

N-Channel Power MOSFET

450V, 0.5A, 4.25Ω

FEATURES

- Low gate charge @ typical 6.5nC
- Low Crss @ typical 6.5pF
- Avalanche energy specified
- Improved dV/dt capability
- Pb-free plating
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21 definition

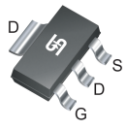
APPLICATION

- Power Supply
- Lighting

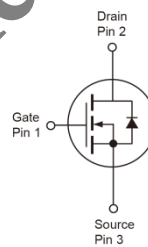
KEY PERFORMANCE PARAMETERS		
PARAMETER	VALUE	UNIT
V_{DS}	450	V
$R_{DS(on)}$ (max)	4.25	Ω
Q_g	6.5	nC



SOT-223



TO-92



Notes: MSL 3 (Moisture Sensitivity Level) per JEDEC J-STD-020

ABSOLUTE MAXIMUM RATINGS (T _A = 25°C unless otherwise noted)			
PARAMETER	SYMBOL	Limit	UNIT
Drain-Source Voltage	V_{DS}	450	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current ^(Note 1)	I_D	0.5	A
	T _C = 25°C		
Pulsed Drain Current ^(Note 2)	I_{DM}	4	A
Total Power Dissipation @ T _C = 25°C	TO-92	2	W
	SOT-223	15	
Single Pulsed Avalanche Energy ^(Note 3)	E_{AS}	108	mJ
Single Pulsed Avalanche Current ^(Note 3)	I_{AS}	1.6	A
Repetitive Avalanche Energy ^(Note 3)	E_{AR}	0.25	mJ
Repetitive Avalanche Current ^(Note 3)	I_{AR}	0.5	A
Operating Junction and Storage Temperature Range	T _J , T _{STG}	- 55 to +150	°C

THERMAL PERFORMANCE				
PARAMETER		SYMBOL	Limit	UNIT
Junction to Lead Thermal Resistance	TO-92	$R_{\theta JL}$	50	°C/W
Junction to Case Thermal Resistance	SOT-223	$R_{\theta JC}$	8.5	
Junction to Ambient Thermal Resistance	TO-92	$R_{\theta JA}$	140	
	SOT-223		60	

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 with minimum recommended footprint in still air.

Not Recommended

ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static (Note 4)						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu\text{A}$	BV_{DSS}	450	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	$V_{GS(TH)}$	2.3	--	4.25	V
Gate Body Leakage	$V_{GS} = \pm 30V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Zero Gate Voltage Drain Current	$V_{DS} = 450V, V_{GS} = 0V$	I_{DSS}	--	--	10	μA
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 0.25A$	$R_{DS(on)}$	--	3.7	4.25	Ω
Dynamic (Note 5)						
Total Gate Charge	$V_{DS} = 360V, I_D = 0.5A,$ $V_{GS} = 10V$	Q_g	--	6.5	10	nC
Gate-Source Charge		Q_{gs}	--	1.3	--	
Gate-Drain Charge		Q_{gd}	--	3.2	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$	C_{iss}	--	235	--	pF
Output Capacitance		C_{oss}	--	29	--	
Reverse Transfer Capacitance		C_{rss}	--	6.5	--	
Switching (Note 6)						
Turn-On Delay Time	$V_{DD} = 225V,$ $R_{GEN} = 25\Omega,$ $I_D = 0.5A, V_{GS} = 10V,$	$t_{d(on)}$	--	14.7	--	ns
Turn-On Rise Time		t_r	--	32.8	--	
Turn-Off Delay Time		$t_{d(off)}$	--	25.2	--	
Turn-Off Fall Time		t_f	--	23.7	--	
Source-Drain Diode (Note 4)						
Maximum Continuous Drain-Source Diode Forward Current		I_S	--	--	0.5	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}	--	--	4	A
Forward On Voltage	$I_S = 0.5A, V_{GS} = 0V$	V_{SD}	--	--	1.4	V
Reverse Recovery Time	$V_{GS} = 0V, I_S = 1A$	t_{rr}	--	110	--	ns
Reverse Recovery Charge	$di_F/dt = 100A/\mu\text{s}$	Q_{rr}	--	0.35	--	μC

Notes:

1. Current limited by package.
2. Pulse width limited by the maximum junction temperature.
3. $L = 75\text{mH}, I_{AS} = 1.6A, V_{DD} = 50V, R_G = 25\Omega,$ Starting $T_J = 25^\circ\text{C}$
4. Pulse test: $PW \leq 300\mu\text{s},$ 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

