

N-Channel Power MOSFET

600V, 4A, 2.5Ω

FEATURES

- 100% Avalanche Tested
- Pb-free plating
- RoHS compliant
- Halogen-free according to IEC 61249-2-21

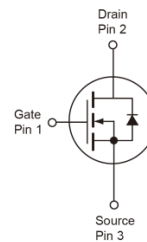
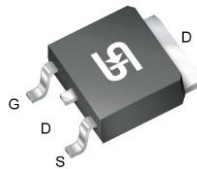
APPLICATIONS

- Lighting
- Charger
- Power Supply
- Switching applications

PRODUCT SUMMARY			
PARAMETER		VALUE	UNIT
V_{DS}		600	V
$R_{DS(on)}$ (max)	$V_{GS} = 10V$	2.5	Ω
Q_g	$V_{GS} = 10V$	16	nC



TO-252 (DPAK)



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

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current ^(Note 1)	I_D	$T_C = 25^\circ\text{C}$	4
		$T_C = 100^\circ\text{C}$	2.7
Pulsed Drain Current	I_{DM}	16	A
Single Pulse Avalanche Current ^(Note 2)	I_{AS}	4.6	A
Single Pulse Avalanche Energy ^(Note 2)	E_{AS}	84	mJ
Total Power Dissipation	P_D	114	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	- 55 to +150	°C

THERMAL RESISTANCE			
PARAMETER	SYMBOL	MAXIMUM	UNIT
Thermal Resistance – Junction to Case	$R_{\theta JC}$	1.1	°C/W
Thermal Resistance – Junction to Ambient	$R_{\theta JA}$	62	°C/W

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. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$	BV_{DSS}	600	--	--	V
Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	$V_{GS(TH)}$	2.5	2.8	4.5	V
Gate-Source Leakage Current	$V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$	I_{GSS}	--	--	± 100	nA
Drain-Source Leakage Current	$V_{GS} = 0\text{V}, V_{DS} = 600\text{V}$	I_{DSS}	--	--	1	μA
Drain-Source On-State Resistance (Note 3)	$V_{GS} = 10\text{V}, I_D = 2\text{A}$	$R_{DS(on)}$	--	2	2.5	Ω
Forward Transfer Conductance	$V_{DS} = 10\text{V}, I_D = 2\text{A}$	g_{fs}	--	4	--	S
Dynamic						
Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 480\text{V}, I_D = 4\text{A}$	Q_g	--	16	--	nC
Gate-Source Charge		Q_{gs}	--	2.6	--	
Gate-Drain Charge		Q_{gd}	--	7	--	
Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1.0\text{MHz}$	C_{iss}	--	574	--	pF
Output Capacitance		C_{oss}	--	56	--	
Reverse Transfer Capacitance		C_{rss}	--	7	--	
Switching (Note 4)						
Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 300\text{V}, I_D = 4\text{A}, R_G = 25\Omega$	$t_{d(on)}$	--	11	--	ns
Rise Time		t_r	--	14	--	
Turn-Off Delay Time		$t_{d(off)}$	--	38	--	
Fall Time		t_f	--	21	--	
Source-Drain Diode						
Diode Forward Voltage (Note 3)	$V_{GS} = 0\text{V}, I_S = 4\text{A}$	V_{SD}	--	--	1.13	V
Reverse Recovery Time	$V_{GS} = 10\text{V}, I_S = 2\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$	t_{rr}	--	188	--	ns
Reverse Recovery Charge		Q_{rr}	--	1.1	--	μC
Source Current (Note 1)	Integral reverse diode In the MOSFET	I_S	--	--	4	A
Source Current (Pulse)		I_{SM}	--	--	16	

Notes:

1. Pulsed width limited by maximum junction temperature.
2. $L = 8\text{mH}, V_{GS} = 10\text{V}, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$.
3. Pulse test: Pulse Width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
4. Switching time is essentially independent of operating temperature.

