TAIWAN SEMICONDUCTOR

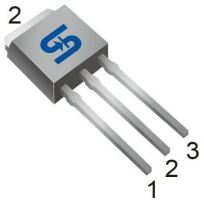
TSM4N60E

600V, 4A, 2.5q

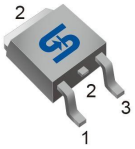
N-Channel Power MOSFET

Pb-Free RoHS COMPLIANT

TO-251 (IPAK)



TO-252 (DPAK)



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

Key Parameter Performance

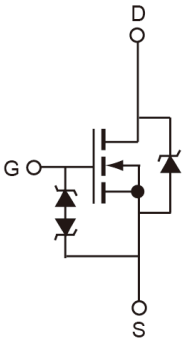
Parameter	Value	Unit
V_{DS}	600	V
$R_{DS(on)}$(max)	2.5	q
Q_g (typ)	13	nC

Features

ð 100% Avalanche Tested

ð G-S ESD Protection Diode Embedded

Block Diagram



N-Channel MOSFET with ESD Protection

Ordering Information

Part No.	Package	Packing
TSM4N60ECH C5G	TO-251	75pcs / Tube
TSM4N60ECP ROG	TO-252	2.5kpcs / 13òReel

Note: ñGòdenotes for Halogen- and Antimony-free as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds

Absolute Maximum Ratings (Tc=25°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)	Tc=25℃	I_D	4	A
	Tc=100℃		2.34	A
Pulsed Drain Current (Note 2)		I_{DM}	16	A
Repetitive Avalanche Current (Note 1)		I_{AR}	4	A
Repetitive Avalanche Energy (Note 1)		E_{AR}	8.62	mJ
Single Pulse Avalanche Energy (Note 3)		E_{AS}	192	mJ
Total Power Dissipation	@ T_C = 25℃	P_D	86.2	W
	Derate above T_C = 25℃		0.68	W/℃
Peak Diode Recovery dV/dt (Note 4)		dV/dt	4.5	V/ns
Operating Junction Temperature		T_J	150	℃
Storage Temperature Range		T_{STG}	-55 to +150	℃

Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	$R_{\theta JC}$	1.45	℃/W
Thermal Resistance - Junction to Ambient	$R_{\theta JA}$	110	℃/W

TSM4N60E

600V, 4A, 2.5q

N-Channel Power MOSFET

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

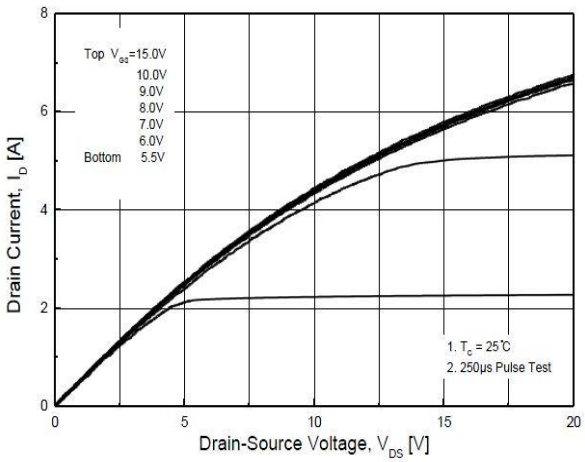
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static (Note 5)						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA	BV_{DSS}	600	--	--	V
Drain-Source On-State Resistance	V_{GS} = 10V, I_D = 2A	$R_{DS(ON)}$	--	2	2.5	q
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	$V_{GS(TH)}$	3	--	5	V
Zero Gate Voltage Drain Current	V_{DS} = 600V, V_{GS} = 0V	I_{DSS}	--	--	1	μA
	V_{DS} = 480V, T_J = 125℃		--	--	10	
Gate Body Leakage	V_{GS} = ±30V, V_{DS} = 0V	I_{GSS}	--	--	±100	μA
Forward Transconductance	V_{DS} = 30V, I_D = 2A	g_{fs}	--	6	--	S
Dynamic (Note 6)						
Total Gate Charge	V_{DS} = 480V, I_D = 4A, V_{GS} = 10V	Q_g	--	12	--	nC
Gate-Source Charge		Q_{gs}	--	3	--	
Gate-Drain Charge		Q_{gd}	--	6	--	
Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz	C_{iss}	--	545	--	pF
Output Capacitance		C_{oss}	--	61	--	
Reverse Transfer Capacitance		C_{rss}	--	10	--	
Switching (Note 7)						
Turn-On Delay Time	V_{DD} = 300V, V_{GS} = 10V, R_G = 25Ω, I_D = 4A	$t_{d(on)}$	--	18	--	ns
Turn-On Rise Time		t_r	--	27	--	
Turn-Off Delay Time		$t_{d(off)}$	--	47	--	
Turn-Off Fall Time		t_f	--	21	--	
Source-Drain Diode Ratings and Characteristic (Note 5)						
Maximum Continuous Drain-Source Diode Forward Current		I_S	--	--	4	A
Maximum Pulse Drain-Source Diode Forward Current		I_{SM}	--	--	16	A
Diode-Source Forward Voltage	V_{GS} = 0V, I_S = 4A	V_{SD}	--	--	1.5	V
Reverse Recovery Time	V_{GS} = 0V, I_S = 4A, dI_F/dt = 100A/μs	t_{rr}	--	316	--	ns
Reverse Recovery Charge		Q_{rr}	--	1.2	--	nC

