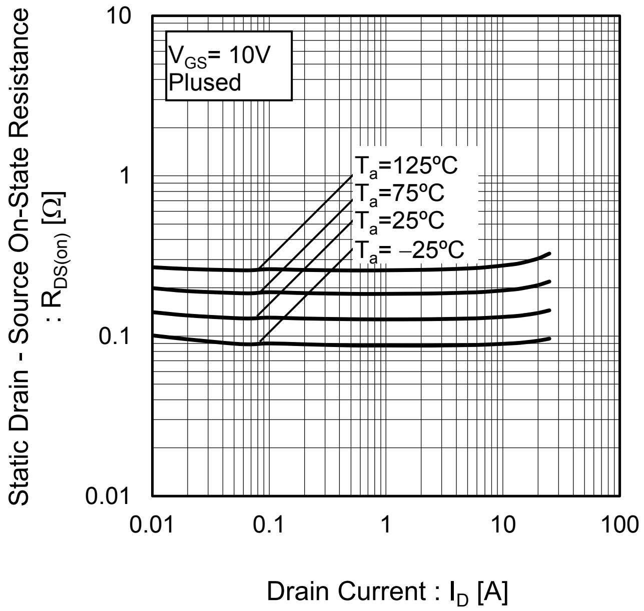


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

Fig.18 Typical Capacitance vs. Drain - Source Voltage

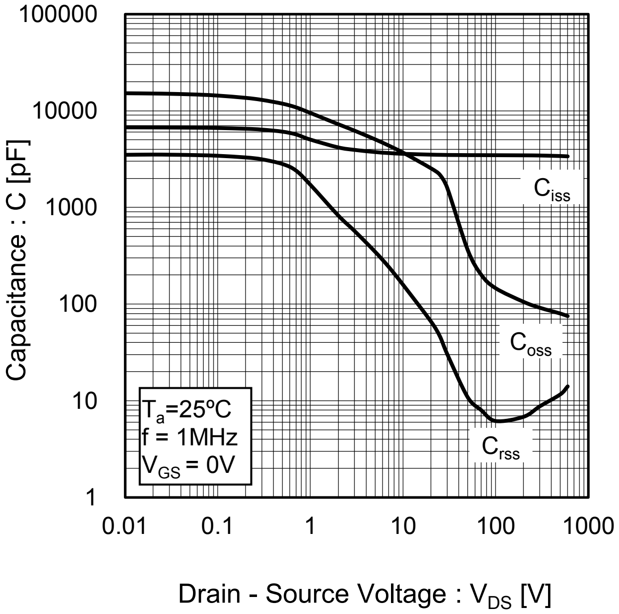


Fig.19 Coss Stored Energy

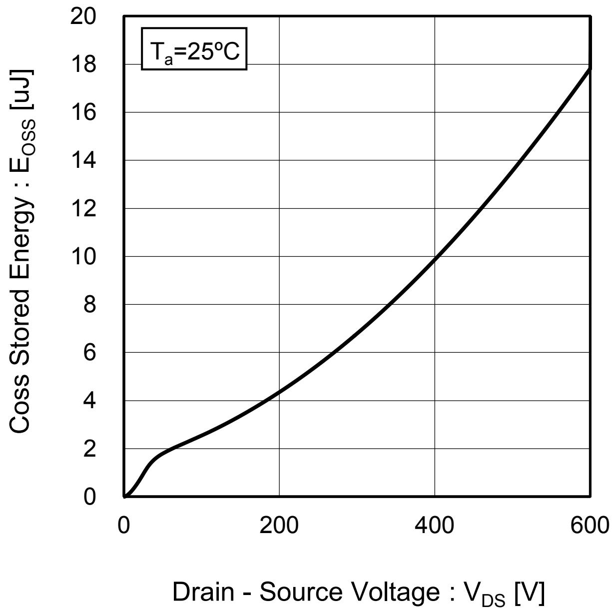


Fig.20 Switching Characteristics