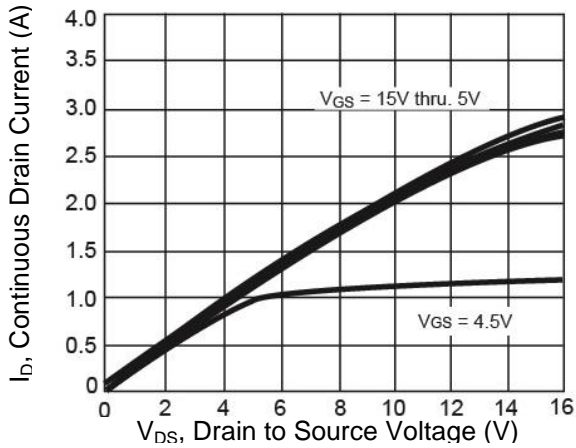
PART NO.	PACKAGE	PACKING
TSM1N45CT B0G	TO-92	1,000pcs / Bulk
TSM1N45CT A3G	TO-92	2,000pcs / Ammo
TSM1N45CW RPG	SOT-223	2,500pcs / 13" Reel

Not Recommended

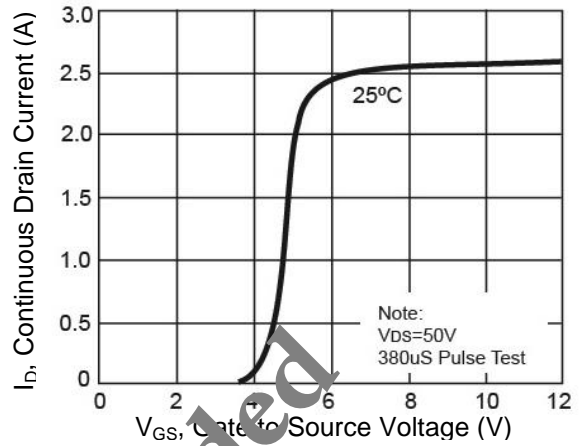
CHARACTERISTICS CURVES

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

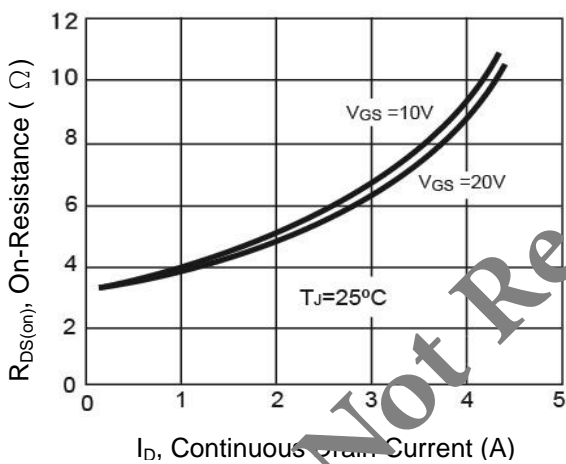
Output Characteristics



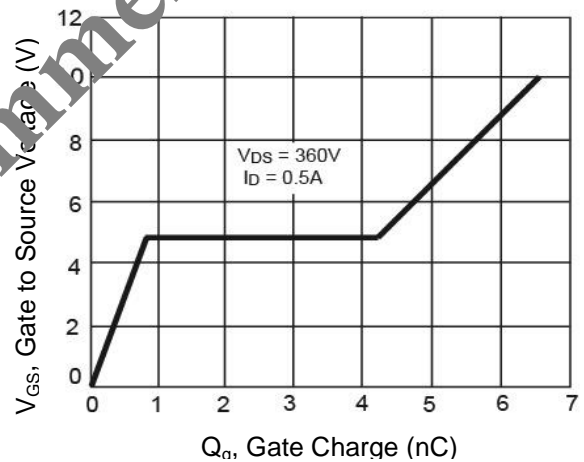
Transfer Characteristics