Notes:

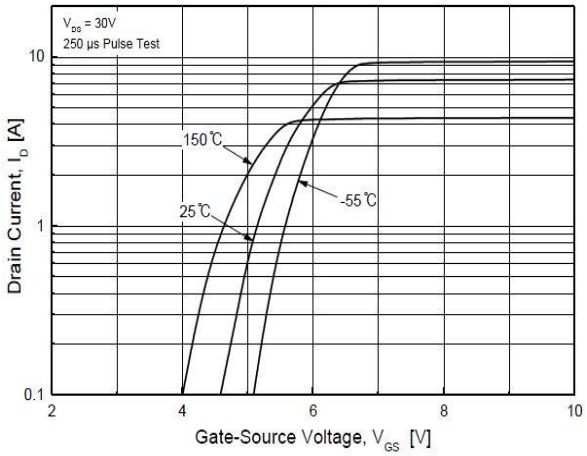
1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. V_{DD} = 50V, L= 22mH, I_{AS} = 4A, R_G = 25Ω, Starting T_J = 25℃
4. I_{SD} Ò4A, di/dt Ò200A/μs, V_{DD} ÒBV_{DS}, Starting T_J = 25℃
5. Pulse test: PW Ò300μs, duty cycle Ò2%
6. For DESIGN AID ONLY, not subject to production testing.
7. Switching time is essentially independent of operating temperature.

Electrical Characteristics Curves (T_C = 25°C, unless otherwise noted)

