

## N-Channel Power MOSFET

60V, 11A, 90mΩ

### FEATURES

- 100% UIS and Rg tested
- Logic-level gate drive
- Fast switching
- RoHS Compliant
- Halogen-Free according to IEC 61249-2-21

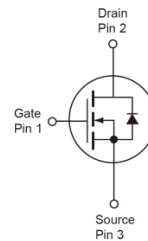
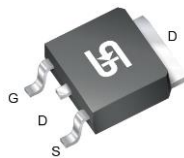
### APPLICATIONS

- DC-DC Converters
- Solenoid and Motor Drivers

PRODUCT SUMMARY			
PARAMETER	VALUE	UNIT	
$V_{DS}$	60	V	
$R_{DS(on)}$ (max)	$V_{GS} = 10V$	90	mΩ
	$V_{GS} = 4.5V$	100	
$Q_g$	$V_{GS} = 10V$	9.5	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	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>(Note 1)</sup>	$I_D$	$T_C = 25^\circ\text{C}$	11
		$T_C = 100^\circ\text{C}$	7
Pulsed Drain Current <sup>(Note 2)</sup>	$I_{DM}$	44	A
Single Pulse Avalanche Current <sup>(Note 3)</sup>	$I_{AS}$	7	A
Single Pulse Avalanche Energy <sup>(Note 3)</sup>	$E_{AS}$	25	mJ
Total Power Dissipation	$T_C = 25^\circ\text{C}$	$P_D$	25
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	- 55 to +150	$^\circ\text{C}$

THERMAL RESISTANCE			
PARAMETER	SYMBOL	MAXIMUM	UNIT
Thermal Resistance – Junction to Case	$R_{\theta JC}$	5	$^\circ\text{C/W}$
Thermal Resistance – Junction to Ambient	$R_{\theta JA}$	62	$^\circ\text{C/W}$

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

<b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$	$BV_{DSS}$	60	--	--	V
Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	$V_{GS(TH)}$	1.2	1.8	2.5	V
Gate-Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	$I_{GSS}$	--	--	$\pm 100$	nA
Drain-Source Leakage Current	$V_{GS} = 0\text{V}, V_{DS} = 60\text{V}$	$I_{DSS}$	--	--	1	$\mu\text{A}$
	$V_{GS} = 0\text{V}, V_{DS} = 48\text{V}$ $T_J = 125^\circ\text{C}$		--	--	10	
Drain-Source On-State Resistance (Note 4)	$V_{GS} = 10\text{V}, I_D = 6\text{A}$	$R_{DS(on)}$	--	76	90	m $\Omega$
	$V_{GS} = 4.5\text{V}, I_D = 3\text{A}$		--	87	100	
Forward Transconductance (Note 4)	$V_{DS} = 10\text{V}, I_D = 3\text{A}$	$g_{fs}$	--	4	--	S
<b>Dynamic</b>						
Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 48\text{V},$ $I_D = 6\text{A}$	$Q_g$	--	9.5	--	nC
Gate-Source Charge		$Q_{gs}$	--	2	--	
Gate-Drain Charge		$Q_{gd}$	--	1.4	--	
Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 30\text{V},$ $f = 1.0\text{MHz}$	$C_{iss}$	--	553.4	--	pF
Output Capacitance		$C_{oss}$	--	34.4	--	
Reverse Transfer Capacitance		$C_{rss}$	--	27	--	
Gate Resistance	$f = 1.0\text{MHz}$	$R_g$	--	2	--	$\Omega$
<b>Switching</b> (Note 5)						
Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 30\text{V},$ $I_D = 1\text{A}, R_G = 3.3\Omega$	$t_{d(on)}$	--	6.7	--	ns
Rise Time		$t_r$	--	2.8	--	
Turn-Off Delay Time		$t_{d(off)}$	--	17.1	--	
Fall Time		$t_f$	--	1.8	--	
<b>Source-Drain Diode</b>						
Diode Forward Voltage (Note 4)	$V_{GS} = 0\text{V}, I_S = 1\text{A}$	$V_{SD}$	--	--	1.2	V
Reverse Recovery Time	$I_S = 2\text{A}, V_{GS} = 30\text{V}$ $di/dt = 100\text{A}/\mu\text{s}$	$t_{rr}$	--	12.5	--	ns
Reverse Recovery Charge		$Q_{rr}$	--	7.7	--	nC

