

P-Channel Power MOSFET

-60V, -14.5A, 68 mΩ

FEATURES

- Improved dV/dt capability
- Fast switching
- 100% Eas Guaranteed
- Pb-free plating
- RoHS compliant
- Halogen-Free according to IEC 61249-2-21

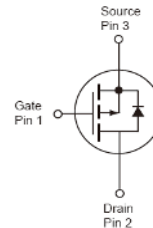
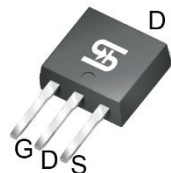
PRODUCT SUMMARY			
PARAMETER	VALUE	UNIT	
V_{DS}	-60	V	
$R_{DS(on)}$ (max)	$V_{GS} = -10V$	68	mΩ
	$V_{GS} = -4.5V$	110	
Q_g	$V_{GS} = -10V$	18	nC

APPLICATIONS

- Motor Drive
- Power Tools
- LED Lighting



TO-251S (IPAK SL)



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}	± 20	V
Continuous Drain Current ^(Note 1)	I_D	$T_C = 25^\circ\text{C}$	-14.5
		$T_C = 100^\circ\text{C}$	-9.2
Pulsed Drain Current ^(Note 2)	I_{DM}	-58	A
Single Pulse Avalanche Current ^(Note 3)	I_{AS}	-19.1	A
Single Pulse Avalanche Energy ^(Note 3)	E_{AS}	18.2	mJ
Total Power Dissipation	P_D	20.5	W
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	$R_{\theta JC}$	6.1	$^\circ\text{C/W}$
Thermal Resistance – Junction to Ambient	$R_{\theta JA}$	62	$^\circ\text{C/W}$

Notes: $R_{\theta JA}$ 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. $R_{\theta JA}$ shown below for single device operation on FR-4 PCB in still air.

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static (Note 4)						
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	-1.4	-2.2	V
Gate-Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	I_{GSS}	--	--	± 100	nA
Drain-Source Leakage Current	$V_{GS} = 0\text{V}, V_{DS} = -60\text{V}$	I_{DSS}	--	--	-1	μA
	$V_{GS} = 0\text{V}, V_{DS} = -48\text{V}$ $T_J = 125^\circ\text{C}$		--	--	-10	
Drain-Source On-State Resistance (Note 3)	$V_{GS} = -10\text{V}, I_D = -6\text{A}$	$R_{DS(on)}$	--	53.2	68	m Ω
	$V_{GS} = -4.5\text{V}, I_D = -3\text{A}$		--	67.4	110	
Forward Transconductance	$V_{DS} = -10\text{V}, I_D = -6\text{A}$	g_{fs}	--	15.3	--	S
Dynamic (Note 5)						
Total Gate Charge	$V_{GS} = -10\text{V}, V_{DS} = -30\text{V},$ $I_D = -6\text{A}$	Q_g	--	18	--	nC
Gate-Source Charge		Q_{gs}	--	2.8	--	
Gate-Drain Charge		Q_{gd}	--	3.2	--	
Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = -30\text{V},$ $f = 1.0\text{MHz}$	C_{iss}	--	929	--	pF
Output Capacitance		C_{oss}	--	68	--	
Reverse Transfer Capacitance		C_{rss}	--	55	--	
Gate Resistance	$f = 1.0\text{MHz}$	R_g	--	14	--	Ω
Switching (Note 6)						
Turn-On Delay Time	$V_{GS} = -10\text{V}, V_{DS} = -30\text{V},$ $I_D = -1\text{A}, R_G = 6\Omega$	$t_{d(on)}$	--	6.7	--	nS
Rise Time		t_r	--	8.5	--	
Turn-Off Delay Time		$t_{d(off)}$	--	53	--	
Fall Time		t_f	--	35	--	
Source-Drain Diode						
Diode Forward Voltage (Note 4)	$V_{GS} = 0\text{V}, I_S = -1\text{A}$	V_{SD}	--	--	-1	V
Reverse Recovery Time	$I_S = -1\text{A},$ $di/dt = 100\text{A}/\mu\text{s}$	t_{rr}	--	11.9	--	nS
Reverse Recovery Charge		Q_{rr}	--	6.2	--	nC

Notes:

- Current limited by package
- Pulse width limited by the maximum junction temperature
- $L = 0.1\text{mH}, V_{GS} = -10\text{V}, R_G = 25\Omega,$ Starting $T_J = 25^\circ\text{C}$
- Pulse test: $PW \leq 300\mu\text{s},$ duty cycle $\leq 2\%$
- For DESIGN AID ONLY, not subject to production testing.
- Switching time is essentially independent of operating temperature.

