

N-Channel Power MOSFET

600V, 4A, 0.98Ω

FEATURES

- Super-Junction technology
- High performance due to small figure-of-merit
- High commutation performance
- 100% UIS & Rg tested
- RoHS Compliant
- Halogen-free

KEY PERFORMANCE PARAMETERS

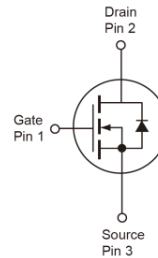
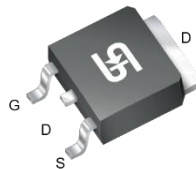
PARAMETER	VALUE	UNIT
V_{DS}	600	V
$R_{DS(on)}$ (max)	0.98	Ω
Q_g	11	nC

APPLICATIONS

- Switching Power Supply
- Lighting



TO-252 (D-PAK)



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}	static	±20
		AC(f>1Hz)	±30
Continuous Drain Current	I_D	4	A
Pulsed Drain Current (Note 1)	I_{DM}	12	A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_D	57	W
Single Pulse Avalanche Energy (Note 2)	E_{AS}	78	mJ
Single Pulse Avalanche Current (Note 2)	I_{AS}	1.8	A
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	$R_{\theta JC}$	2.2	°C/W
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	50	°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. The $R_{\theta JA}$ limit presented here is based on mounting on a 1 in² pad of 2 oz copper.

ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static (Note 3)						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 1mA$	BV_{DSS}	600	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 1mA$	$V_{GS(TH)}$	3	4.5	5	V
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Zero Gate Voltage Drain Current	$V_{DS} = 600V, V_{GS} = 0V$	I_{DSS}	--	--	100	μA
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 1.5A$	$R_{DS(on)}$	--	0.87	0.98	Ω
Dynamic (Note 4)						
Total Gate Charge	$V_{DS} = 300V, I_D = 4A,$ $V_{GS} = 10V$	Q_g	--	11	--	nC
Gate-Source Charge		Q_{gs}	--	2.9	--	
Gate-Drain Charge		Q_{gd}	--	4.7	--	
Input Capacitance	$V_{DS} = 300V, V_{GS} = 0V,$ $f = 1.0MHz$	C_{iss}	--	330	--	pF
Output Capacitance		C_{oss}	--	16	--	
Reverse Transfer Capacitance		C_{rss}	--	11	--	
Gate Resistance	$f = 1.0MHz$	R_g	--	3	--	Ω
Switching (Note 5)						
Turn-On Delay Time	$V_{DD} = 300V, R_G = 10\Omega,$ $I_D = 2A, V_{GS} = 10V$	$t_{d(on)}$	--	12	--	ns
Turn-On Rise Time		t_r	--	11	--	
Turn-Off Delay Time		$t_{d(off)}$	--	28	--	
Turn-Off Fall Time		t_f	--	17	--	
Source-Drain Diode						
Body-Diode Continuous Forward Current		I_S	--	--	4	A
Body-Diode Pulsed Current (Note 1)		I_{SM}	--	--	12	A
Forward Voltage (Note 3)	$I_S = 1.5A, V_{GS} = 0V$	V_{SD}	--	--	1.5	V
Reverse Recovery Time (Note 4)	$I_S = 4A$	t_{rr}	--	237	--	ns
Reverse Recovery Charge (Note 4)	$dI_F/dt = 100A/\mu s$	Q_{rr}	--	2.1	--	μC

Notes:

1. Pulse width limited by the maximum junction temperature.
2. $L = 50mH, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
3. Pulse test: $PW \leq 300\mu s, \text{duty cycle} \leq 2\%$.
4. Defined by design. Not subject to production test.
5. Switching time is essentially independent of operating temperature.