**Notes:**

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

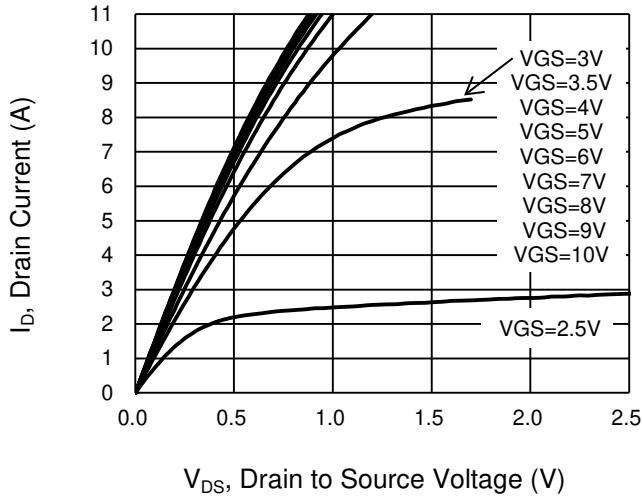
**ORDERING INFORMATION**

ORDERING CODE	PACKAGE	PACKING
TSM900N06CP ROG	TO-252	2.5kpcs / 13" Reel

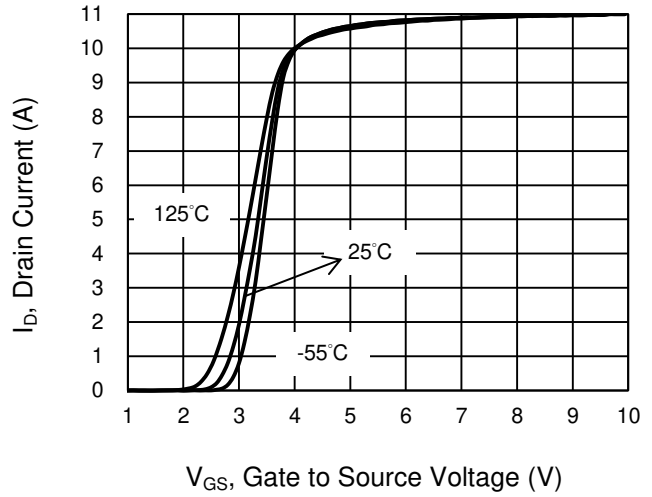
**CHARACTERISTICS CURVES**

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

**Output Characteristics**



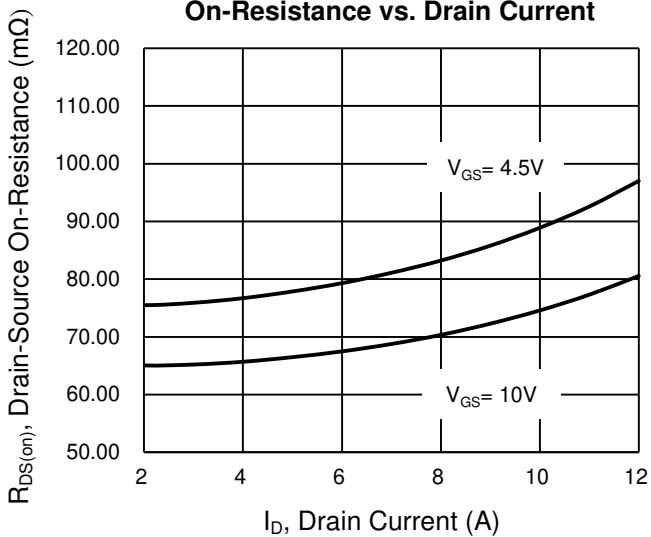
**Transfer Characteristics**



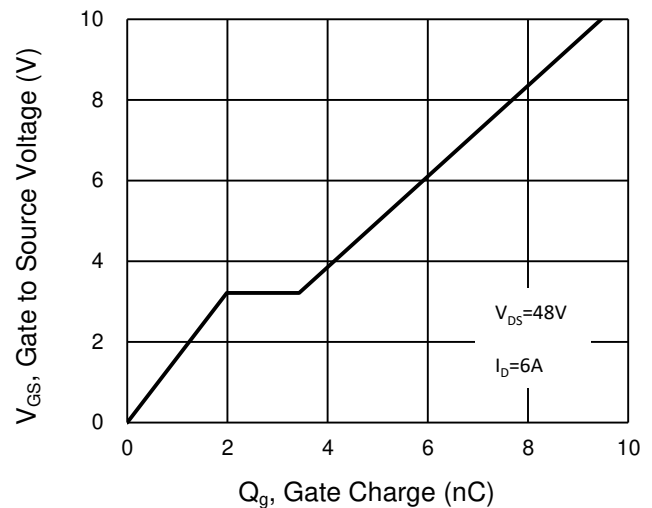
$V_{DS}$ , Drain to Source Voltage (V)

$V_{GS}$ , Gate to Source Voltage (V)

