

N-Channel Power MOSFET

600V, 3A, 1.4Ω

FEATURES

- Super-Junction technology
- High performance due to small figure-of-merit
- High ruggedness performance
- High commutation performance
- 100% UIL tested
- Pb-free plating
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

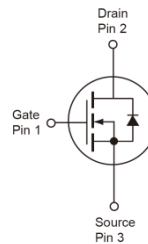
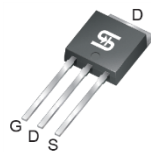
KEY PERFORMANCE PARAMETERS		
PARAMETER	VALUE	UNIT
V_{DS}	600	V
$R_{DS(on)}$ (max)	1.4	Ω
Q_g	7.12	nC

APPLICATIONS

- Power Supply
- Lighting



TO-251 (IPAK)



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	$T_C = 25^\circ\text{C}$	3
		$T_C = 100^\circ\text{C}$	1.8
Pulsed Drain Current ^(Note 2)	I_{DM}	9	A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_{DTOT}	28.4	W
Single Pulsed Avalanche Energy ^(Note 3)	E_{AS}	25	mJ
Single Pulsed Avalanche Current ^(Note 3)	I_{AS}	1.0	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	$R_{\theta JC}$	4.4	°C/W
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	62	°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. $R_{\theta JA}$ shown below for single device operation on FR-4 PCB in still air.

ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ 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	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	$V_{GS(TH)}$	2	3.3	4	V
Gate Body Leakage	$V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$	I_{GSS}	--	--	± 100	nA
Zero Gate Voltage Drain Current	$V_{DS} = 600\text{V}, V_{GS} = 0\text{V}$	I_{DSS}	--	--	1	μA
Drain-Source On-State Resistance (Note 4)	$V_{GS} = 10\text{V}, I_D = 0.9\text{A}$	$R_{DS(on)}$	--	1	1.4	Ω
Dynamic (Note 5)						
Total Gate Charge	$V_{DS} = 380\text{V}, I_D = 3\text{A},$ $V_{GS} = 10\text{V}$	Q_g	--	7.12	--	nC
Gate-Source Charge		Q_{gs}	--	3.52	--	
Gate-Drain Charge		Q_{gd}	--	1.62	--	
Input Capacitance	$V_{DS} = 100\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$	C_{iss}	--	257.3	--	pF
Output Capacitance		C_{oss}	--	41.5	--	
Gate Resistance	$F = 1\text{MHz}, \text{open drain}$	R_g	--	4.1	--	Ω
Switching (Note 6)						
Turn-On Delay Time	$V_{DD} = 380\text{V},$ $R_{GEN} = 25\Omega,$ $I_D = 3\text{A}, V_{GS} = 10\text{V},$	$t_{d(on)}$	--	13.8	--	ns
Turn-On Rise Time		t_r	--	11.4	--	
Turn-Off Delay Time		$t_{d(off)}$	--	28	--	
Turn-Off Fall Time		t_f	--	8.4	--	
Source-Drain Diode						
Forward Voltage (Note 4)	$I_S = 3\text{A}, V_{GS} = 0\text{V}$	V_{SD}	--	--	1.4	V
Reverse Recovery Time	$V_R = 200\text{V}, I_S = 1.5\text{A}$ $dI_F/dt = 100\text{A}/\mu\text{s}$	t_{rr}	--	126	--	ns
Reverse Recovery Charge		Q_{rr}	--	0.637	--	μC

Notes:

1. Current limited by package.
2. Pulse width limited by the maximum junction temperature.
3. $L = 50\text{mH}, I_{AS} = 1.0\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega,$ Starting $T_J = 25^\circ\text{C}$
4. Pulse test: $PW \leq 300\mu\text{s}, \text{duty cycle} \leq 2\%$.
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