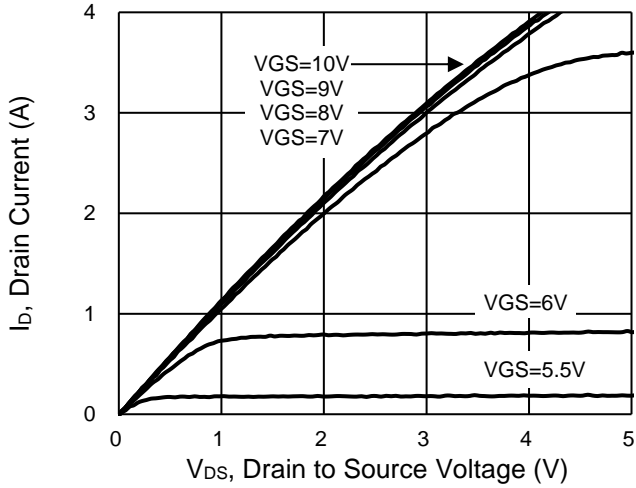
ORDERING INFORMATION

ORDERING CODE	PACKAGE	PACKING
TSM60NC980CP ROG	TO-252 (DPAK)	2500pcs / 13" Reel

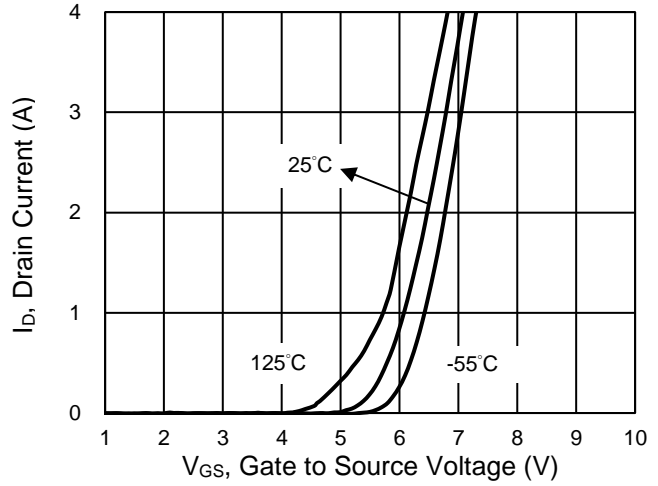
CHARACTERISTICS CURVES

(T_c = 25°C unless otherwise noted)