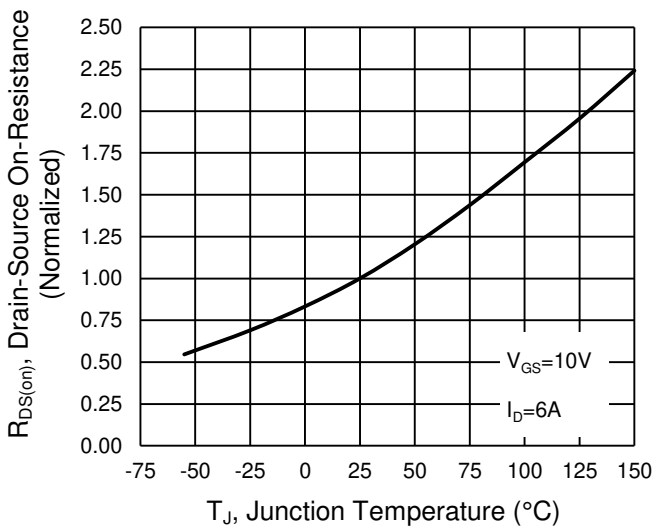
**On-Resistance vs. Drain Current**



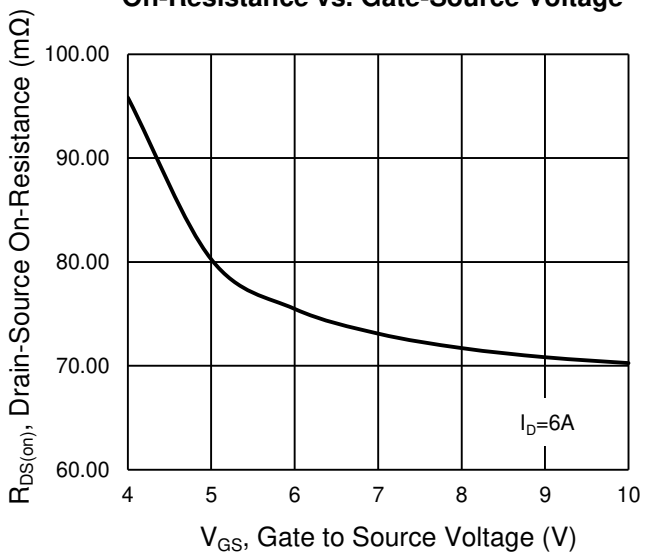
**Gate-Source Voltage vs. Gate Charge**



**On-Resistance vs. Junction Temperature**

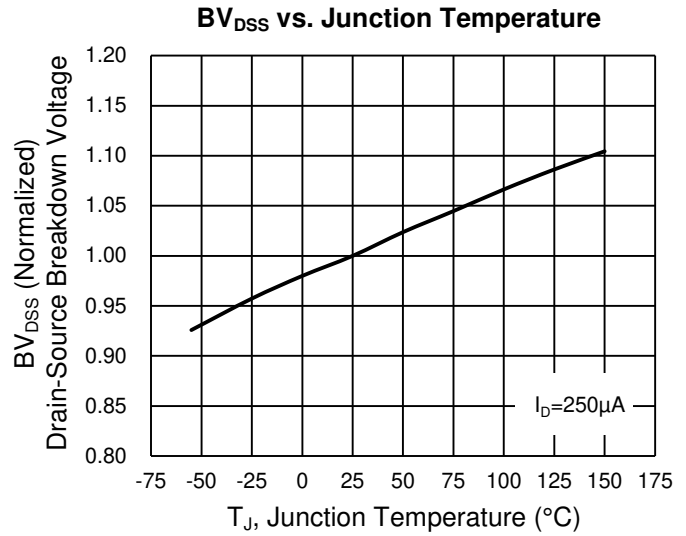