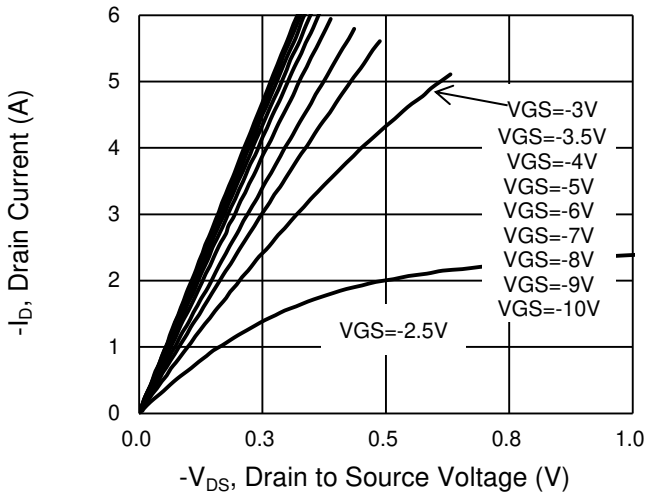
ORDERING INFORMATION

ORDERING CODE	PACKAGE	PACKING
TSM680P06CH X0G	TO-251S	75pcs / Tube

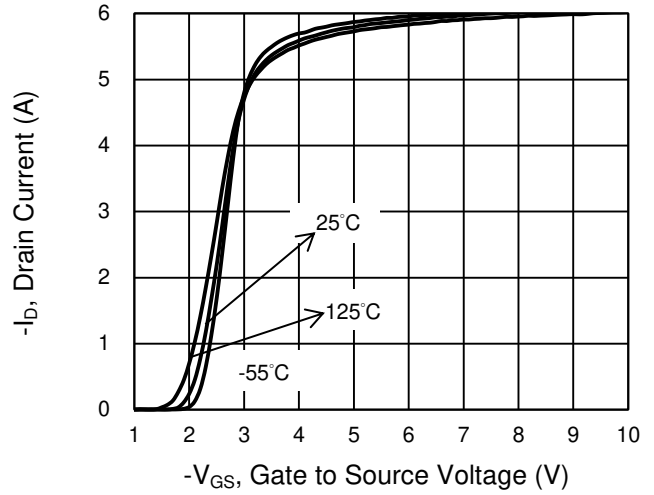
CHARACTERISTICS CURVES

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

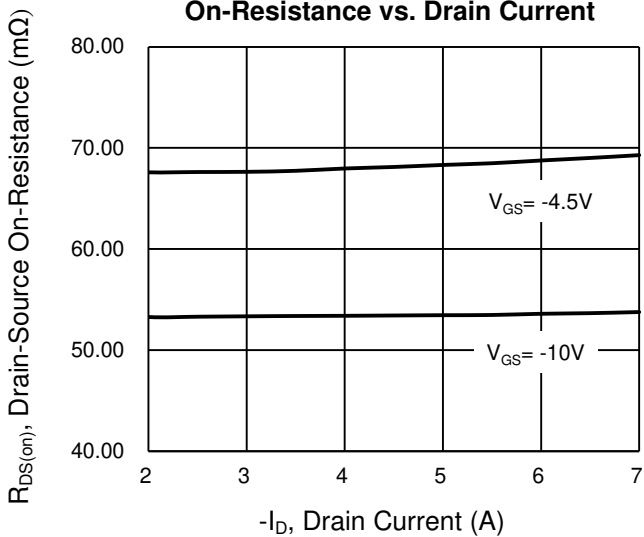