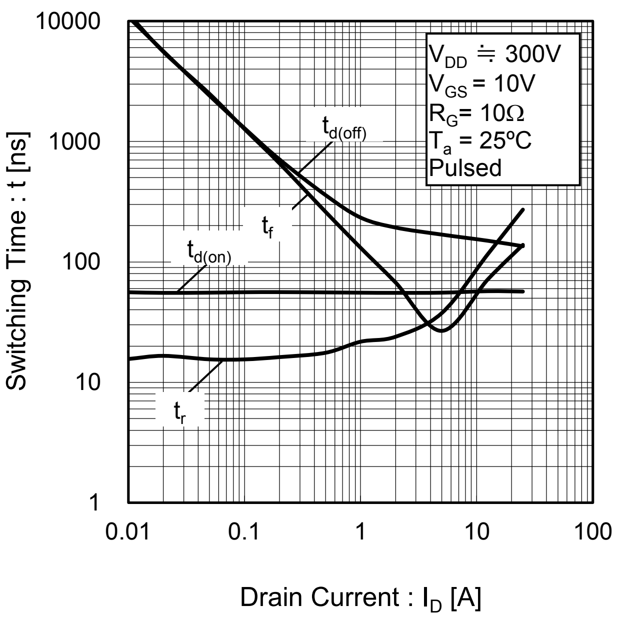
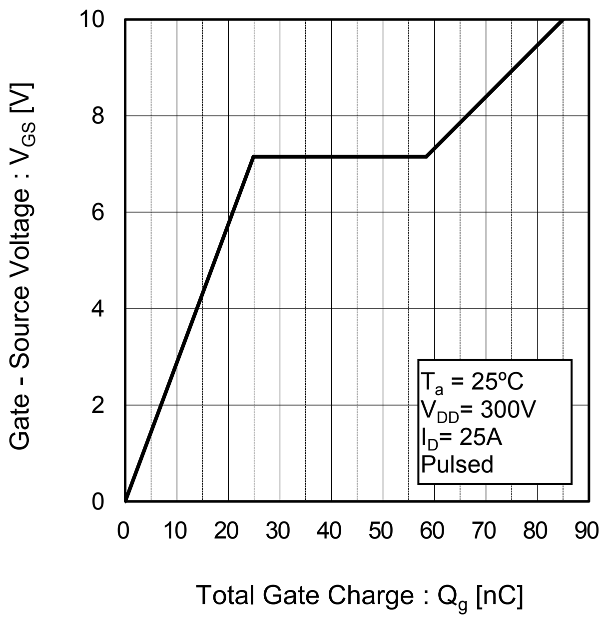


Fig.21 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.22 Inverse Diode Forward Current vs. Source - Drain Voltage

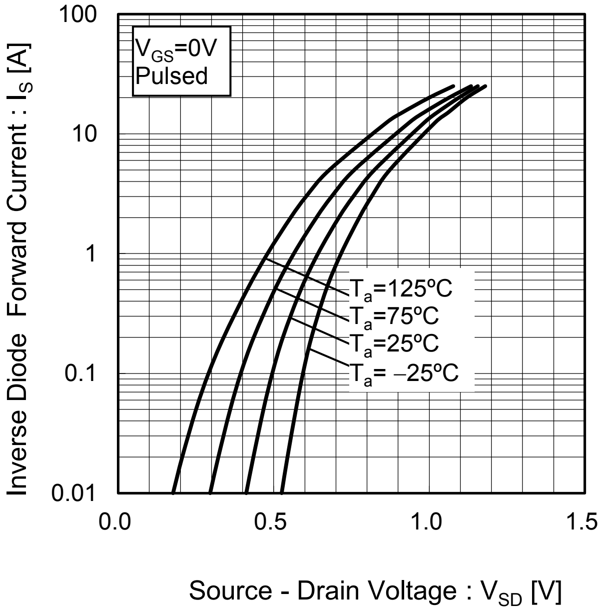
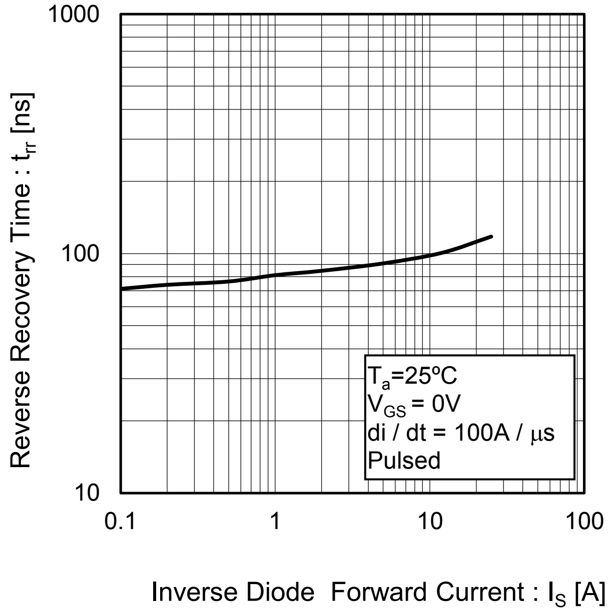