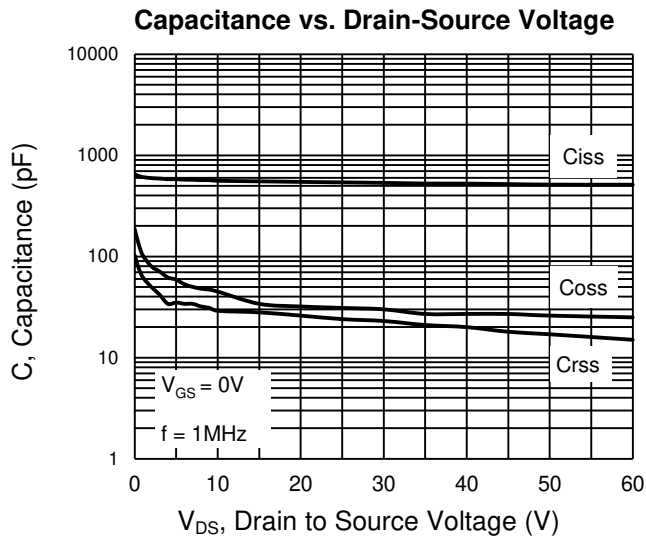


**On-Resistance vs. Gate-Source Voltage**

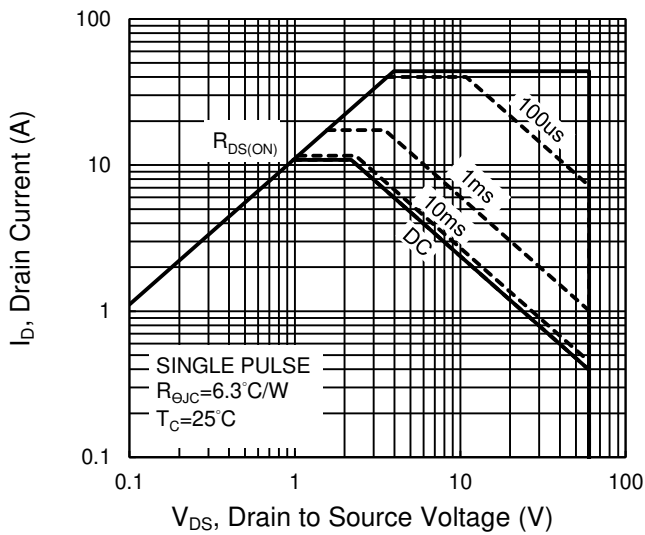


**CHARACTERISTICS CURVES**

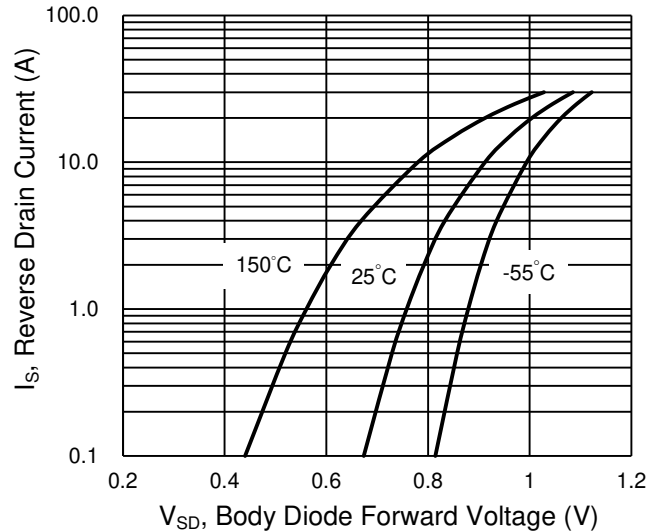
( $T_A = 25^\circ\text{C}$  unless otherwise noted)