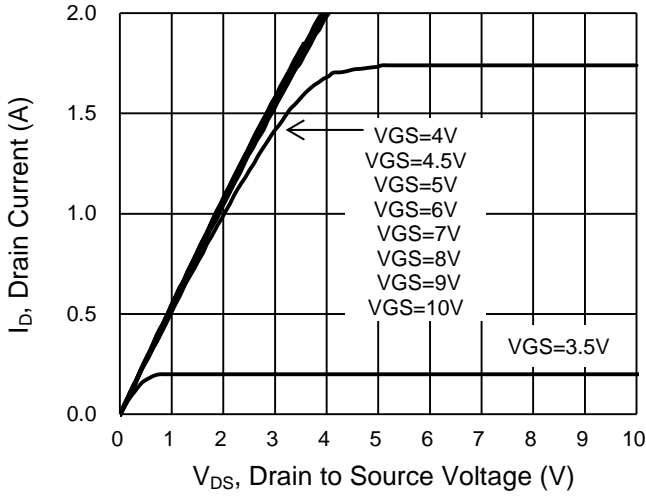
ORDERING INFORMATION

ORDERING CODE	PACKAGE	PACKING
TSM4NB60CP ROG	TO-252 (DPAK)	2,500 pcs / 13" Reel

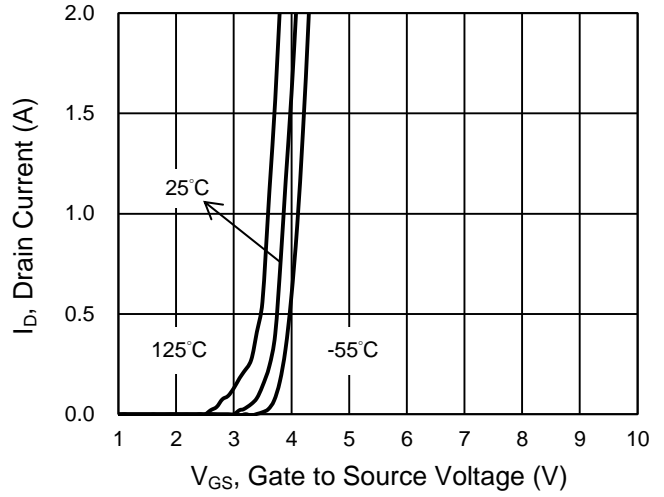
CHARACTERISTICS CURVES

($T_A = 25^\circ\text{C}$ unless otherwise noted)