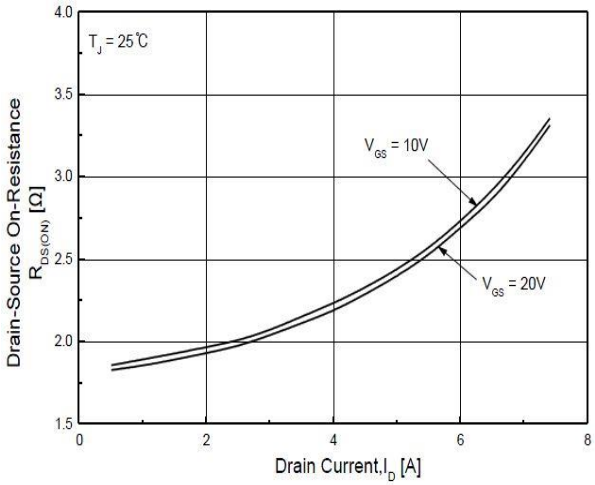
Output Characteristics



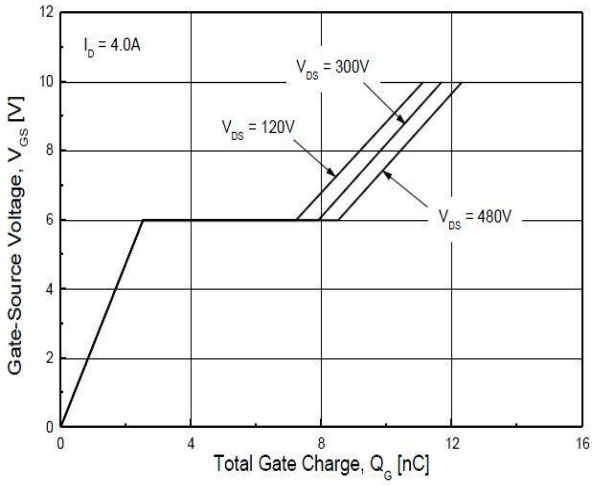
Transfer Characteristics



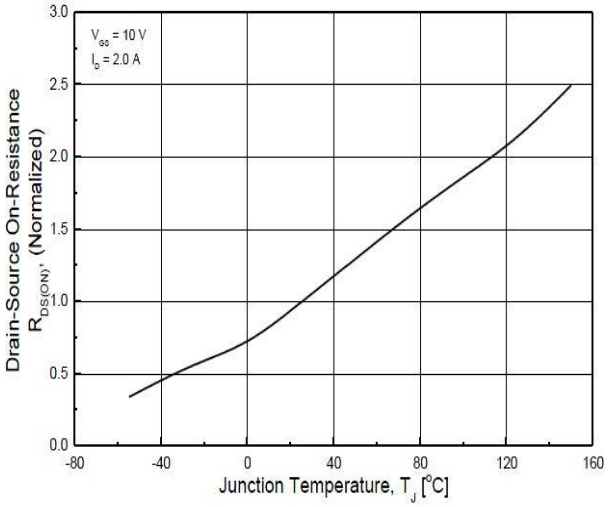
On-Resistance vs. Drain Current



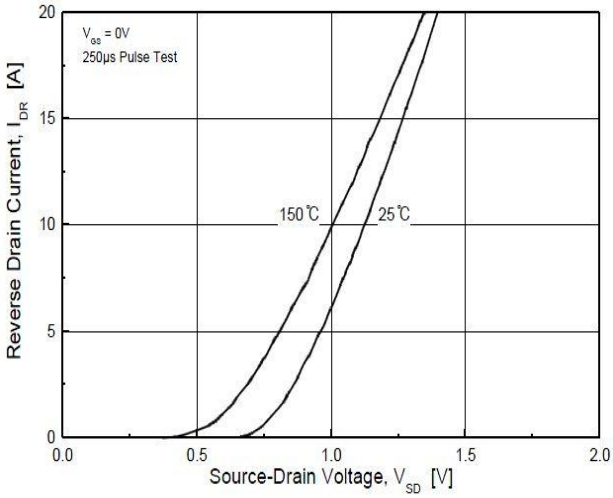
Gate Charge



On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage



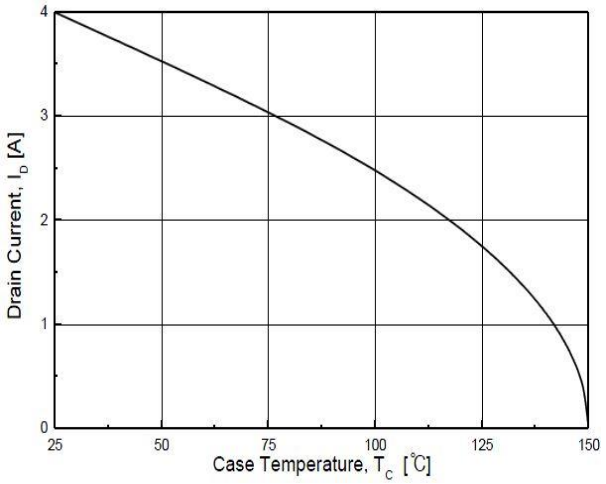
TSM4N60E

600V, 4A, 2.5q

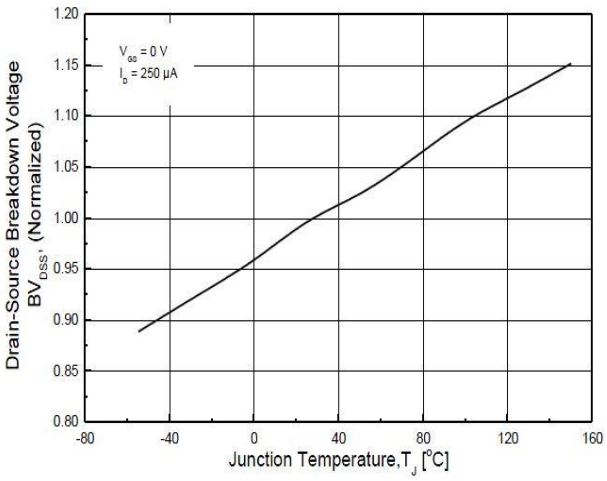
N-Channel Power MOSFET

Electrical Characteristics Curve (T_C = 25°C, unless otherwise noted)

