TSM650P02CX

20V P-Channel Power MOSFET

SOT-23

Pin Definition:
1. Gate
2. Source
3. Drain

Note:
MSL 1 (Moisture Sensitivity Level) per J-STD-020

Key Parameter Performance

Parameter		Value	Unit
V_{DS}		-20	V
$R_{DS(on)}$ (max)	V_{GS} =- 4.5V	65	mΩ
	V_{GS} = -2.5V	85	
	V_{GS} = -1.8V	130	
Q_g		6.4	nC

Features

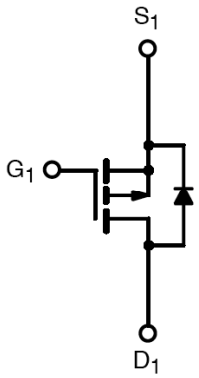
- Fast switching
- Suited for -1.8V gate drive applications
- Halogen-free

Ordering Information

Ordering code	Package	Packing
TSM650P02CX RFG	SOT-23	3kcs / 7” Reel

Note: Halogen-free according to IEC 61249-2-21 definition

Block Diagram



P-Channel MOSFET

Absolute Maximum Ratings (T_C = 25°C unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	-20	V
Gate-Source Voltage		V_{GS}	±10	V
Continuous Drain Current	T_C = 25°C	I_D	-4.1	A
	T_C = 100°C		-2.6	A
Pulsed Drain Current (Note 1)		I_{DM}	-16.4	A
Power Dissipation @ T_C = 25℃		P_D	1.56	W
Operating Junction Temperature		T_J	-55 to +150	°C
Storage Temperature Range		T_{STG}	-55 to +150	°C

Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Ambient	$R_{\Theta JA}$	80	°C/W

TSM650P02CX

20V P-Channel Power MOSFET

Electrical Specifications (T_C = 25°C unless otherwise noted)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = -250μA	BV_{DSS}	-20	--	--	V
Drain-Source On-State Resistance	V_{GS} = -4.5V, I_D = -3A	$R_{DS(on)}$	--	52	65	mΩ
	V_{GS} = -2.5V, I_D = -2A		--	73	85	
	V_{GS} = -1.8V, I_D = -1.5A		--	105	130	
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250μA	$V_{GS(TH)}$	-0.4	-0.6	-0.8	V
Zero Gate Voltage Drain Current	V_{DS} = -20V, V_{GS} = 0V	I_{DSS}	--	--	-1	μA
	V_{DS} = -16V, T_J = 125°C		--	--	-10	
Gate Body Leakage	V_{GS} = ±10V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Forward Transconductance (Note 2)	V_{DS} = -10V, I_D = -3A	g_{fs}	--	5.5	--	S
Dynamic						
Total Gate Charge (Note 2,3)	V_{DS} = -10V, I_D = -3A, V_{GS} = -4.5V	Q_g	--	6.4	--	nC
Gate-Source Charge (Note 2,3)		Q_{gs}	--	0.9	--	
Gate-Drain Charge (Note 2,3)		Q_{gd}	--	1.6	--	
Input Capacitance	V_{DS} = -10V, V_{GS} = 0V, f = 1.0MHz	C_{iss}	--	515	--	pF
Output Capacitance		C_{oss}	--	55	--	
Reverse Transfer Capacitance		C_{rss}	--	20	--	
Switching						
Turn-On Delay Time (Note 2,3)	V_{DD} = -10V, I_D = -1A, V_{GS} = -4.5V, R_{GEN} = 25Ω	$t_{d(on)}$	--	5	--	ns
Turn-On Rise Time (Note 2,3)		t_r	--	17.4	--	
Turn-Off Delay Time (Note 2,3)		$t_{d(off)}$	--	40.7	--	
Turn-Off Fall Time (Note 2,3)		t_f	--	11.4	--	
Source-Drain Diode Ratings and Characteristic						
Maximum Continuous Drain-Source Diode Forward Current	Integral reverse diode in the MOSFET	I_S	--	--	-4.1	A
Maximum Pulse Drain-Source Diode Forward Current		I_{SM}	--	--	-16.4	A
Diode-Source Forward Voltage	V_{GS} = 0V, I_S = -1A	V_{SD}	--	--	-1	V