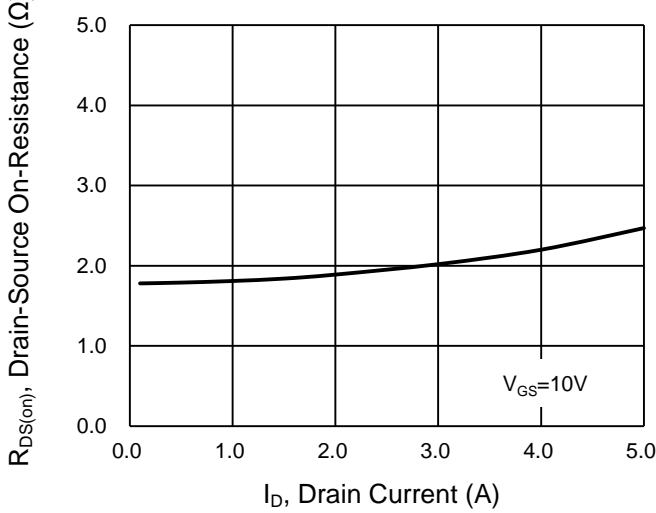
Output Characteristics



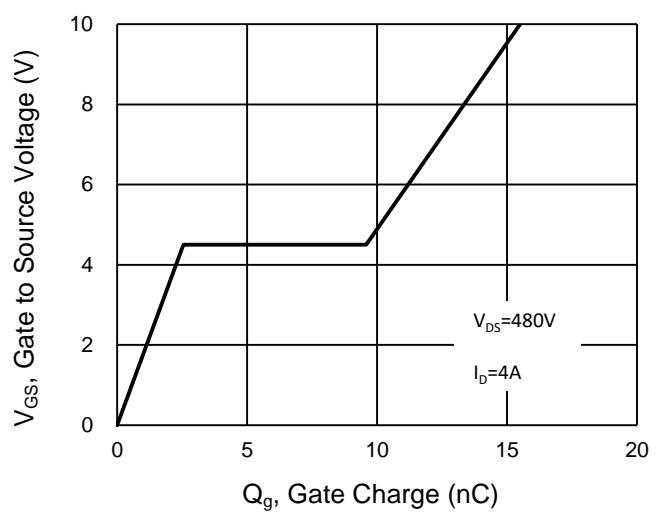
Transfer Characteristics



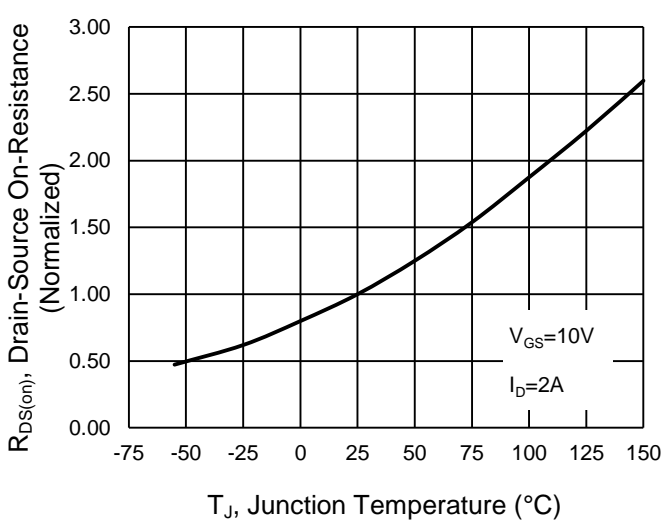
On-Resistance vs. Drain Current



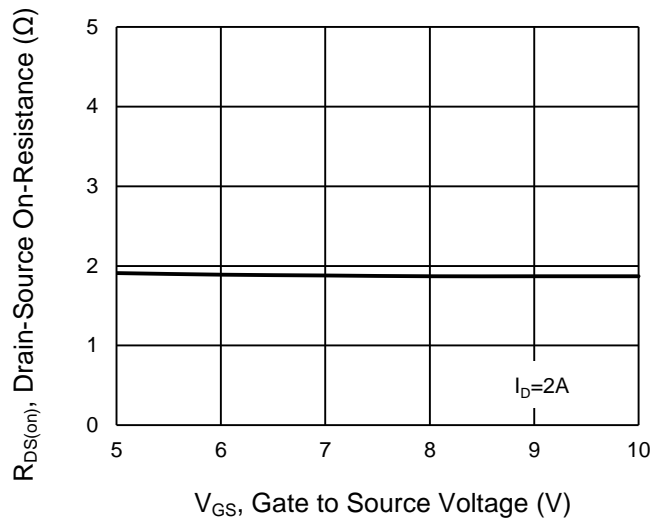
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



