N-Channel Power MOSFET

40V, 135A, 3.8mΩ

FEATURES

- Low $R_{DS(ON)}$ to minimize conductive losses
- Logic level
- Low gate charge for fast power switching
- 100% UIS and R_g tested
- Compliant to RoHS directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

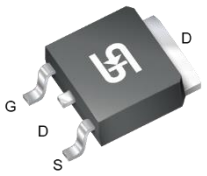
KEY PERFORMANCE PARAMETERS			
PARAMETER		**VALUE**	**UNIT**
V_{DS}		40	V
$R_{DS(on)}$ (max)	V_{GS} = 10V	3.8	mΩ
	V_{GS} = 4.5V	5	
Q_g		53	nC

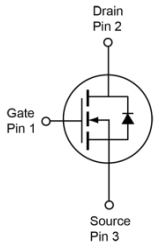
APPLICATIONS

- BLDC Motor Control
- Battery Power Management
- DC-DC converter
- Secondary Synchronous Rectification

Pb-Free RoHS COMPLIANT HALOGEN FREE

TO-252 (DPAK)





Note: MSL 3 (Moisture Sensitivity Level) per J-STD-020

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)				
PARAMETER		**SYMBOL**	**LIMIT**	**UNIT**
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current (Note 1)	T_C = 25°C	I_D	135	A
	T_A = 25°C		19	
Pulsed Drain Current		I_{DM}	540	A
Single Pulse Avalanche Current (Note 2)		I_{AS}	38	A
Single Pulse Avalanche Energy (Note 2)		E_{AS}	217	mJ
Total Power Dissipation	T_C = 25°C	P_D	125	W
	T_C = 125°C		25	
Total Power Dissipation	T_A = 25°C	P_D	2.6	W
	T_A = 125°C		0.5	
Operating Junction and Storage Temperature Range		T_J, T_{STG}	- 55 to +150	°C

THERMAL PERFORMANCE			
PARAMETER	**SYMBOL**	**LIMIT**	**UNIT**
Junction to Case Thermal Resistance	$R_{\Theta JC}$	1	°C/W
Junction to Ambient Thermal Resistance	$R_{\Theta JA}$	49	°C/W

Thermal Performance Note: $R_{\Theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistances. The case-thermal reference is defined at the solder mounting surface of the drain pins. $R_{\Theta JA}$ is guaranteed by design while $R_{\Theta CA}$ is determined by the user's board design.

ELECTRICAL SPECIFICATIONS (T_A = 25°C unless otherwise noted)						
PARAMETER	**CONDITIONS**	**SYMBOL**	**MIN**	**TYP**	**MAX**	**UNIT**
Static						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA	BV_{DSS}	40	--	--	V
Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	$V_{GS(TH)}$	1.2	1.5	2.5	V
Gate-Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Drain-Source Leakage Current	V_{GS} = 0V, V_{DS} = 40V	I_{DSS}	--	--	1	μA
	V_{GS} = 0V, V_{DS} = 40V T_J = 125°C		--	--	100	
Drain-Source On-State Resistance (Note 3)	V_{GS} = 10V, I_D = 19A	$R_{DS(on)}$	--	2.8	3.8	mΩ
	V_{GS} = 4.5V, I_D = 17A		--	3.4	5	
Forward Transconductance (Note 3)	V_{DS} = 5V, I_D = 19A	g_{fs}	--	55	--	S
Dynamic (Note 4)						
Total Gate Charge	V_{GS} = 10V, V_{DS} = 20V, I_D = 19A	Q_g	--	104	--	nC
Total Gate Charge	V_{GS} = 4.5V, V_{DS} = 20V, I_D = 17A	Q_g	--	53	--	
Gate-Source Charge		Q_{gs}	--	14	--	
Gate-Drain Charge		Q_{gd}	--	23	--	
Input Capacitance	V_{GS} = 0V, V_{DS} = 20V f = 1.0MHz	C_{iss}	--	5509	--	pF
Output Capacitance		C_{oss}	--	548	--	
Reverse Transfer Capacitance		C_{rss}	--	332	--	
Gate Resistance	f = 1.0MHz	R_g	0.4	1.3	2.6	Ω
Switching (Note 4)						
Turn-On Delay Time	V_{GS} = 10V, V_{DS} = 20V, I_D = 19A, R_G = 2Ω,	$t_{d(on)}$	--	8	--	ns
Turn-On Rise Time		t_r	--	21	--	
Turn-Off Delay Time		$t_{d(off)}$	--	57	--	
Turn-Off Fall Time		t_f	--	35	--	
Source-Drain Diode						
Forward Voltage (Note 3)	V_{GS} = 0V, I_S = 19A	V_{SD}	--	--	1	V
Reverse Recovery Time	I_S = 19A , dI/dt = 100A/μs	t_{rr}	--	37	--	ns
Reverse Recovery Charge		Q_{rr}	--	27	--	nC