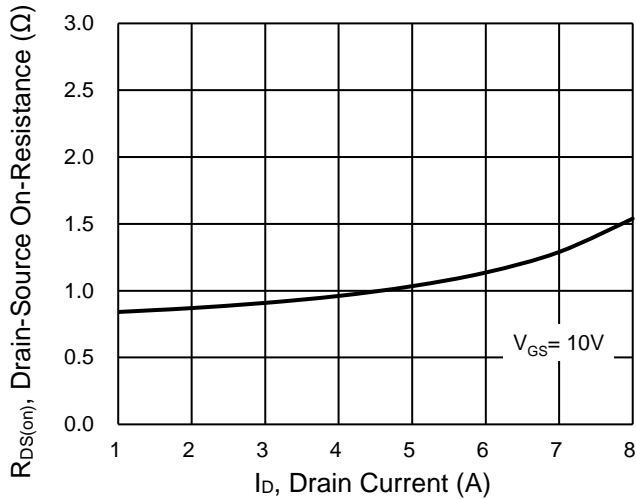
Output Characteristics



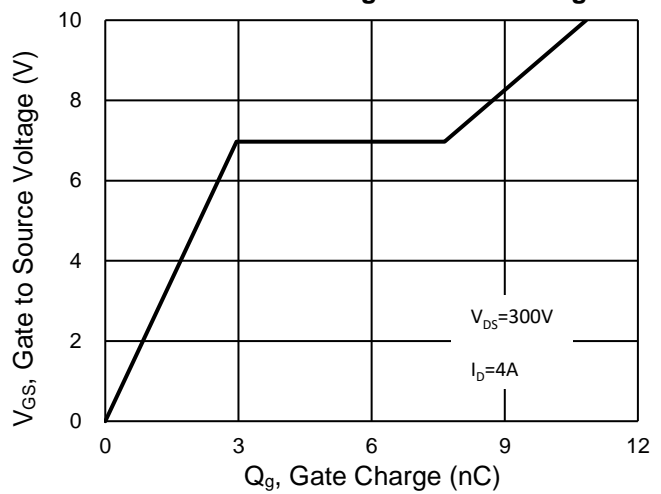
Transfer Characteristics



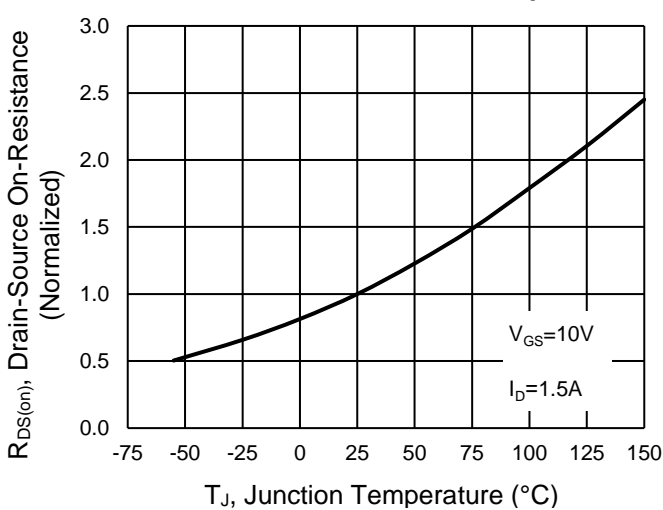
On-Resistance vs. Drain Current



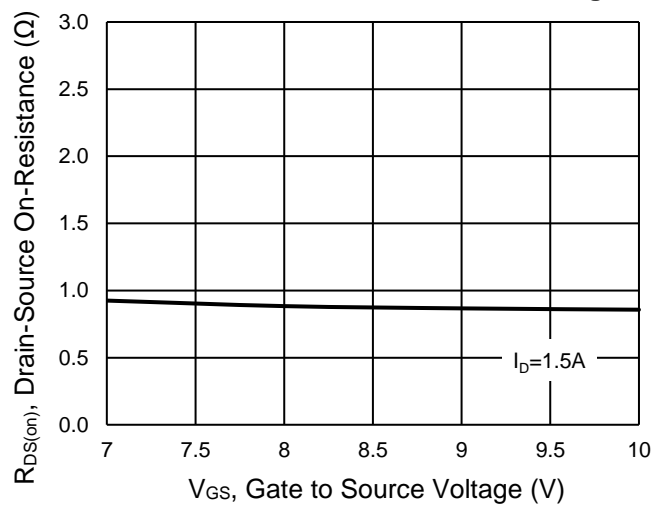
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