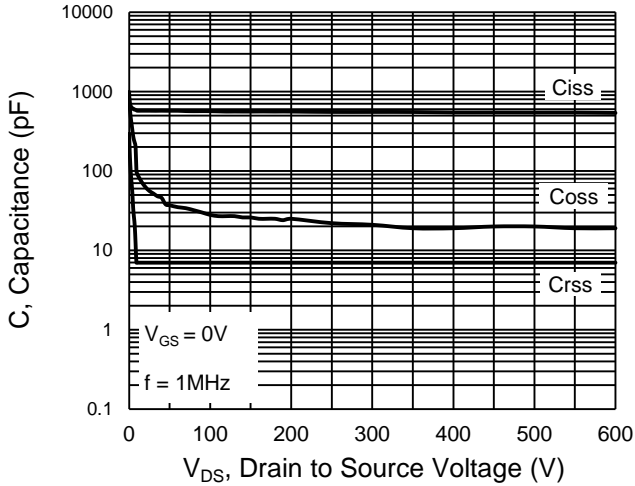
On-Resistance vs. Gate-Source Voltage



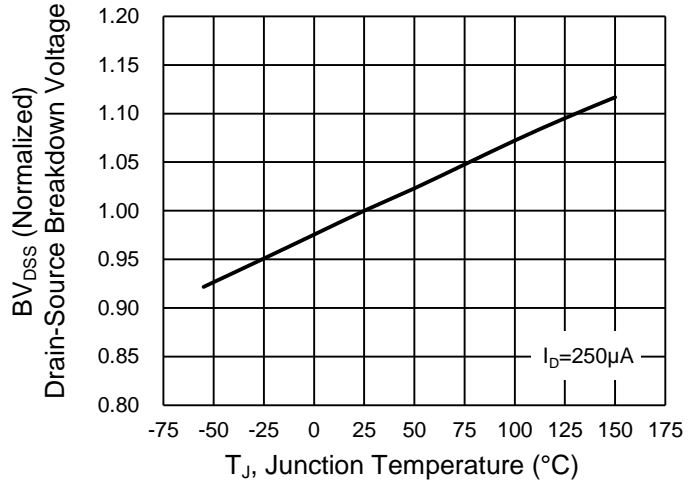
CHARACTERISTICS CURVES

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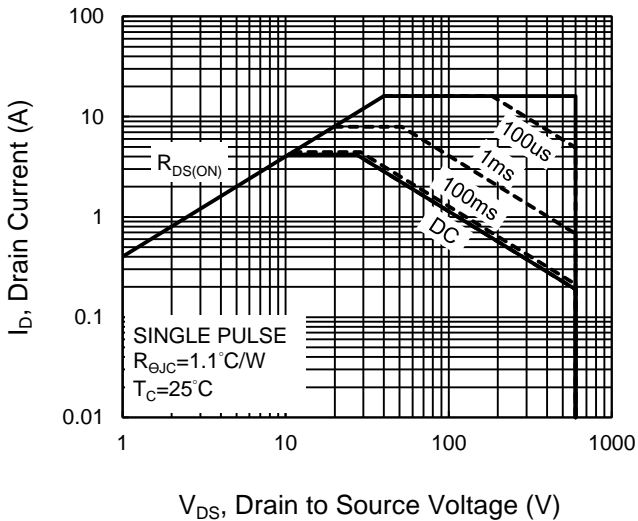
Capacitance vs. Drain-Source Voltage