Notes:

1. Silicon limited current only.
2. L = 0.3mH, V_{GS} = 10V, V_{DD} = 25V, R_G = 25Ω, I_{AS} = 38A, Starting T_J = 25°C
3. Pulse test: Pulse Width ≤ 300μs, duty cycle ≤ 2%.
4. Switching time is essentially independent of operating temperature.

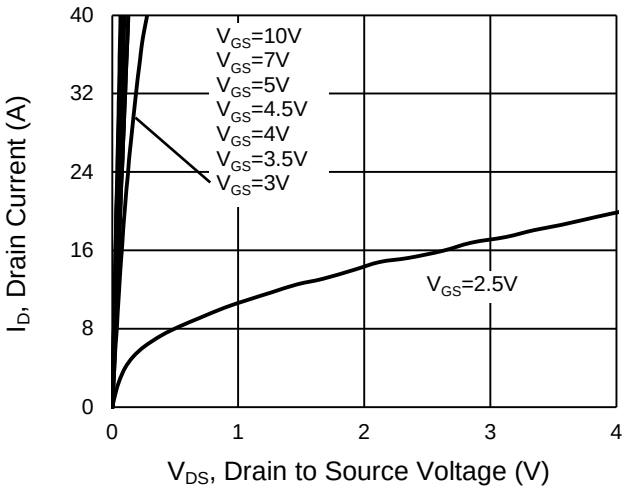
ORDERING INFORMATION

PART NO.	PACKAGE	PACKING
TSM038N04LCP ROG	TO-252 (DPAK)	2,500pcs / 13” Reel

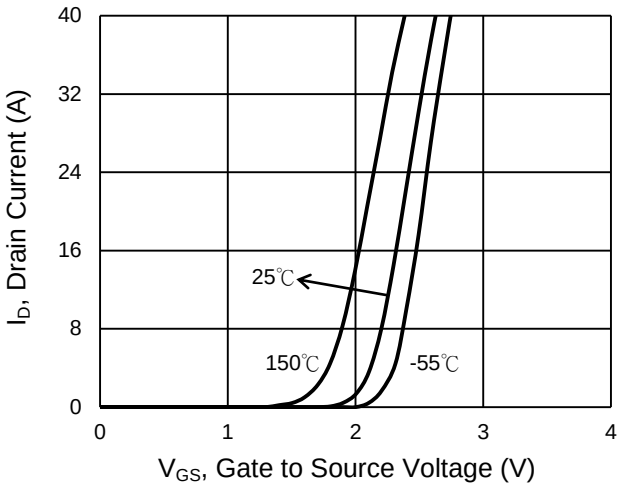
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

