

## P-Channel Power MOSFET

-20V, -11A, 16mΩ

### FEATURES

- Improved dV/dt capability
- Fast Switching
- Suitable for 1.8V drive applications
- Pb-free plating
- RoHS compliant
- Halogen-free mold compound

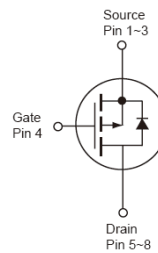
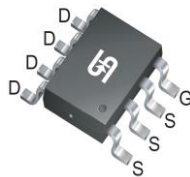
### APPLICATION

- Load Switch
- Networking

KEY PERFORMANCE PARAMETERS		
PARAMETER	VALUE	UNIT
$V_{DS}$	-20	V
$R_{DS(on)}$ (max)	$V_{GS} = -4.5V$	16
	$V_{GS} = -2.5V$	22
	$V_{GS} = -1.8V$	28
$Q_g$	27	nC



SOP-8



**Notes:** Moisture sensitivity level: level 3. Per J-STD-020

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ C$ unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 10$	V
Continuous Drain Current <sup>(Note 1)</sup>	$I_D$	$T_C = 25^\circ C$	-11
		$T_C = 100^\circ C$	-7
Pulsed Drain Current <sup>(Note 2)</sup>	$I_{DM}$	-44	A
Total Power Dissipation @ $T_C = 25^\circ C$	$P_{TOT}$	2.5	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	- 55 to +150	$^\circ C$

THERMAL PERFORMANCE			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction to Case Thermal Resistance	$R_{\theta JC}$	25	$^\circ C/W$
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	50	$^\circ C/W$

**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.  $R_{\theta JA}$  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.

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
<b>Static</b> (Note 3)						
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$	$BV_{DSS}$	-20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$	$V_{GS(TH)}$	-0.3	-0.6	-1.0	V
Gate Body Leakage	$V_{GS} = \pm 10\text{V}, V_{DS} = 0\text{V}$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = -20\text{V}, V_{GS} = 0\text{V}$	$I_{DSS}$	--	--	-1	$\mu\text{A}$
Drain-Source On-State Resistance	$V_{GS} = -4.5\text{V}, I_D = -6\text{A}$	$R_{DS(ON)}$	--	12	16	m $\Omega$
	$V_{GS} = -2.5\text{V}, I_D = -4\text{A}$		--	16	22	
	$V_{GS} = -1.8\text{V}, I_D = -3\text{A}$		--	21	28	
<b>Dynamic</b> (Note 4)						
Total Gate Charge	$V_{DS} = -10\text{V}, I_D = -6\text{A},$ $V_{GS} = -4.5\text{V}$	$Q_g$	--	27	--	nC
Gate-Source Charge		$Q_{gs}$	--	2.4	--	
Gate-Drain Charge		$Q_{gd}$	--	5.3	--	
Input Capacitance	$V_{DS} = -15\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$	$C_{iss}$	--	2320	--	pF
Output Capacitance		$C_{oss}$	--	280	--	
Reverse Transfer Capacitance		$C_{rss}$	--	175	--	
<b>Switching</b> (Note 5)						
Turn-On Delay Time	$V_{DD} = -10\text{V},$ $R_{GEN} = 25\Omega,$ $I_D = -1\text{A}, V_{GS} = -4.5\text{V},$	$t_{d(on)}$	--	16.2	--	ns
Turn-On Rise Time		$t_r$	--	43.5	--	
Turn-Off Delay Time		$t_{d(off)}$	--	114	--	
Turn-Off Fall Time		$t_f$	--	28.8	--	
<b>Source-Drain Diode</b> (Note 3)						
Forward On Voltage	$I_S = -1\text{A}, V_{GS} = 0\text{V}$	$V_{SD}$	--	--	-1	V

**Notes:**

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. Pulse test:  $PW \leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$
4. For DESIGN AID ONLY, not subject to production testing.
5. Switching time is essentially independent of operating temperature.