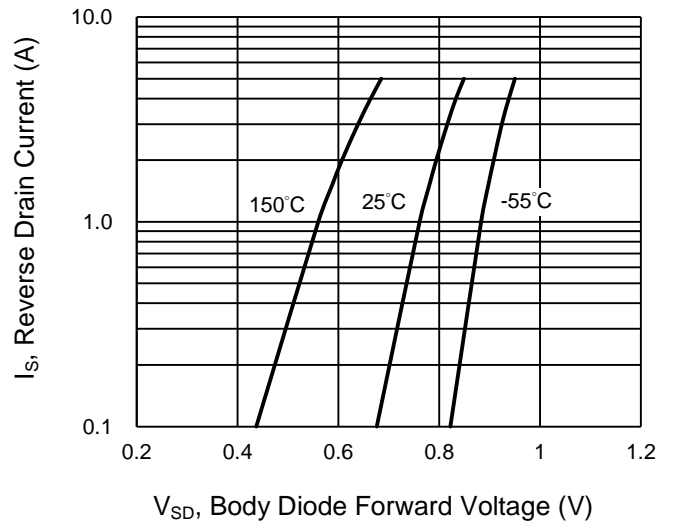
BV_{DSS} vs. Junction Temperature



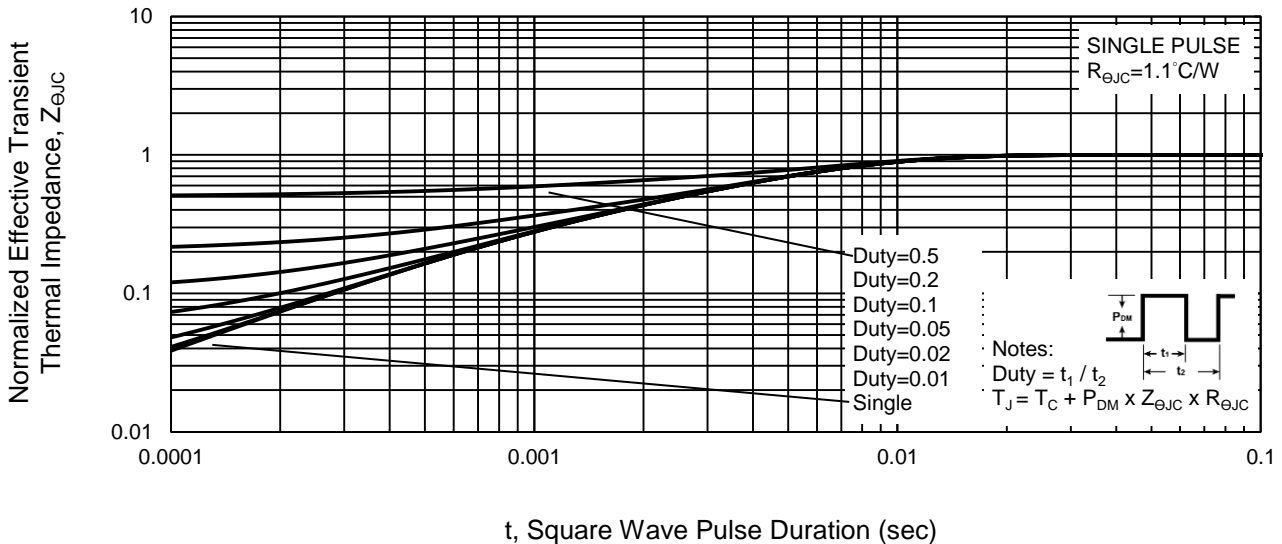
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage



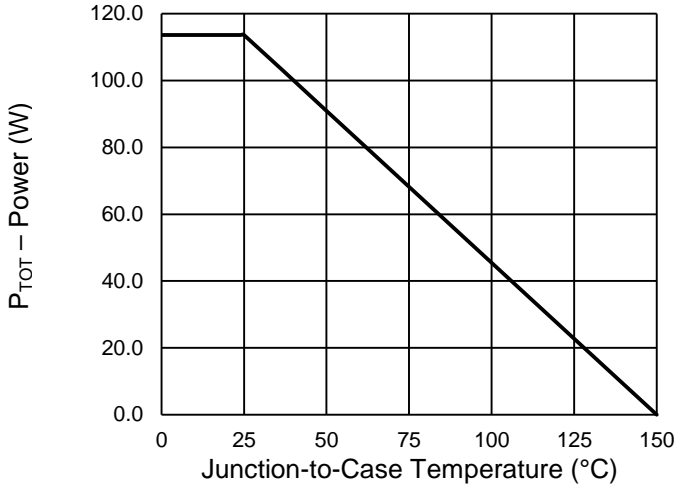
Normalized Thermal Transient Impedance, Junction-to-Case



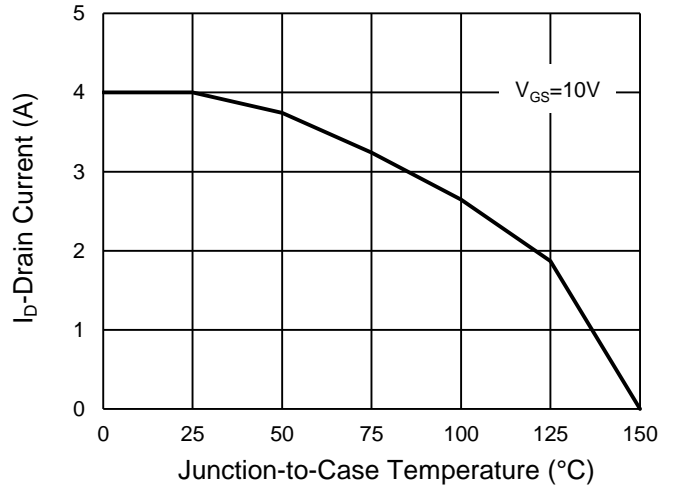
CHARACTERISTICS CURVES

($T_A = 25^\circ\text{C}$ unless otherwise noted)