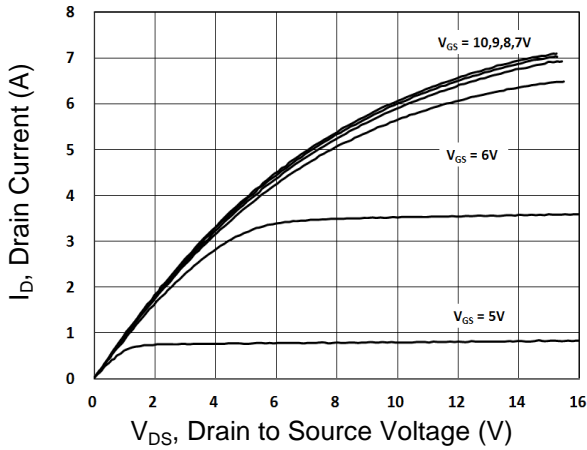
ORDERING INFORMATION

PART NO.	PACKAGE	PACKING
TSM60NB1R4CH C5G	TO-251 (IPAK)	75pcs / Tube

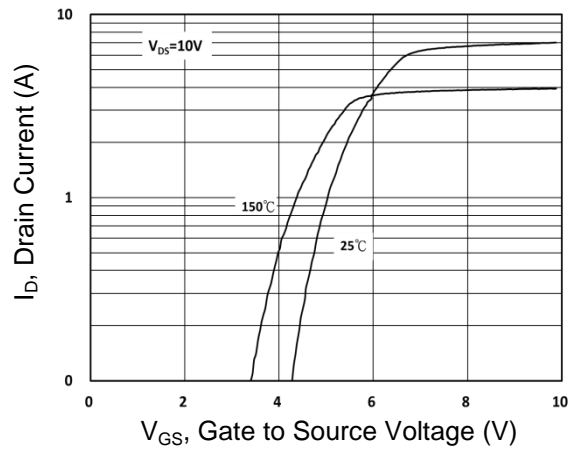
CHARACTERISTICS CURVES

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

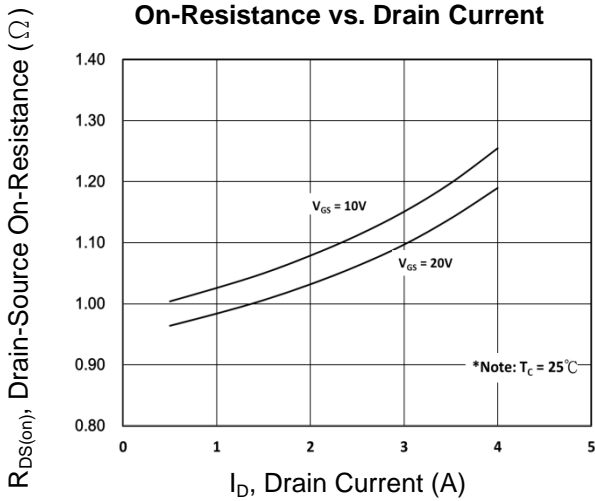
Output Characteristics