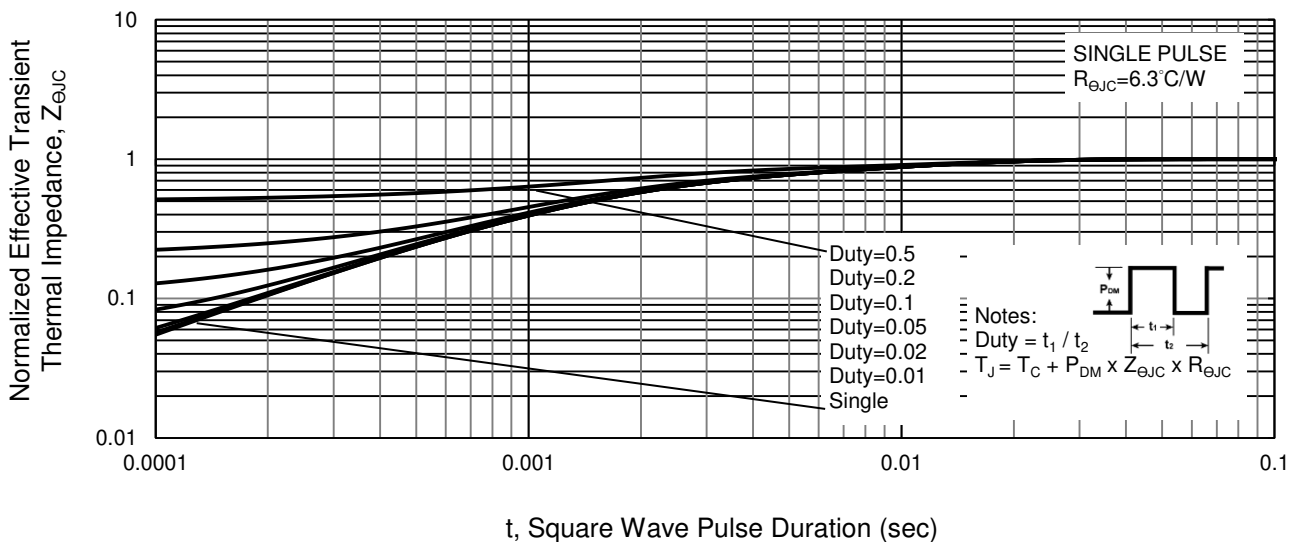
**Maximum Safe Operating Area, Junction-to-Case**



**Source-Drain Diode Forward Current vs. Voltage**



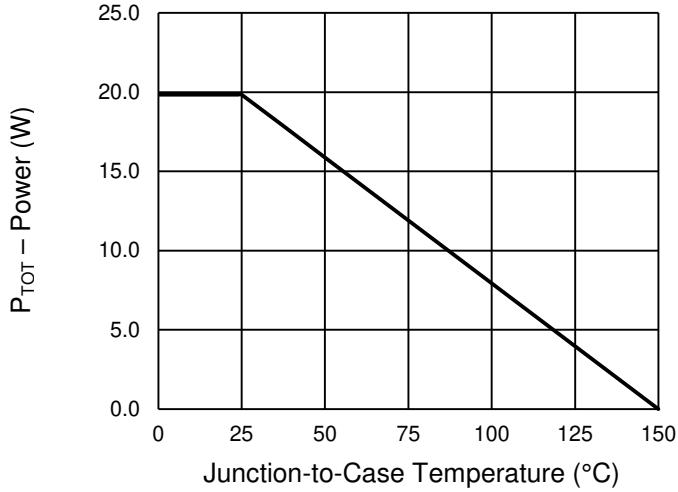
**Normalized Thermal Transient Impedance, Junction-to-Cas**