Fig.23 Reverse Recovery Time vs.Inverse Diode Forward Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

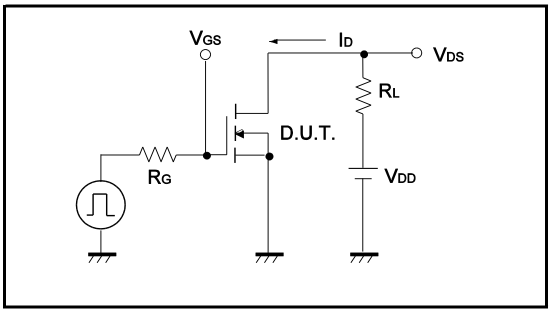


Fig.1-2 Switching Waveforms

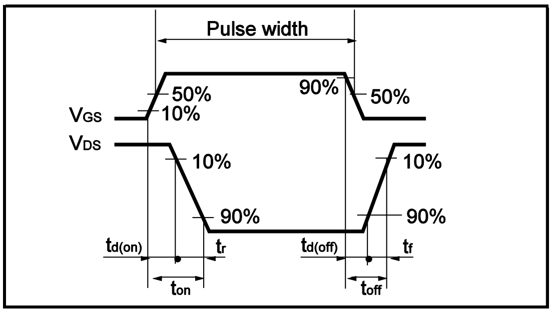


Fig.2-1 Gate Charge Measurement Circuit

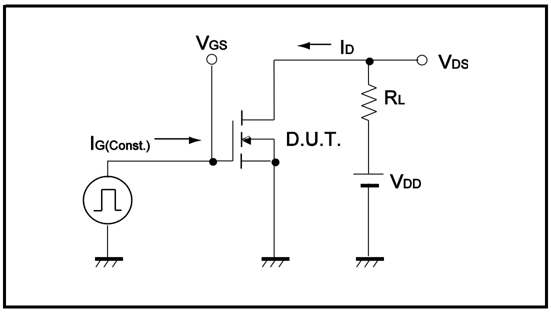


Fig.2-2 Gate Charge Waveform

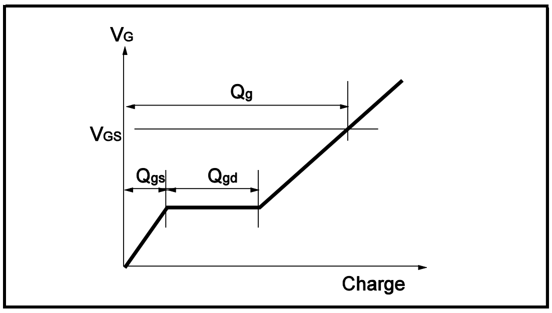


Fig.3-1 Avalanche Measurement Circuit

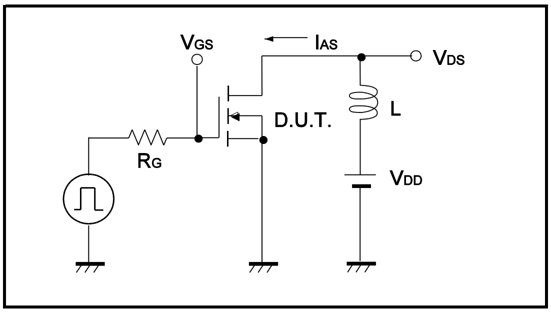