Output Characteristics



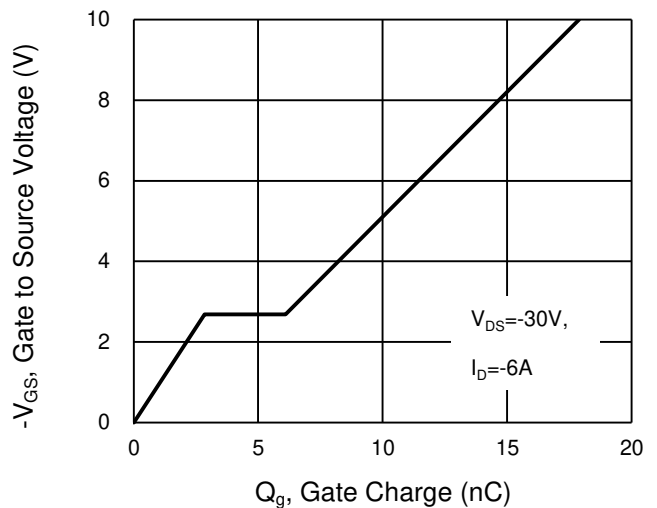
Transfer Characteristics



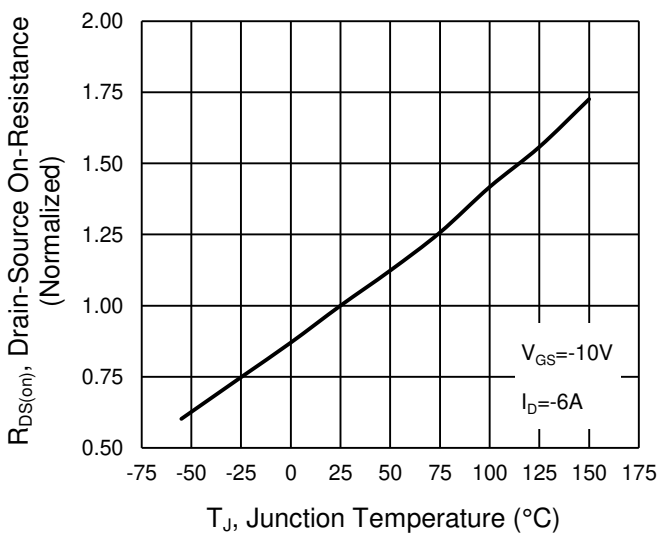
On-Resistance vs. Drain Current



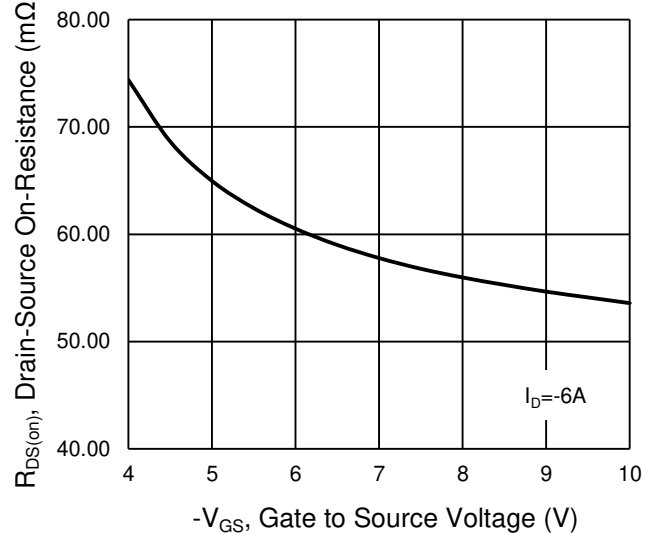
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