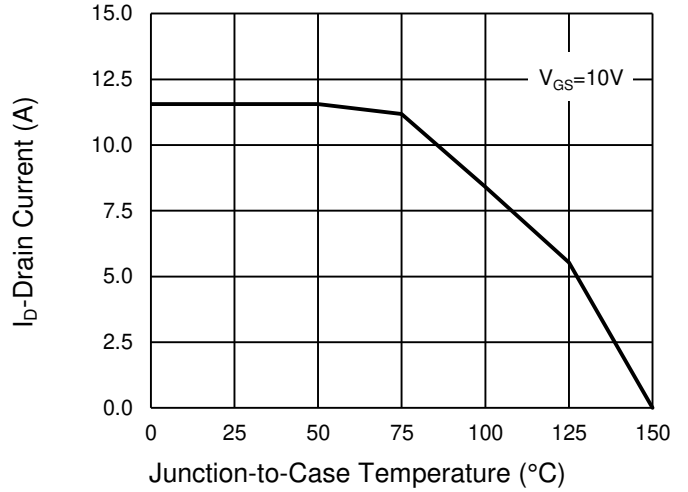
**CHARACTERISTICS CURVES**

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

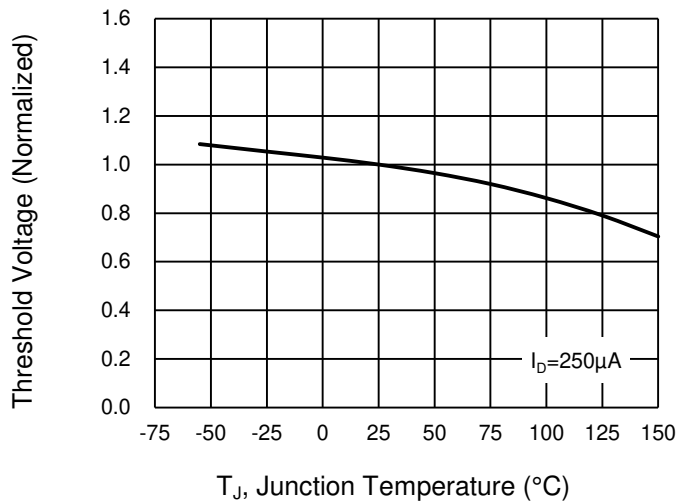
**Power Dissipation**



**Drain Current**

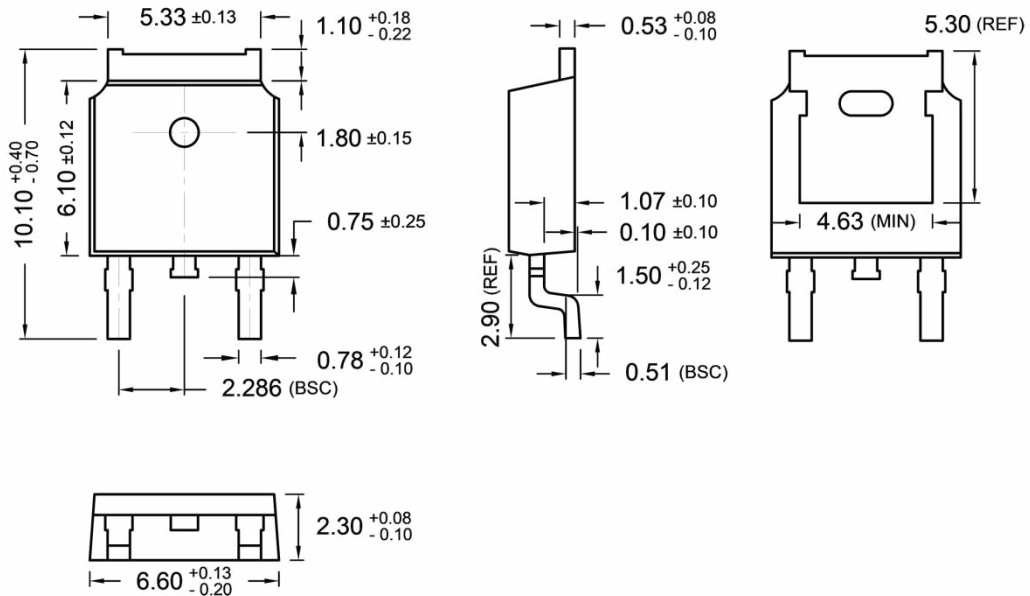


**Normalized gate threshold voltage vs Temperature**

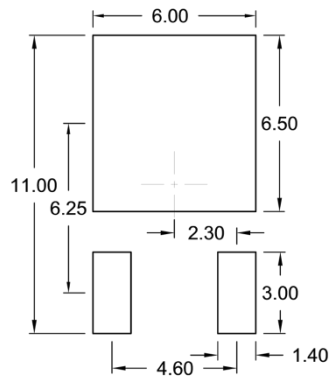


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**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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