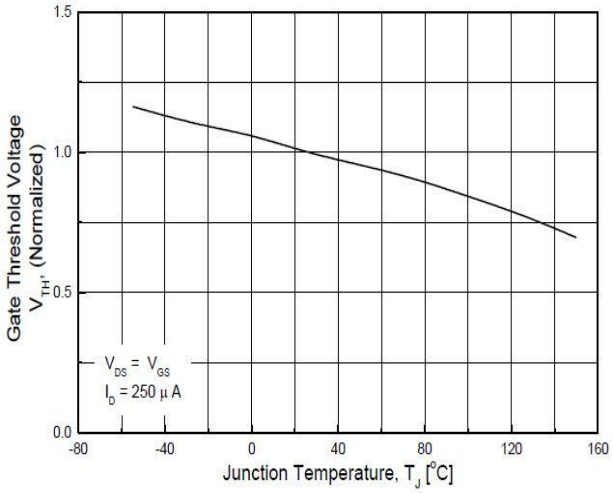
Drain Current vs. Case Temperature



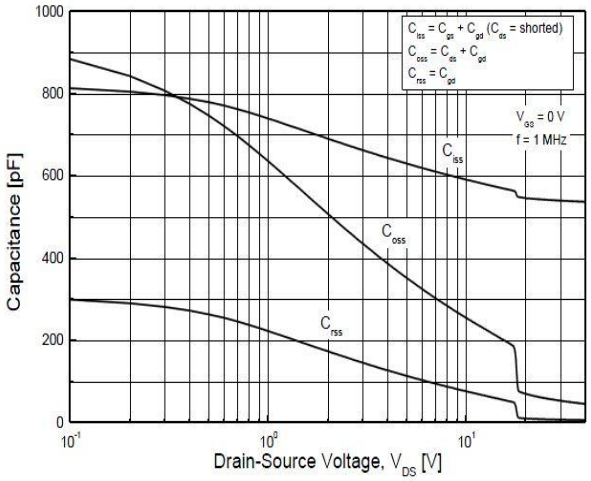
BV_{DSS} vs. Junction Temperature



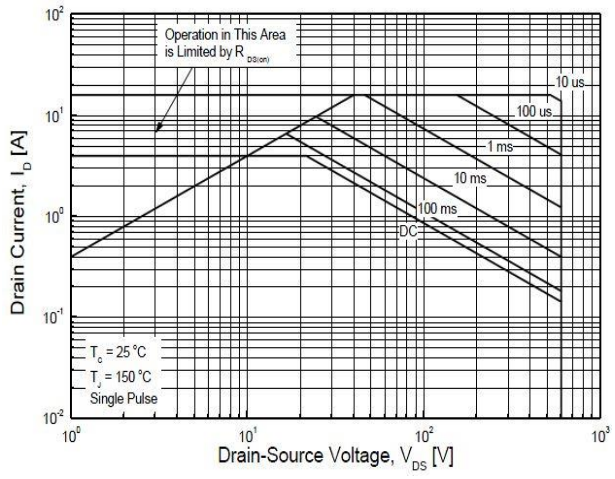
Threshold Voltage vs. Junction Temperature