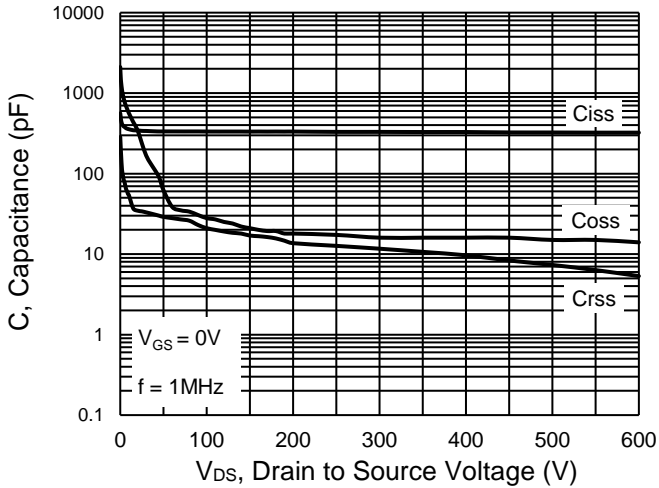
On-Resistance vs. Gate-Source Voltage



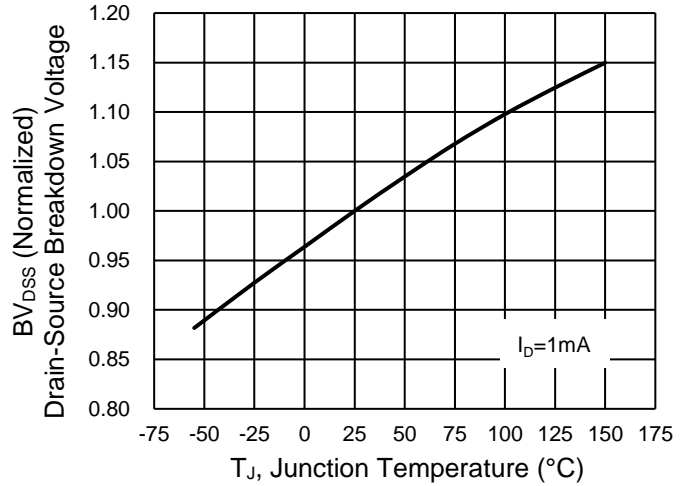
CHARACTERISTICS CURVES

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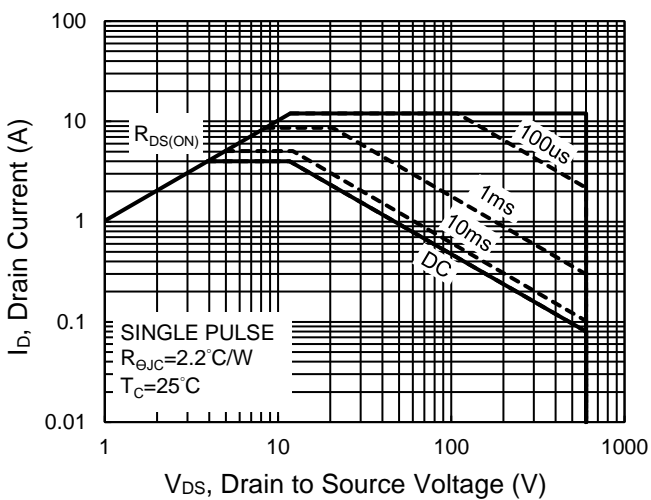
Capacitance vs. Drain-Source Voltage



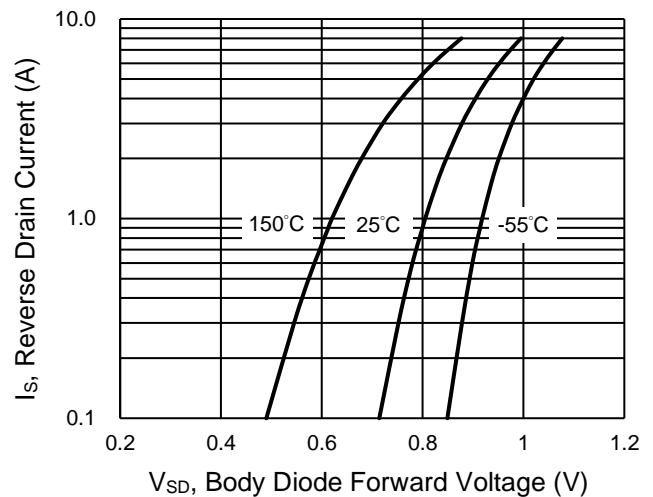
BV_{DSS} vs. Junction Temperature



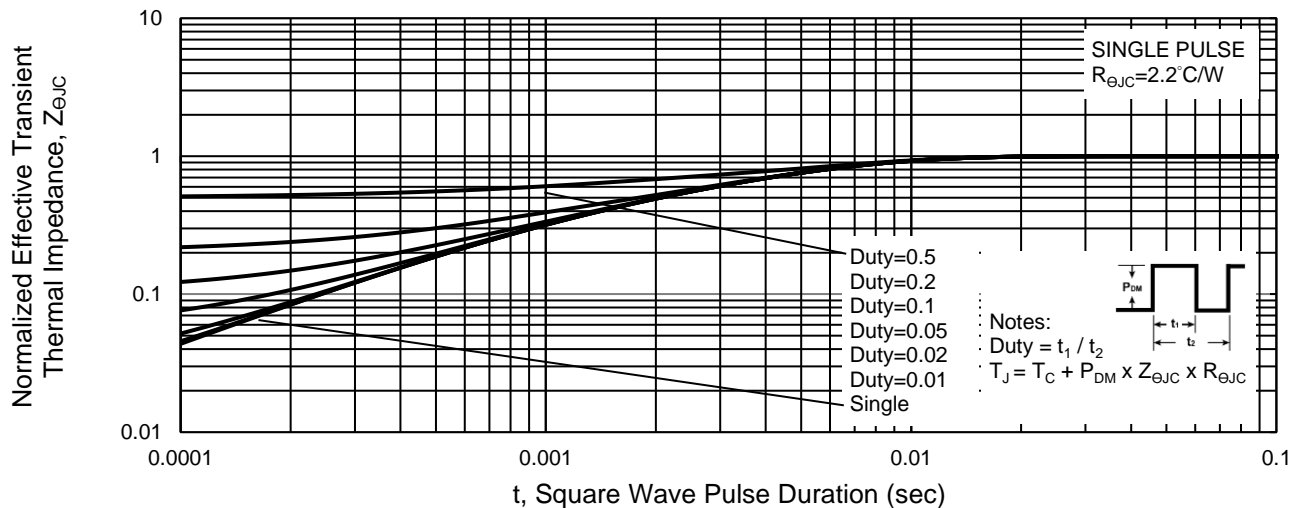
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage