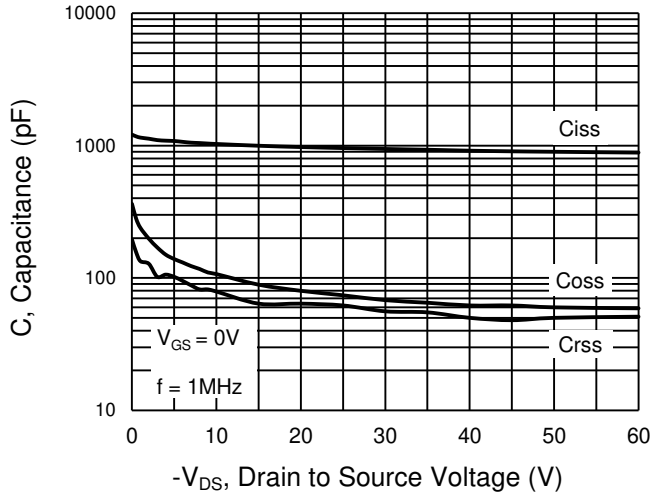
On-Resistance vs. Gate-Source Voltage



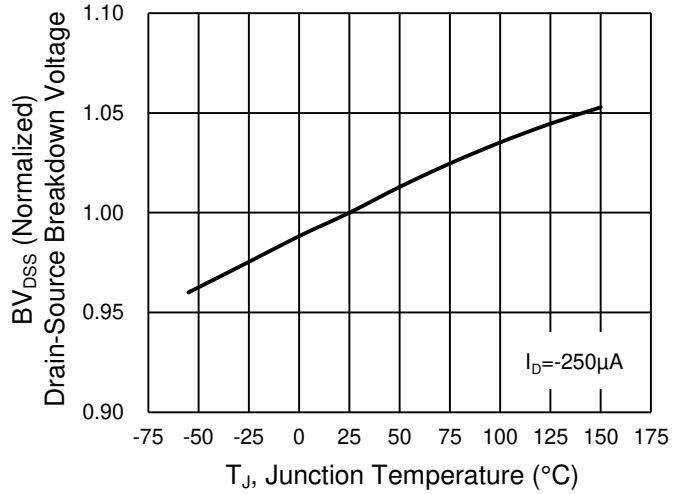
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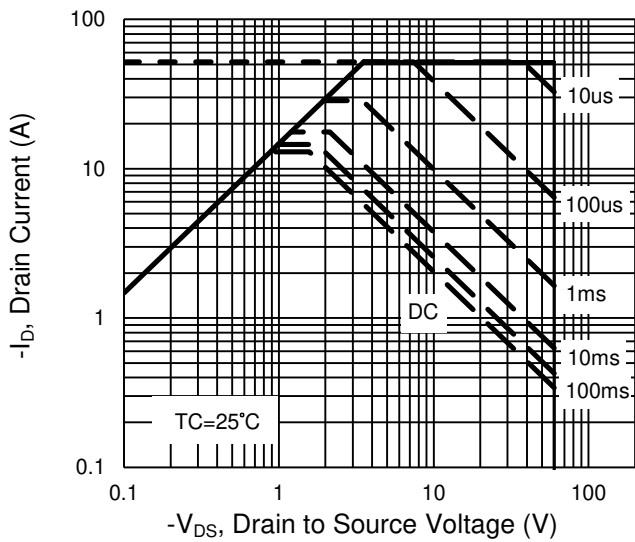
Capacitance vs. Drain-Source Voltage