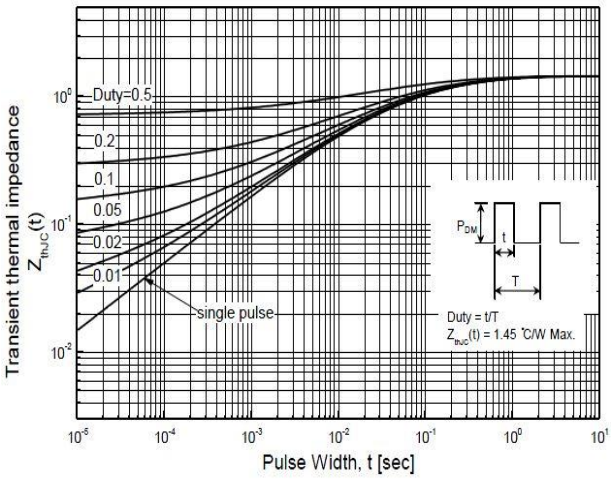
Capacitance vs. Drain-Source Voltage



Maximum Safe Operating Area



Normalized Transient Impedance

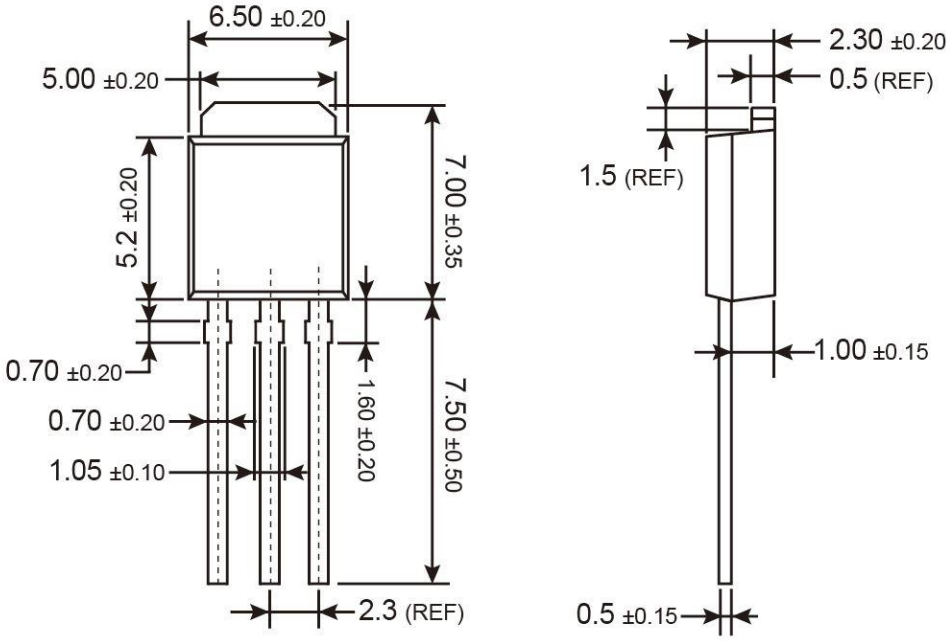


TSM4N60E

600V, 4A, 2.5q

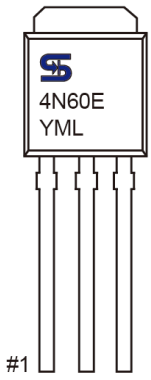
N-Channel Power MOSFET

TO-251 Mechanical Drawing



Unit: Millimeters

Marking Diagram



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)

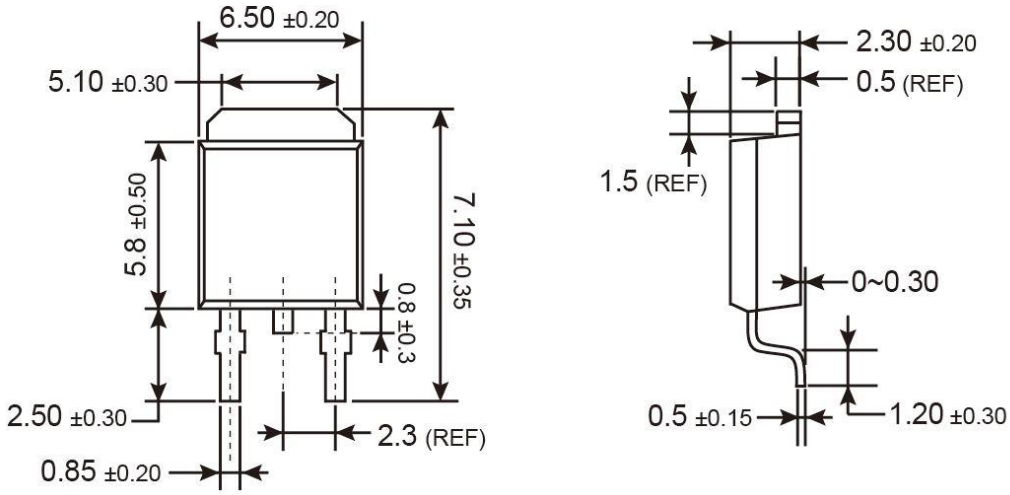
L = Lot Code

TSM4N60E

600V, 4A, 2.5q

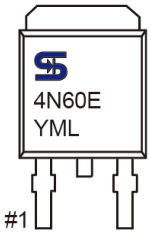
N-Channel Power MOSFET

TO-252 Mechanical Drawing



Unit: Millimeters

Marking Diagram



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

Notice

Specifications of the products displayed herein are subject to change without notice. TSC or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, to any intellectual property rights is granted by this document. Except as provided in TSCs terms and conditions of sale for such products, TSC assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of TSC products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify TSC for any damages resulting from such improper use or sale.