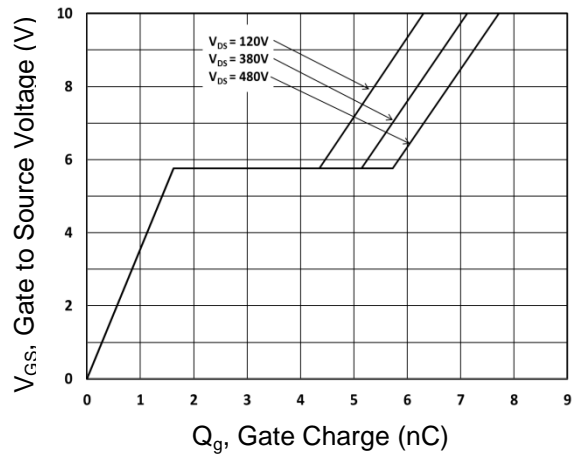
Transfer Characteristics



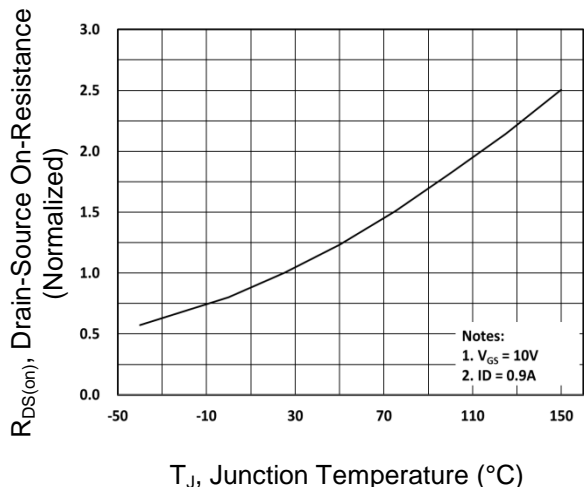
On-Resistance vs. Drain Current



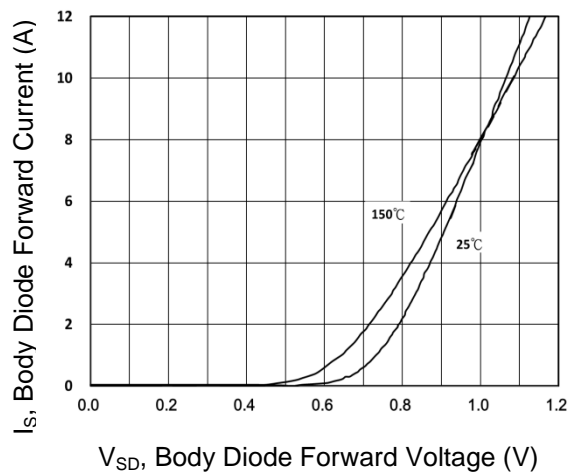
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



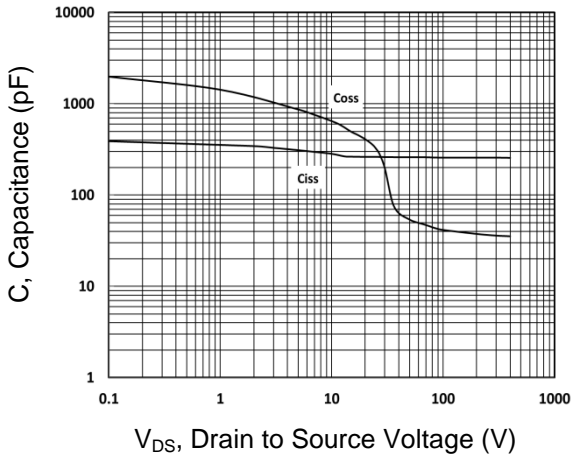
Source-Drain Diode Forward Current vs. Voltage