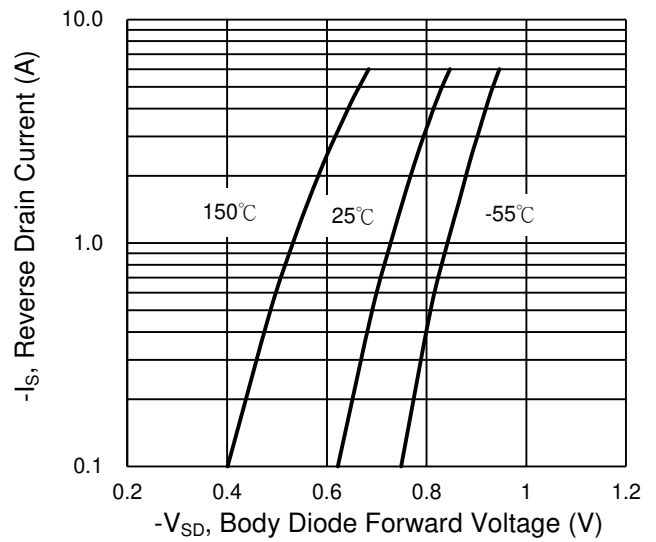
BV_{DSS} vs. Junction Temperature



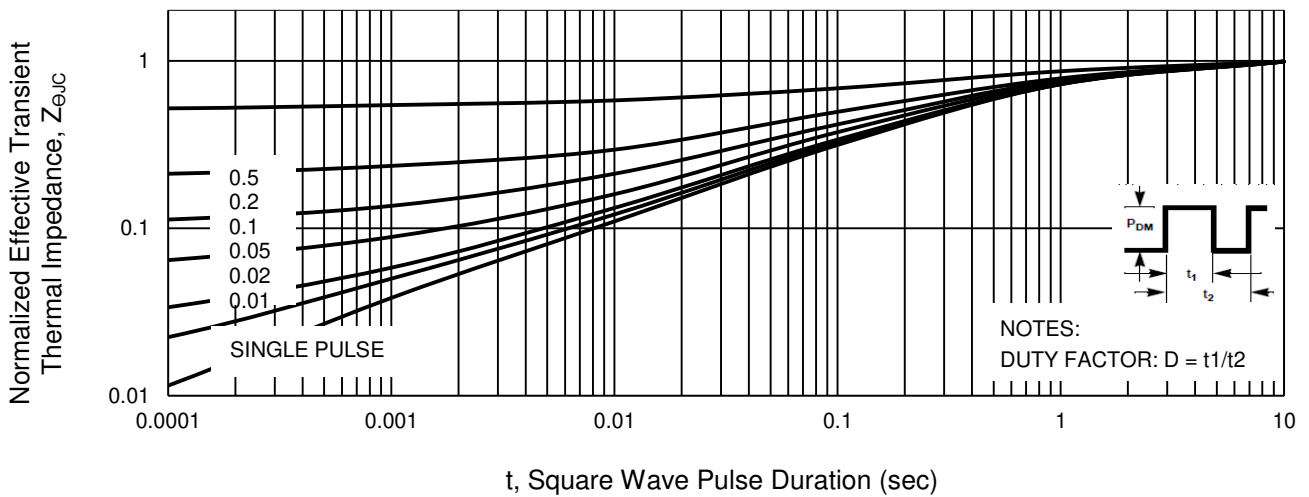
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage

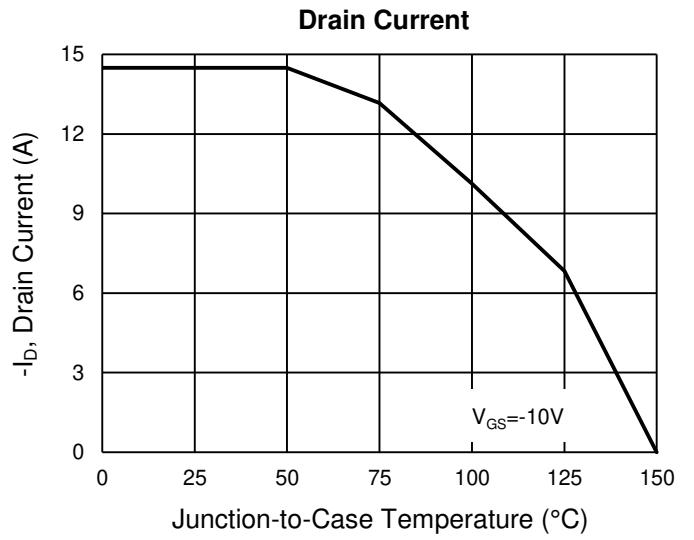
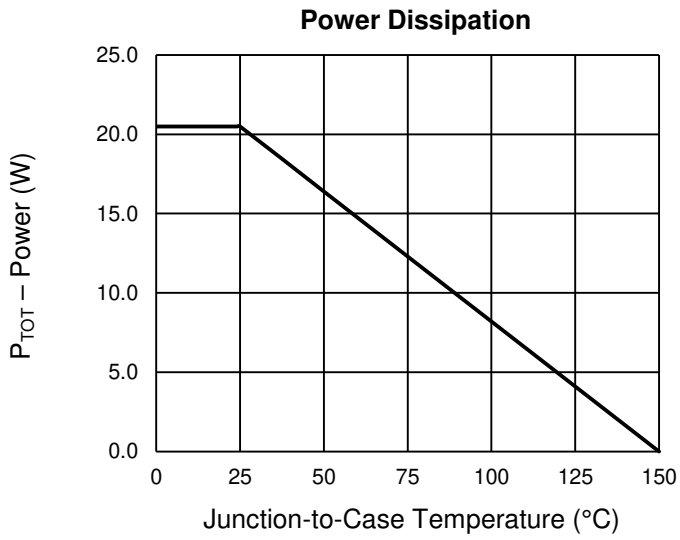