**ORDERING INFORMATION**

<b>PART NO.</b>	<b>PACKAGE</b>	<b>PACKING</b>
TSM160P02CS RLG	SOP-8	2,500pcs / 13"Reel

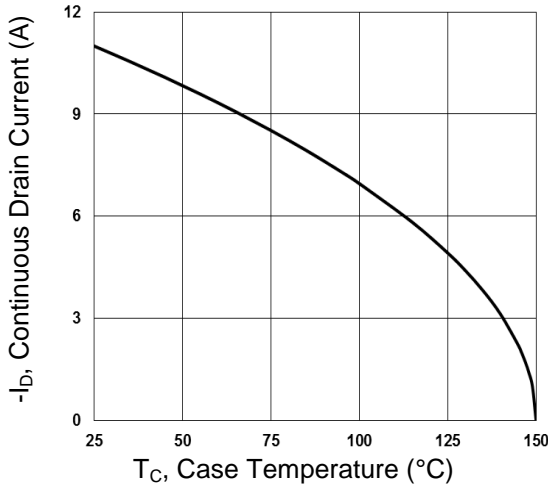
**Note:**

1. Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
2. Halogen-free according to IEC 61249-2-21 definition

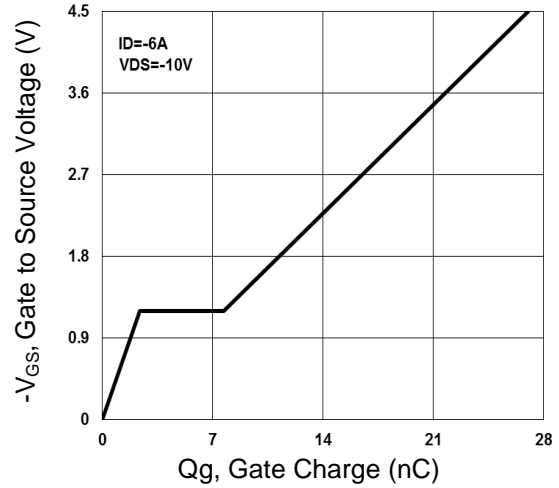
**CHARACTERISTICS CURVES**

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

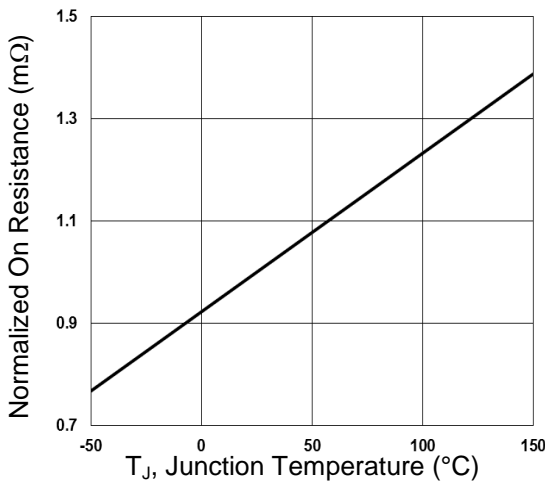
**Continuous Drain Current vs.  $T_C$**



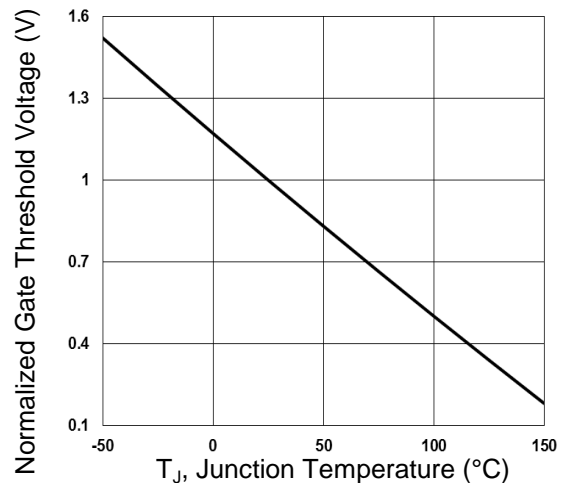
**Gate Charge**



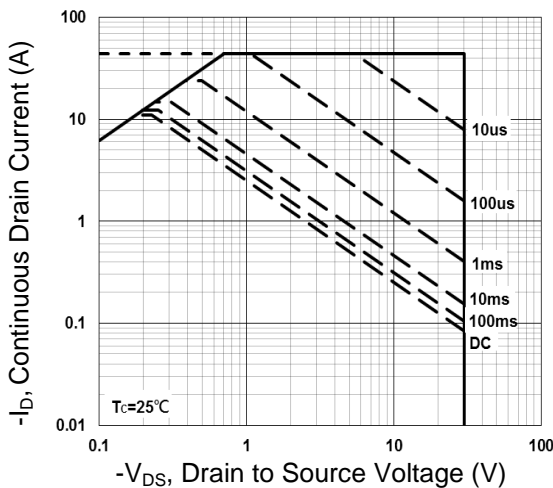