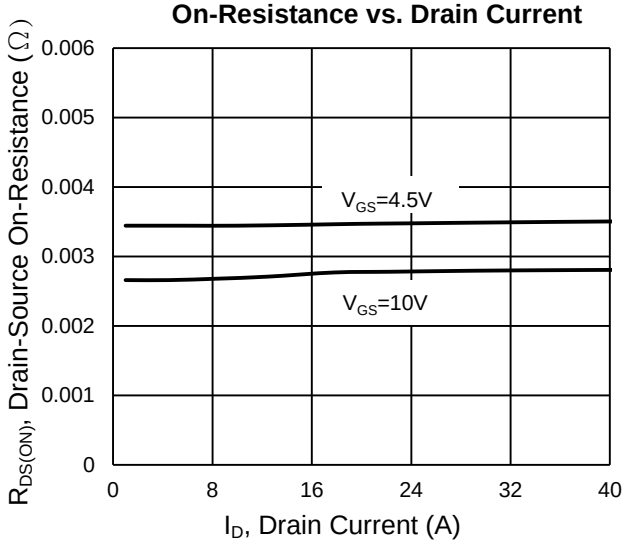
Output Characteristics



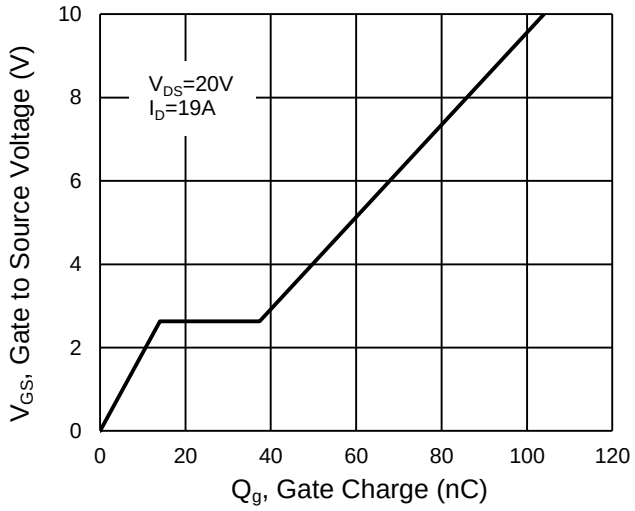
Transfer Characteristics



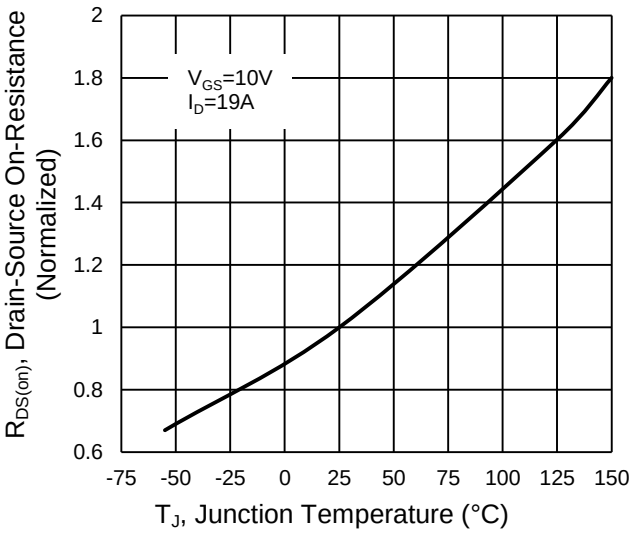
On-Resistance vs. Drain Current



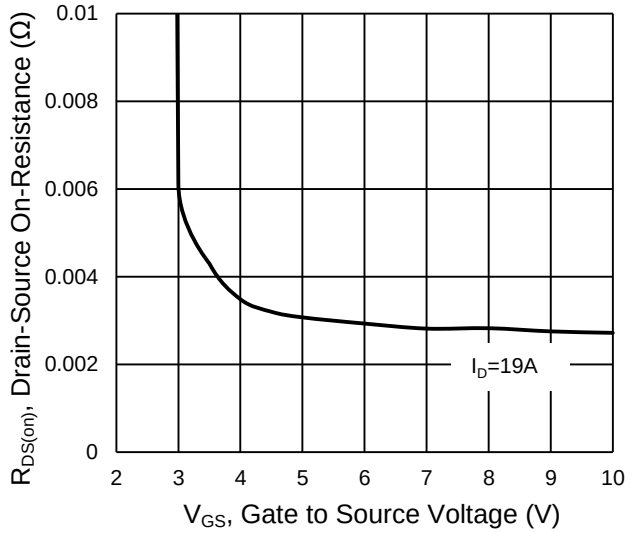
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