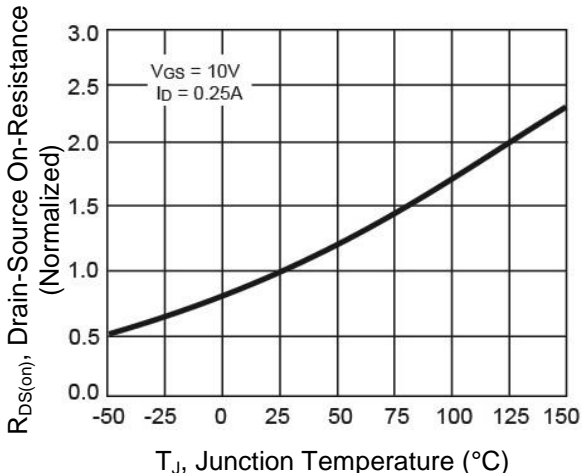
On-Resistance vs. Drain Current



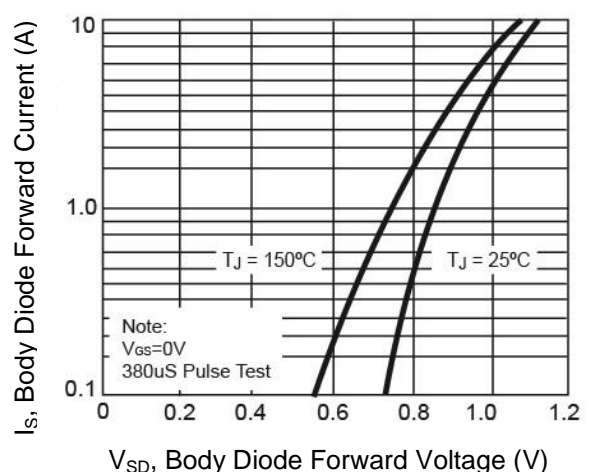
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



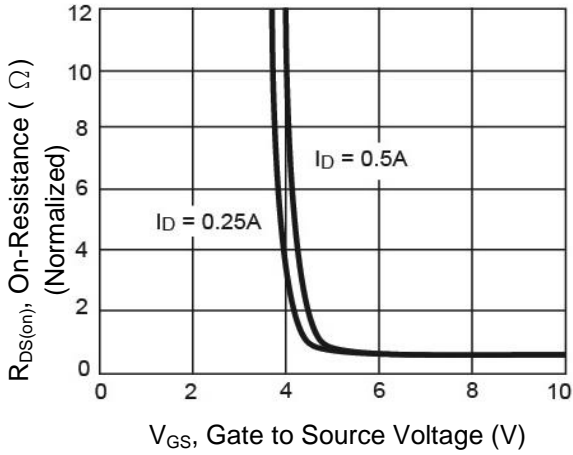
Source-Drain Diode Forward Current vs. Voltage



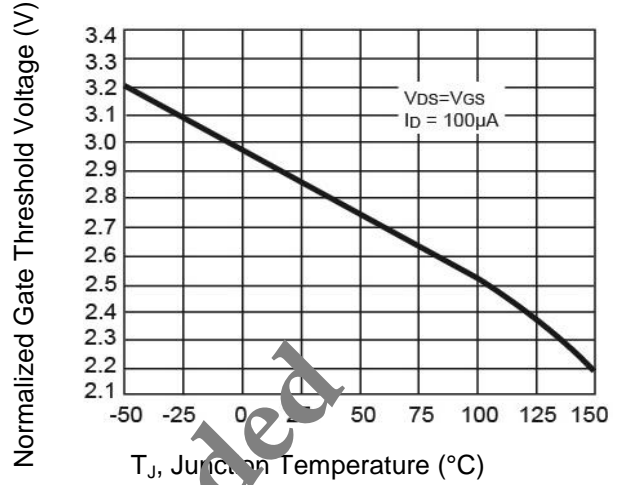
CHARACTERISTICS CURVES

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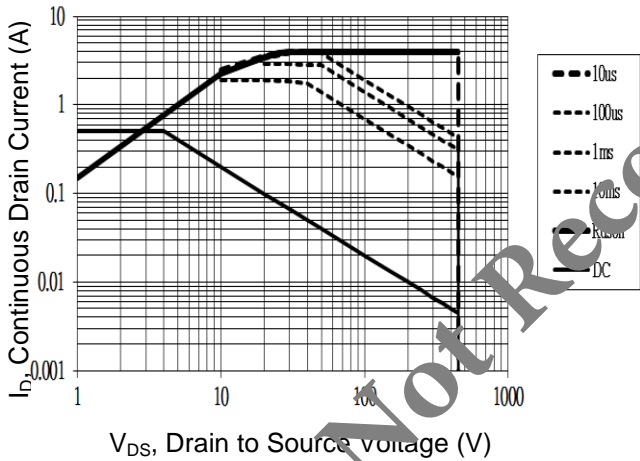
On-Resistance vs. Gate-Source Voltage