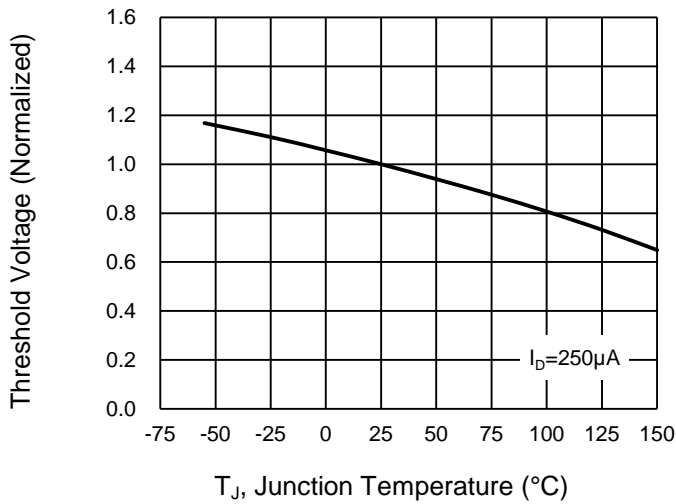
Power Dissipation



Drain Current

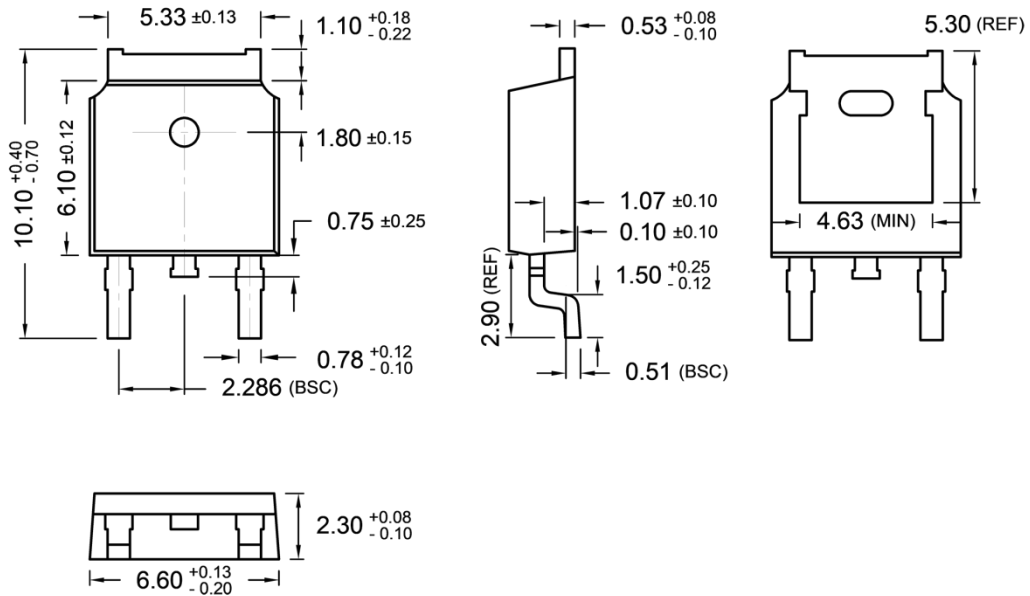


Normalized gate threshold voltage vs Temperature

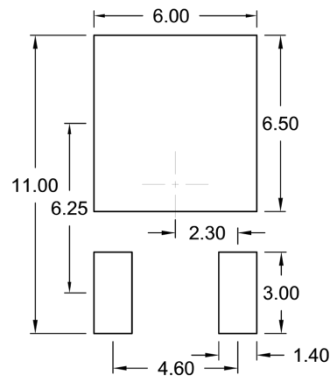


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

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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