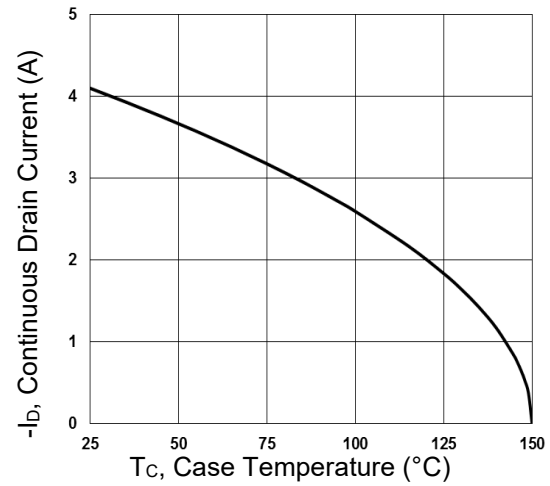
Note:

1. Pulse width limited by safe operating area
2. Pulse test: pulse width ≤ 300μs, duty cycle ≤ 2%
3. Switching time is essentially independent of operating temperature.

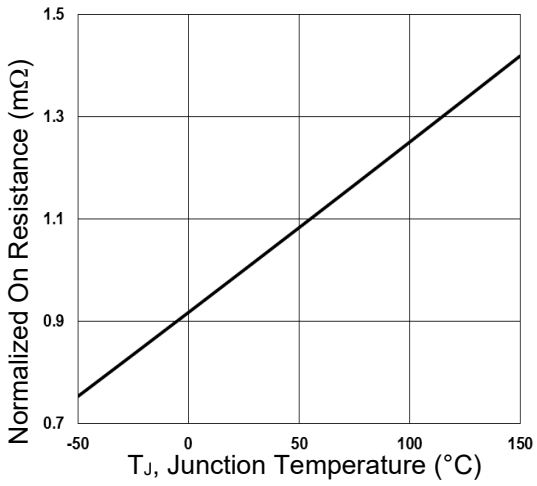
Pb-Free RoHS COMPLIANT

Electrical Characteristics Curve

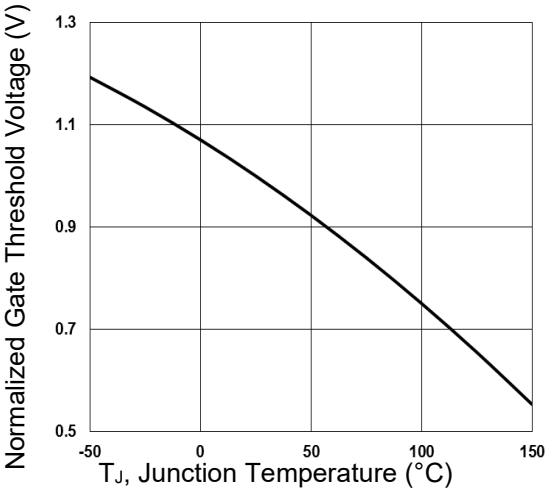
Continuous Drain Current vs. T_C



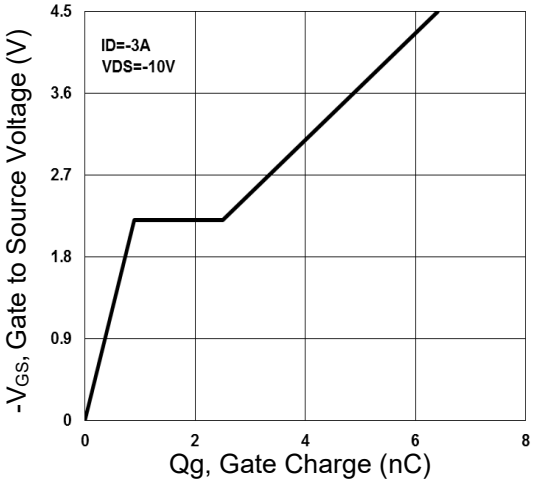
Normalized $R_{DS}(on)$ VS. T_J



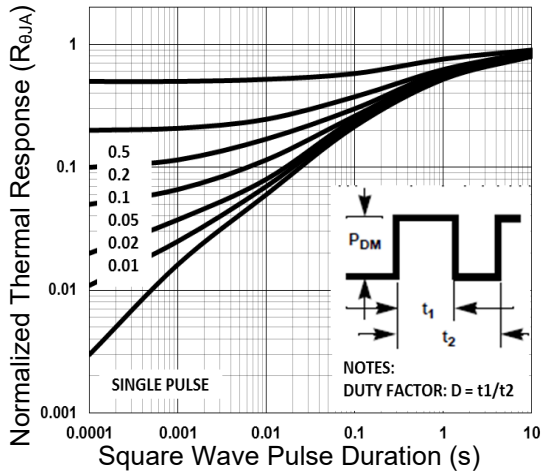
Threshold Voltage vs. Junction Temperature