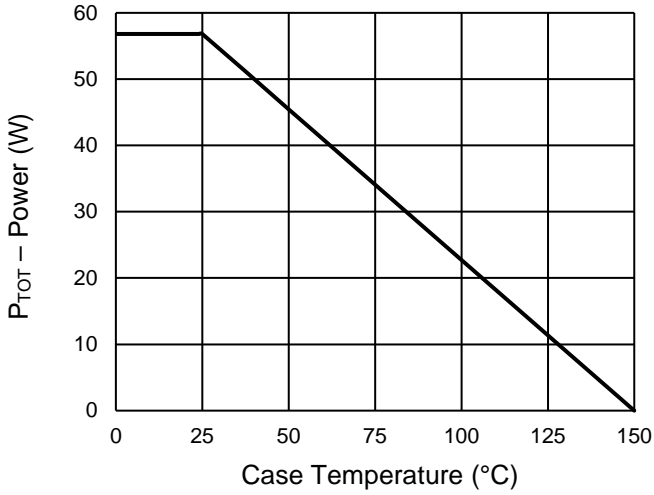
Normalized Thermal Transient Impedance, Junction-to-Case



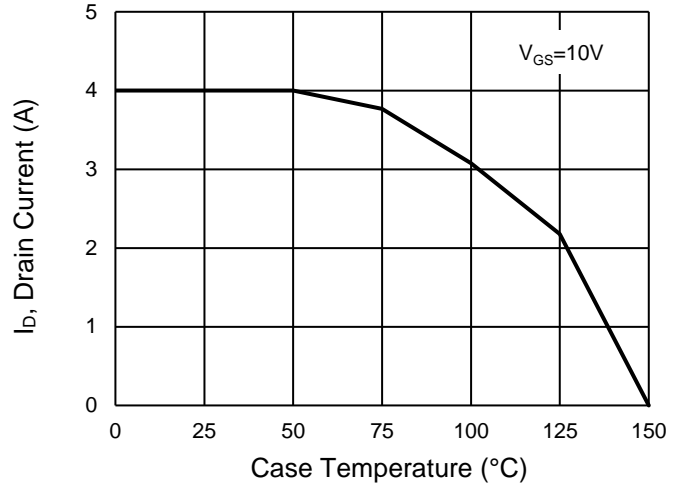
CHARACTERISTICS CURVES

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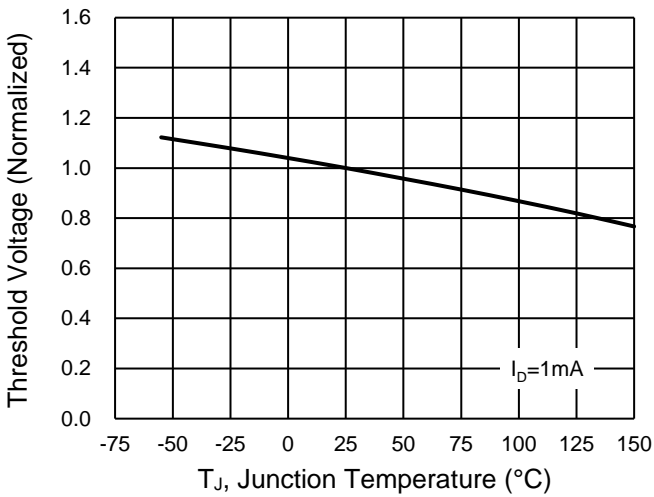
Power Dissipation