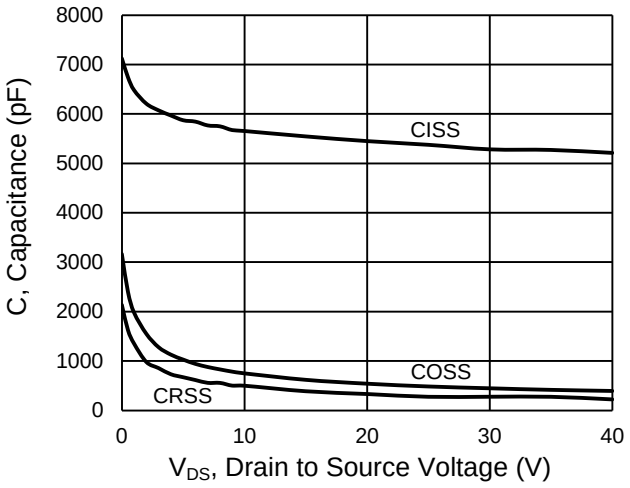
On-Resistance vs. Gate-Source Voltage



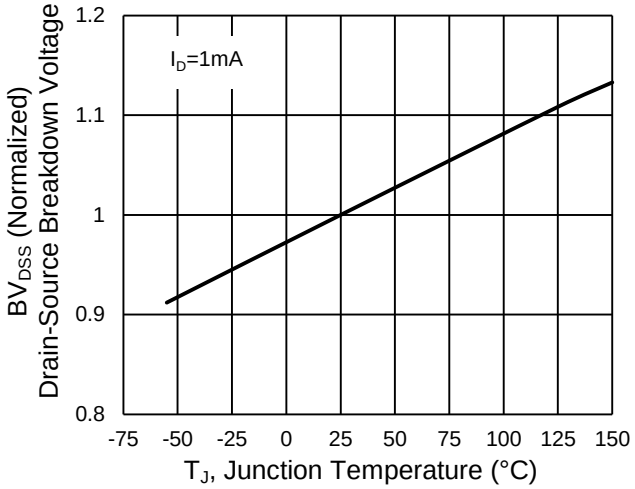
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