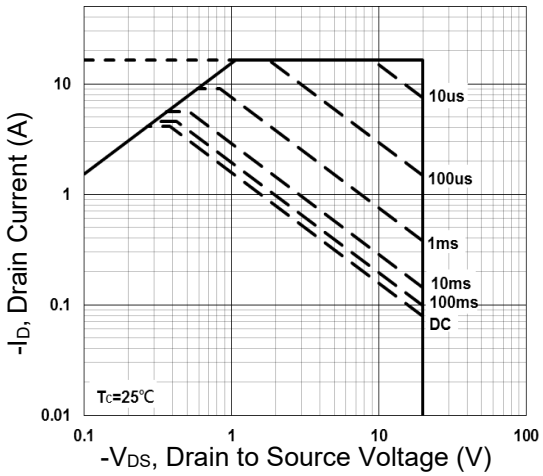
Gate Charge Waveform



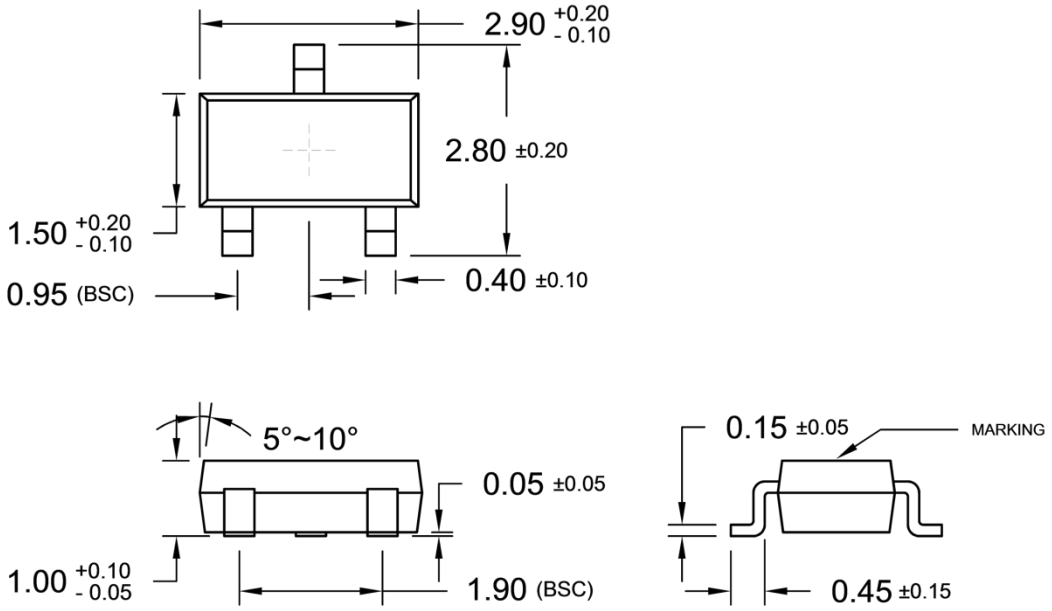
Normalized Thermal Transient Impedance Curve



Maximum Safe Operating Area

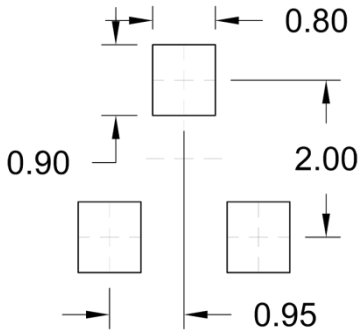


SOT-23 Mechanical Drawing

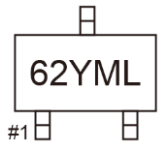


Unit: Millimeters

SUGGESTED PAD LAYOUT (Unit: Millimeters)



Marking Diagram



62 = Device Code
Y = Year Code
M = Month Code for Halogen Free Product
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apl, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
L = Lot Code

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