Drain Current

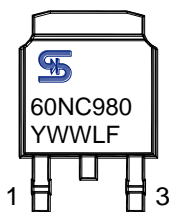
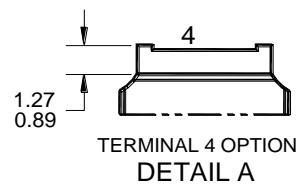
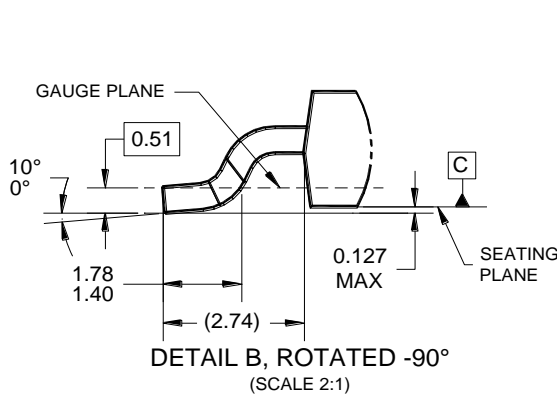
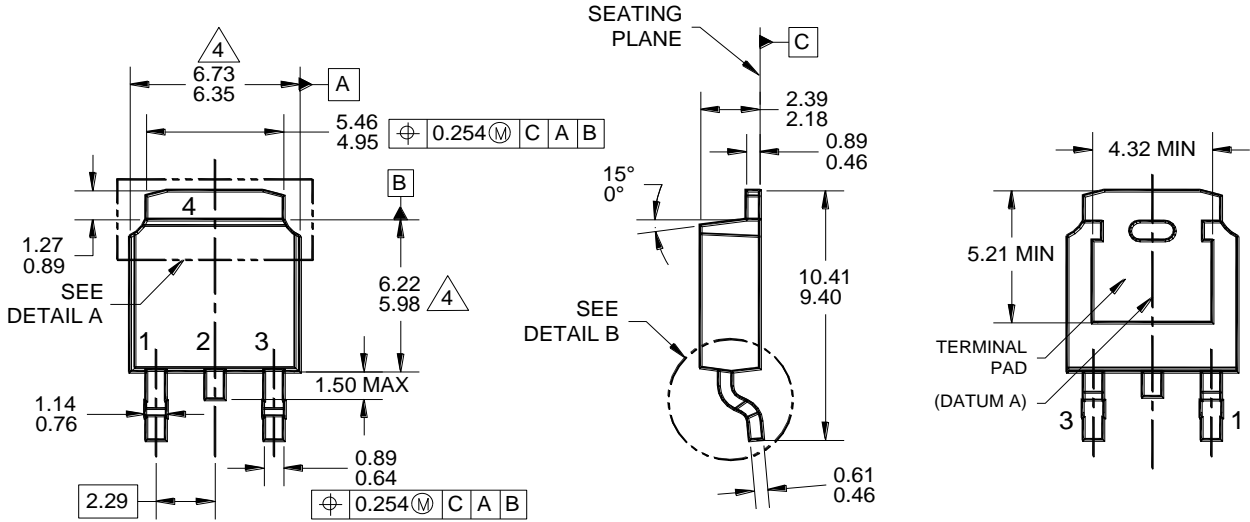


Normalized gate threshold voltage vs Temperature



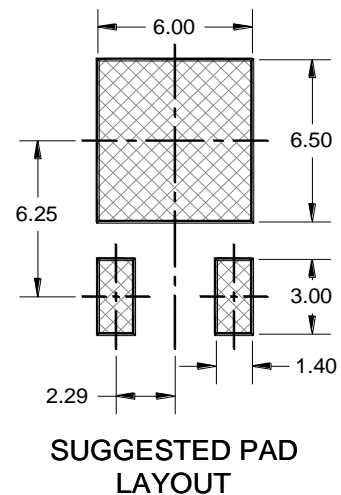
PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-252



MARKING DIAGRAM

Y = YEAR CODE
 WW = WEEK CODE (01 ~ 52)
 L = LOT CODE (1~9, A~Z)
 F = FACTORY CODE



SUGGESTED PAD LAYOUT

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. PACKAGE OUTLINE REFERENCE: JEDEC TO-252, VARIATION AA, ISSUE F.
4. MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSION, OR GATE BURRS.
5. DWG NO. REF: HQ2SD07-TO252AA-013 REV A.

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