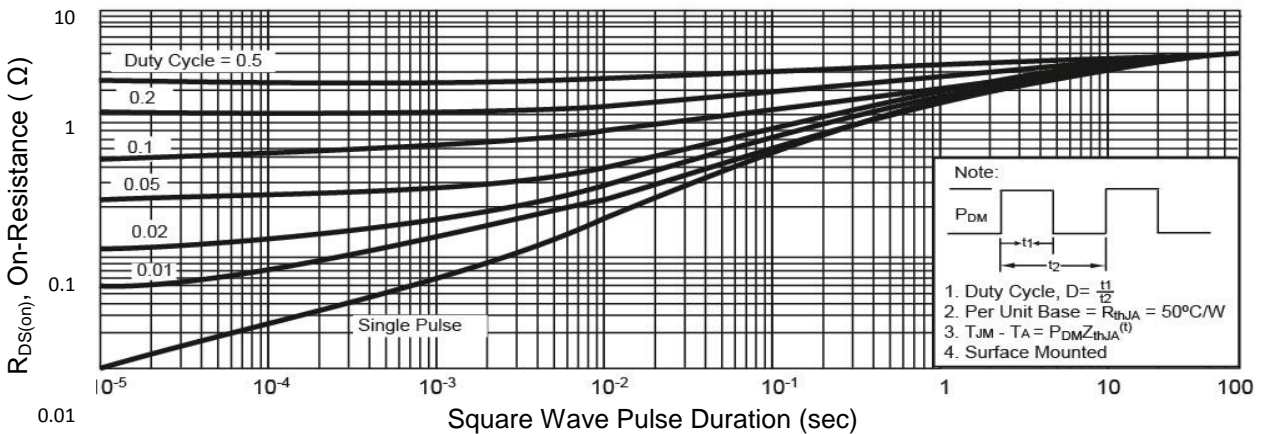
Threshold Voltage



Maximum Safe Operating Area

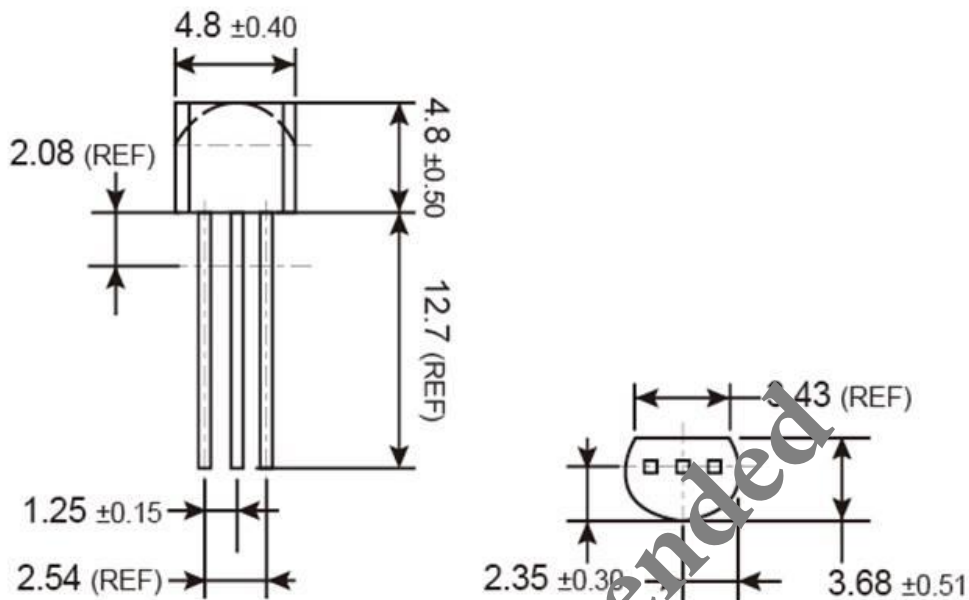


Thermal Transient Impedance, Junction-to-Ambient



PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-92



MARKING DIAGRAM



Y = Year Code

M = Month Code for Halogen Free Product

O =Jan F =Feb Q =Mar R =Apr

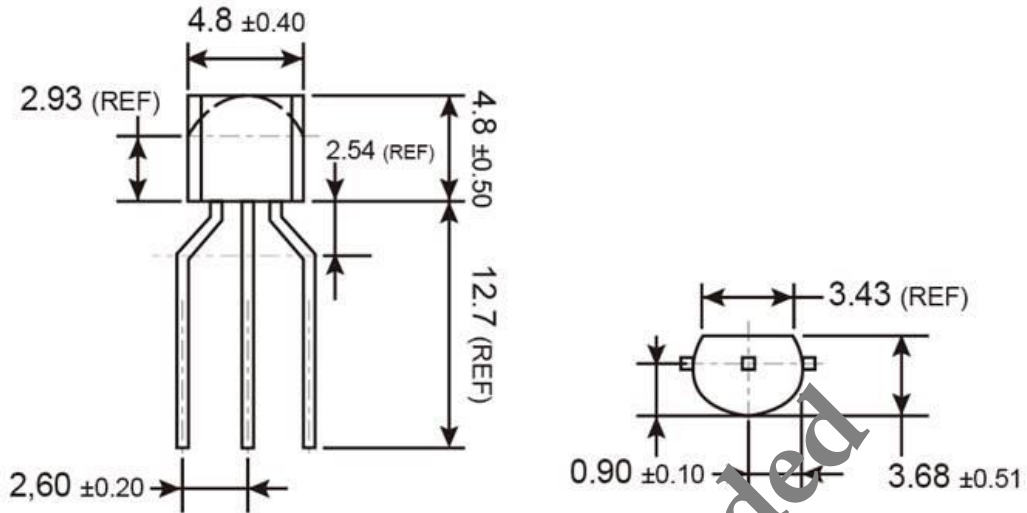
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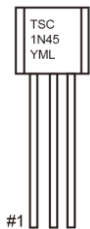
L = Lot Code