Normalized Thermal Transient Impedance, Junction-to-Case

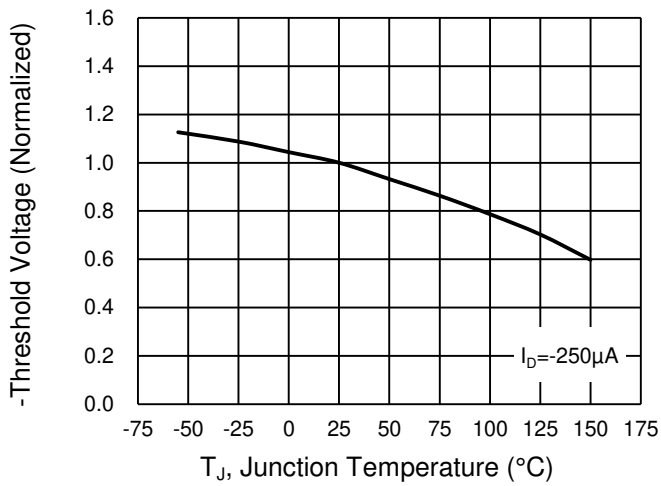


CHARACTERISTICS CURVES

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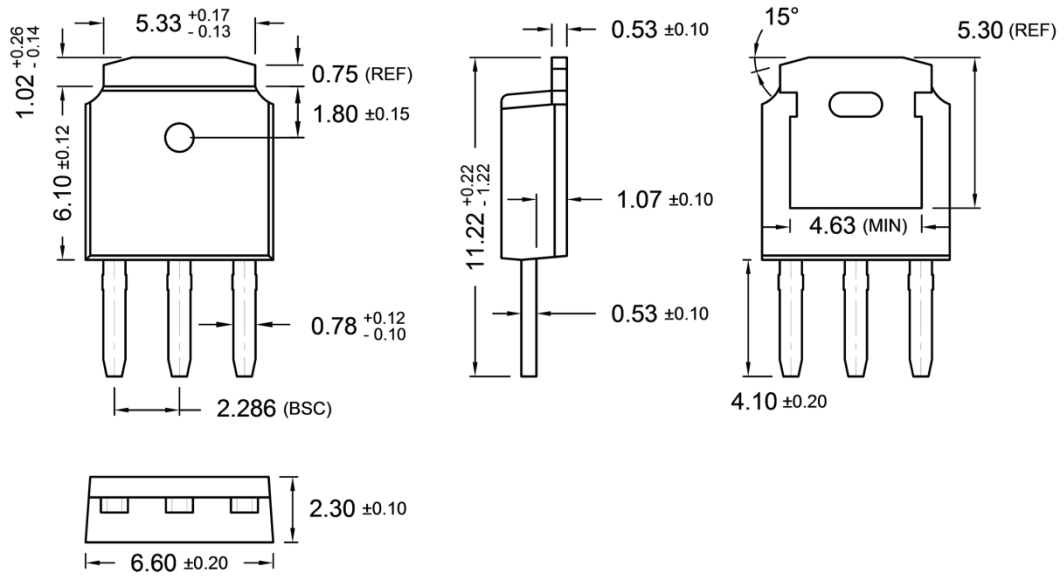


Normalized gate threshold voltage vs Temperature

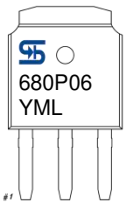


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-251S



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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