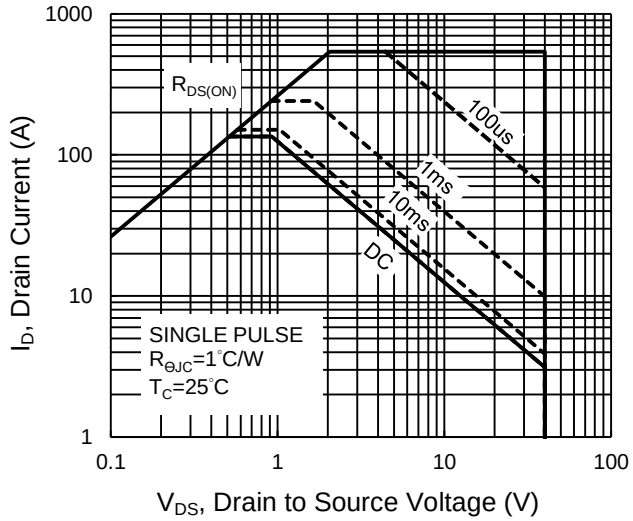
Capacitance vs. Drain-Source Voltage



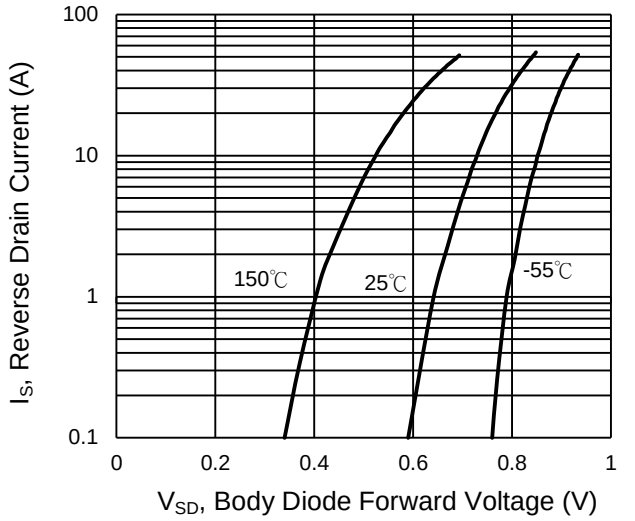
BV_{DSS} vs. Junction Temperature



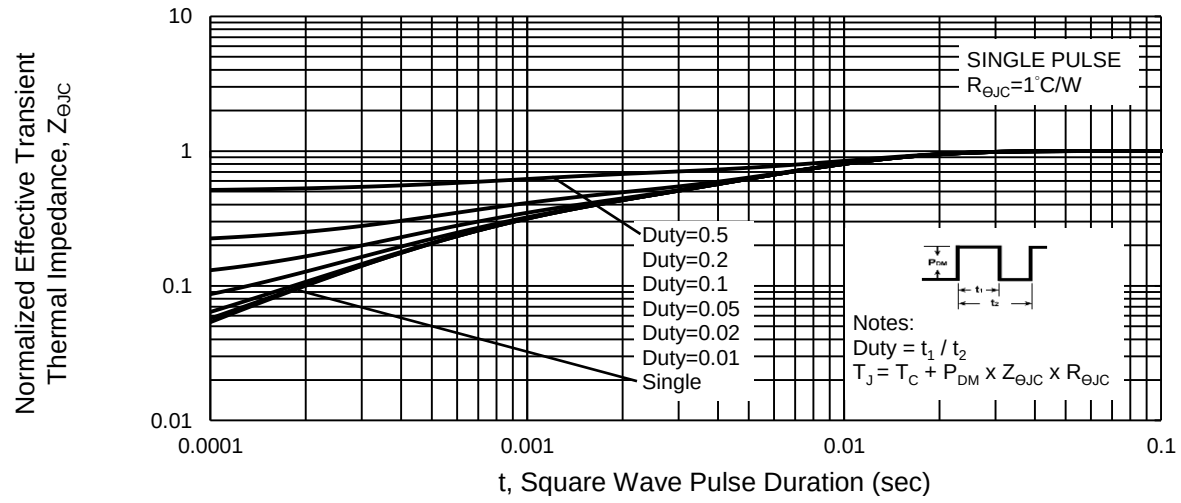
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage

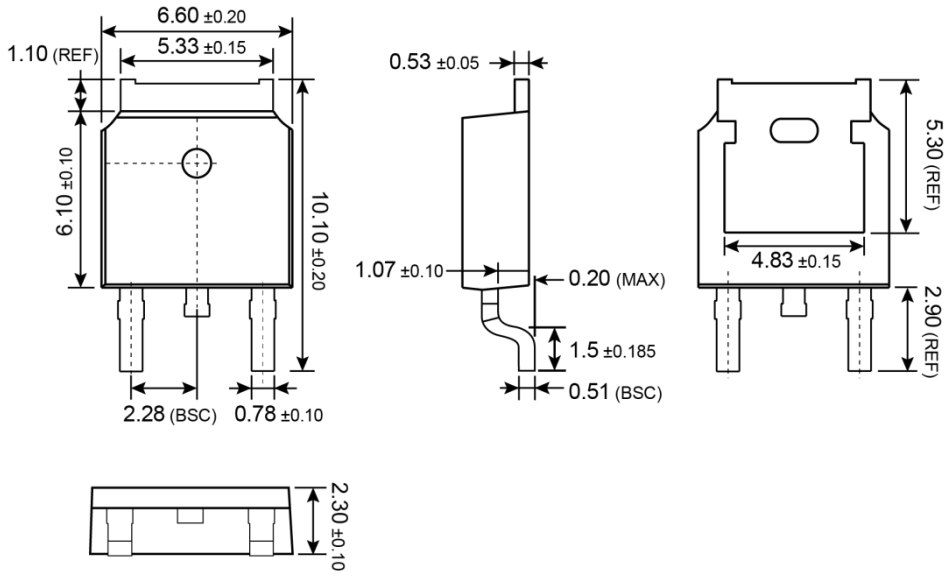


Normalized Thermal Transient Impedance, Junction-to-Case

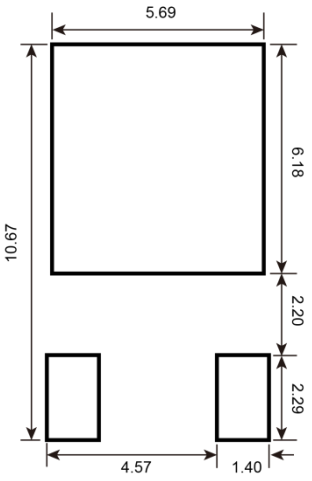


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-252 (DPAK)



SUGGESTED PAD LAYOUT (Unit: Millimeters)



MARKING DIAGRAM

Y = Year Code
M = Month Code

O	=Jan	**P**	=Feb	**Q**	=Mar	**R**	=Apr
S	=May	**T**	=Jun	**U**	=Jul	**V**	=Aug
W	=Sep	**X**	=Oct	**Y**	=Nov	**Z**	=Dec

L = Lot Code (1~9, A~Z)

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