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-92



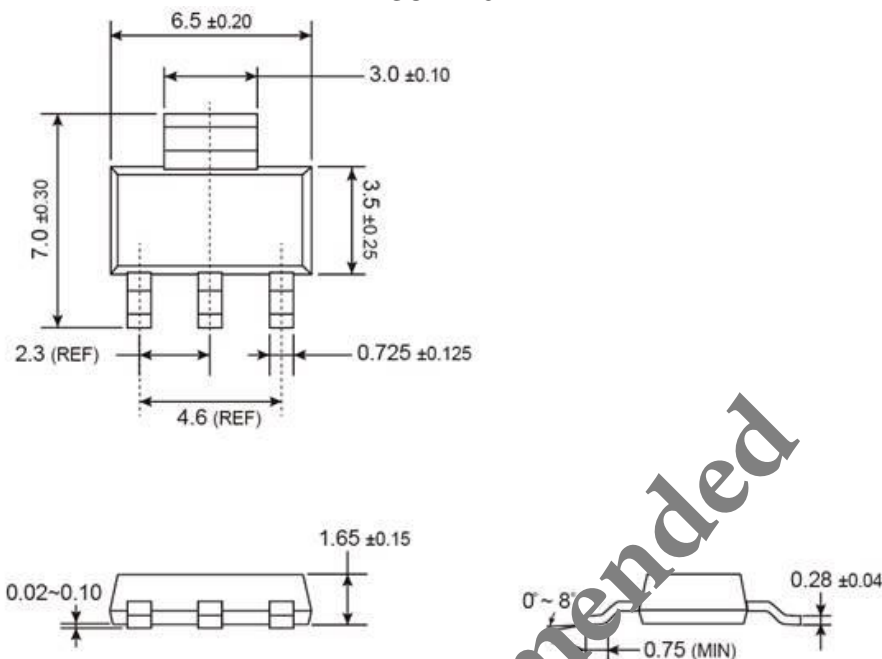
MARKING DIAGRAM



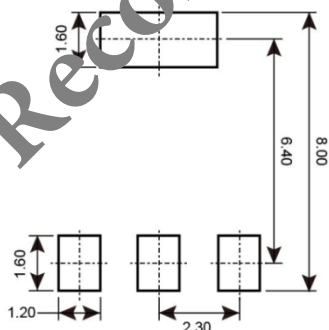
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PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

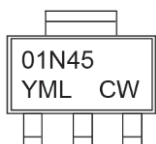
SOT-223



SUGGESTED PAD LAYOUT



MARKING DIAGRAM



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Not Recommended

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