**On-Resistance vs. Junction Temperature**



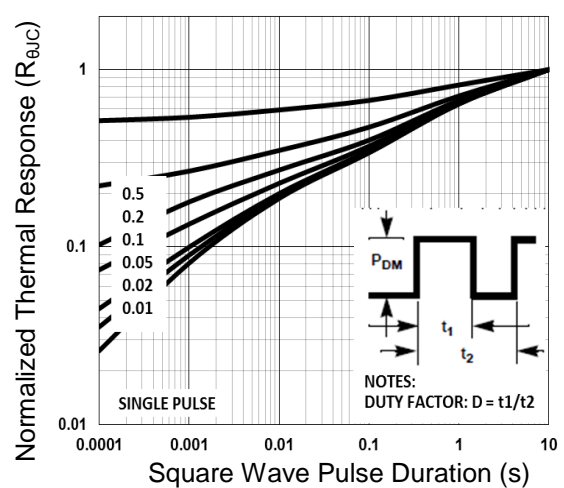
**Threshold Voltage vs. Junction Temperature**



**Maximum Safe Operating Area**

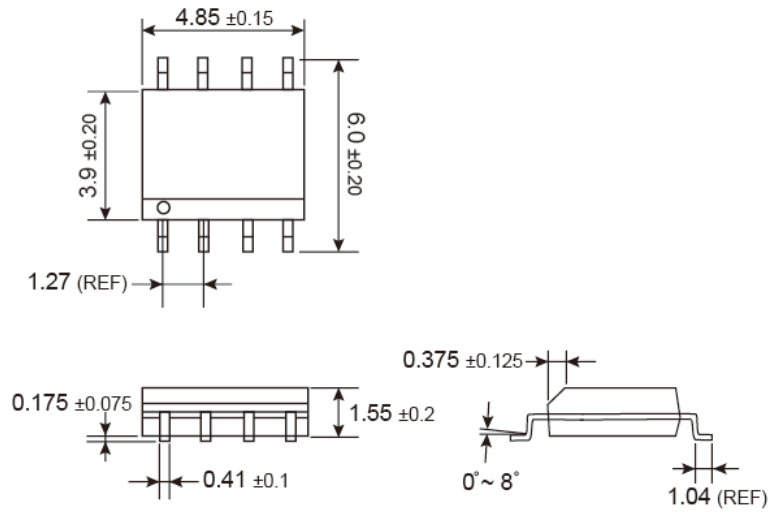


**Normalized Thermal Transient Impedance Curve**

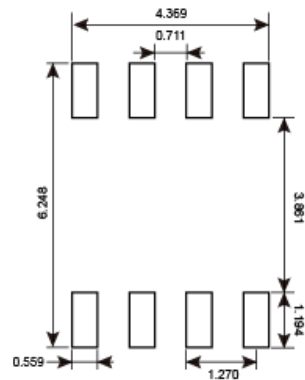


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

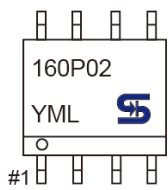
**SOP-8**



**SUGGESTED PAD LAYOUT**



**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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