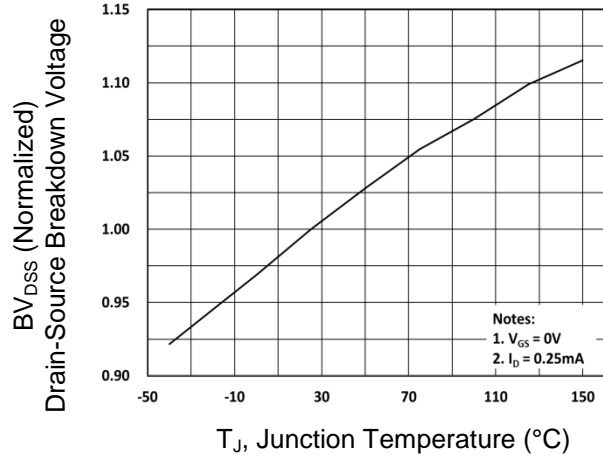
CHARACTERISTICS CURVES

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

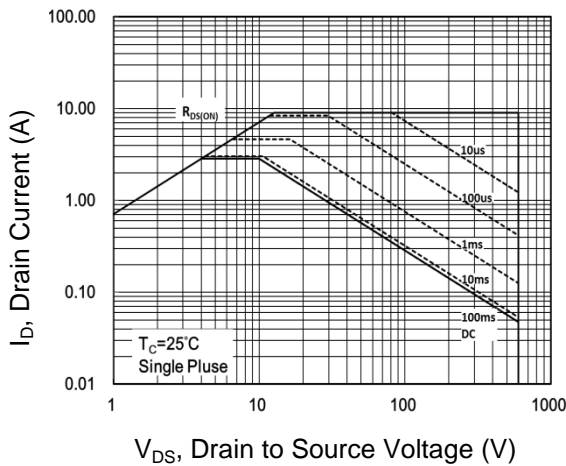
Capacitance vs. Drain-Source Voltage



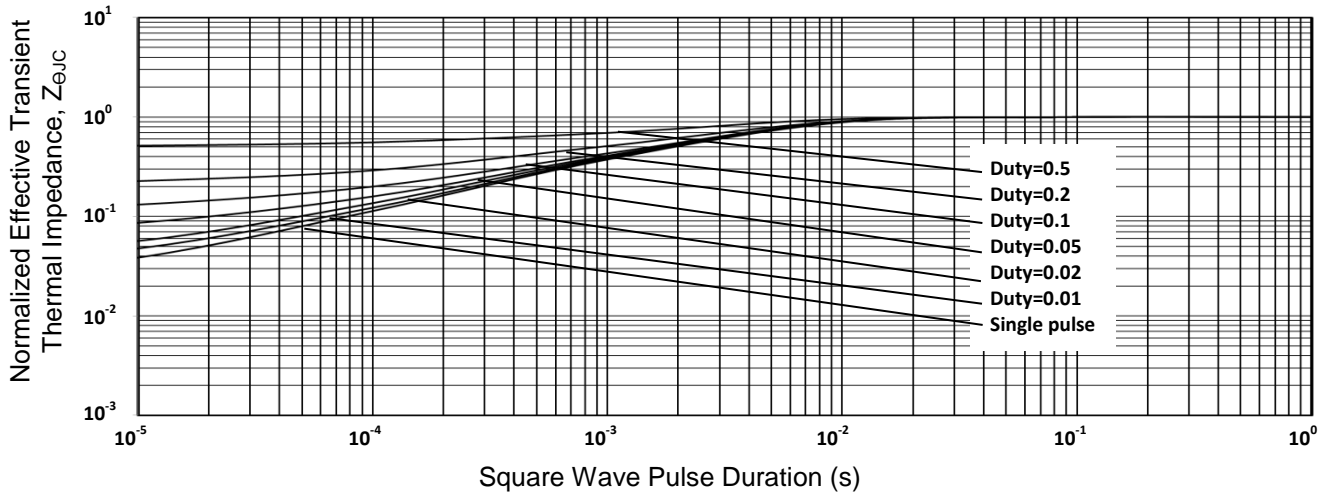
BV_{DSS} vs. Junction Temperature



Maximum Safe Operating Area

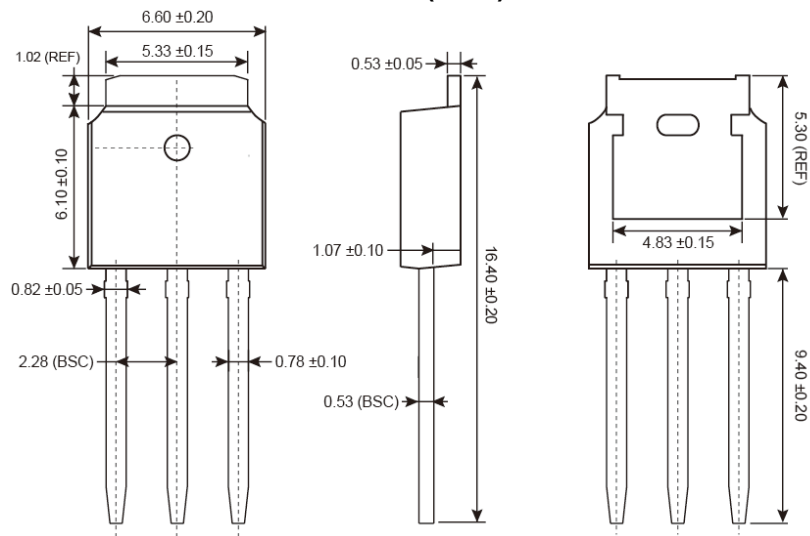


Normalized Thermal Transient Impedance, Junction-to-Case

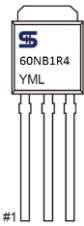


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-251 (IPAK)



MARKING DIAGRAM



- Y** = Year Code
- M** = Month Code for Halogen Free Product
 - 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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