Fig.3-2 Avalanche Waveform

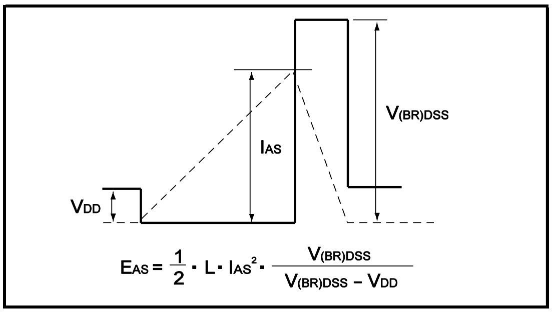


Fig.4-1 dv/dt Measurement Circuit

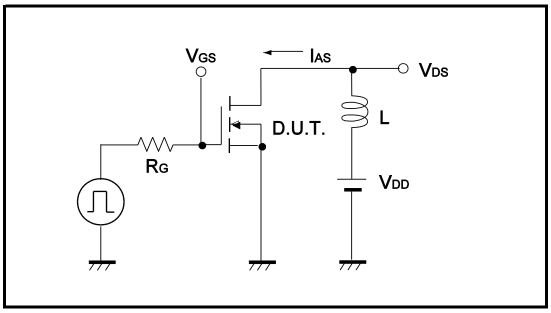


Fig.4-2 dv/dt Waveform

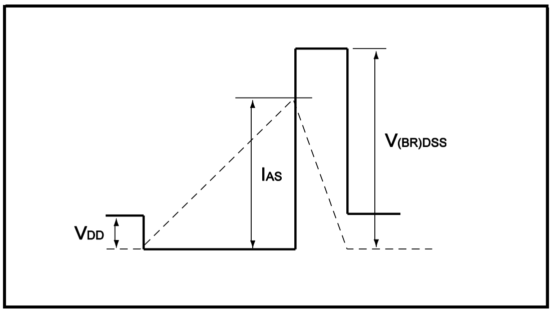


Fig.5-1 di/dt Measurement Circuit

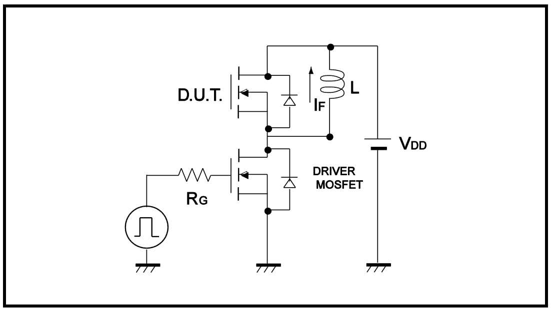
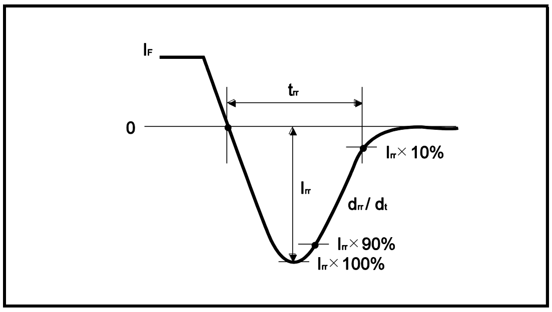
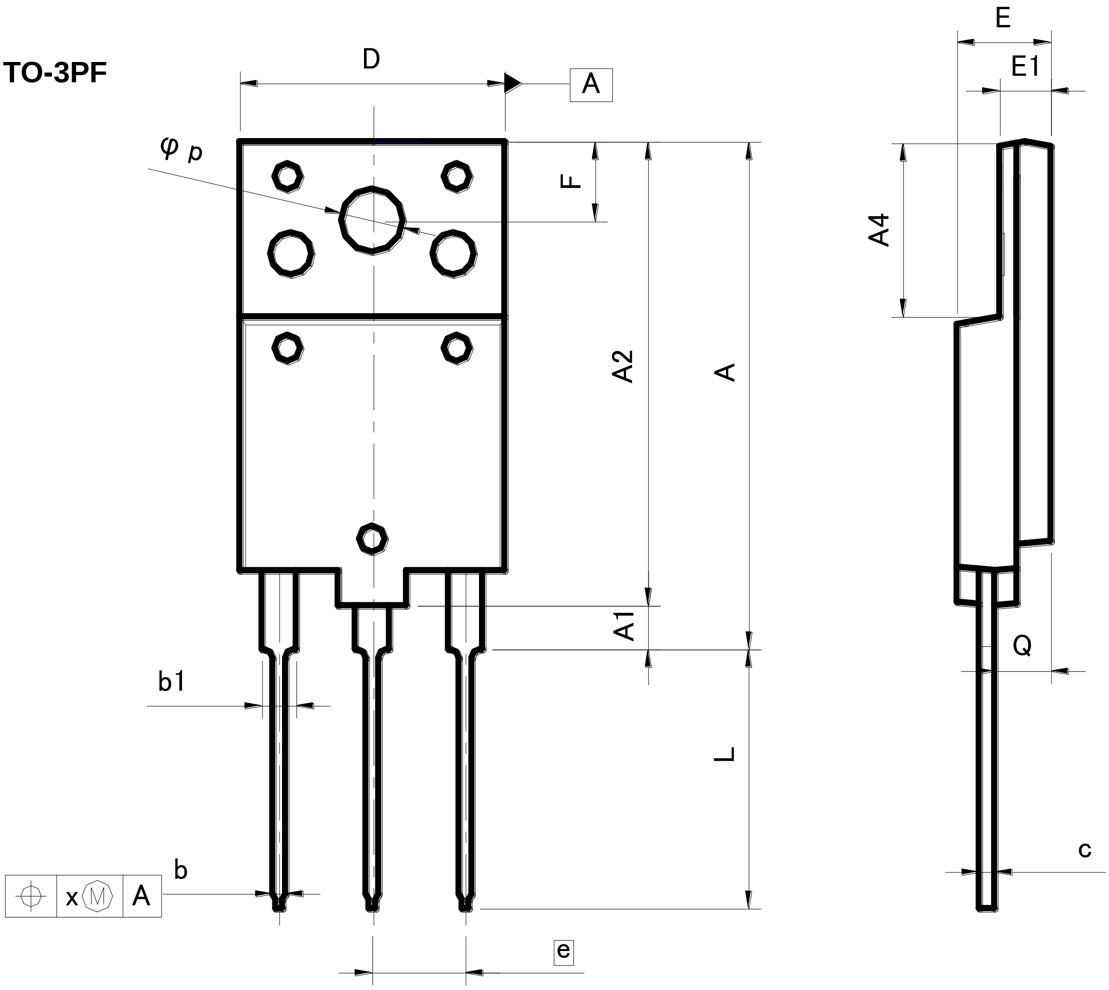


Fig.5-2 di/dt Waveform



●Dimensions (Unit : mm)

TO-3PF



DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	26.30	26.70	1.035	1.051
A1	2.30	2.70	0.091	0.106
A2	26.30	26.70	1.035	1.051
A4	9.80	10.20	0.386	0.402
b	0.65	0.95	0.026	0.037
b1	1.80	2.20	0.071	0.087
c	0.80	1.10	0.031	0.043
D	15.30	15.70	0.602	0.618
E	5.30	5.70	0.209	0.224
e	5.45		0.215	−
E1	2.80	3.20	0.110	0.126
F	4.30	4.70	0.169	0.185
L	14.60	15.00	0.575	0.591
p	3.40	3.80	0.134	0.150
Q	3.10	3.50	0.122	0.138
x	−	0.50	−	0.020

Dimension in mm / inches

Notes

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