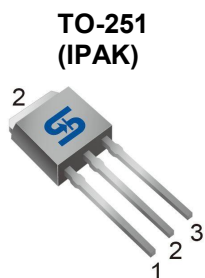


TSM4N60E

600V, 4A, 2.5
N-Channel Power MOSFET



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_g (typ)	13	nC

Features

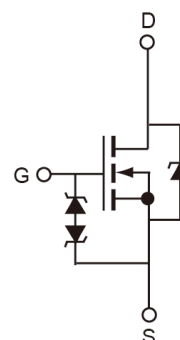
- 100% Avalanche Tested
- G-S ESD Protection Diode Embedded

Ordering Information

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

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

Block Diagram



N-Channel MOSFET with ESD Protection

Absolute Maximum Ratings ($T_C=25^\circ\text{C}$ 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	$T_C=25^\circ\text{C}$	4
		$T_C=100^\circ\text{C}$	2.34
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	P_D	@ $T_C = 25^\circ\text{C}$	86.2
		Derate above $T_C = 25^\circ\text{C}$	0.68
Peak Diode Recovery dV/dt ^(Note 4)	dV/dt	4.5	V/ns
Operating Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 to +150	$^\circ\text{C}$

Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	R_{JC}	1.45	$^\circ\text{C/W}$
Thermal Resistance - Junction to Ambient	R_{JA}	110	$^\circ\text{C/W}$

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

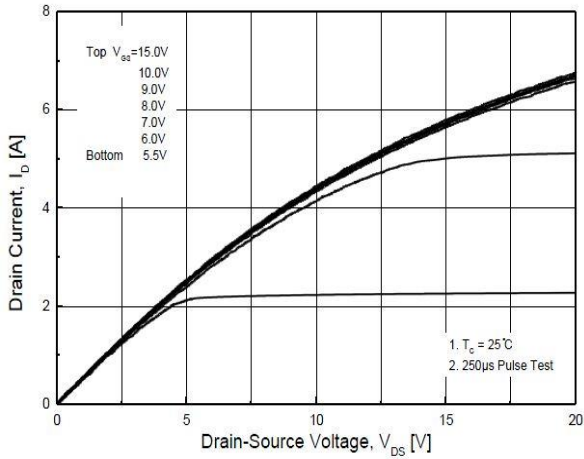
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static (Note 5)						
Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA	BV _{DSS}	600	--	--	V
Drain-Source On-State Resistance	V _{GS} = 10V, I _D = 2A	R _{DS(ON)}	--	2	2.5	
Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	V _{GS(TH)}	3	--	5	V
Zero Gate Voltage Drain Current	V _{DS} = 600V, V _{GS} = 0V	I _{DSS}	--	--	1	μA
	V _{DS} = 480V, T _J = 125°C		--	--	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	t _{rr}	--	316	--	ns
Reverse Recovery Charge	di _F /dt = 100A/μs	Q _{rr}	--	1.2	--	nC

Notes:

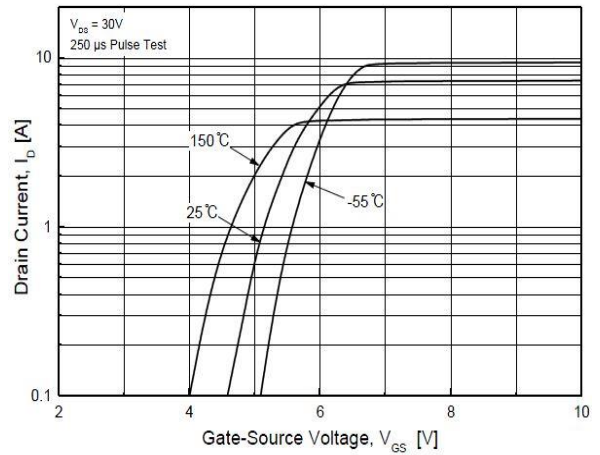
- Current limited by package
- Pulse width limited by the maximum junction temperature
- V_{DD} = 50V, L = 22mH, I_{AS} = 4A, R_G = 25Ω, Starting T_J = 25°C
- I_{SD} m4A, di/dt m200A/μs, V_{DD} mBV_{DS}, Starting T_J = 25°C
- Pulse test: PW m300μs, duty cycle m2%
- For DESIGN AID ONLY, not subject to production testing.
- Switching time is essentially independent of operating temperature.

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

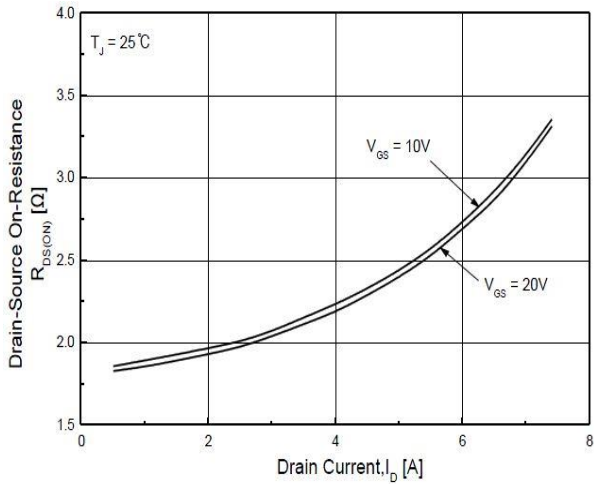
Output Characteristics



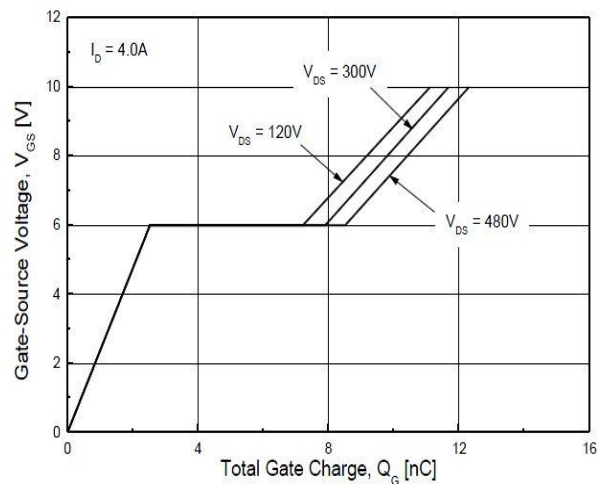
Transfer Characteristics



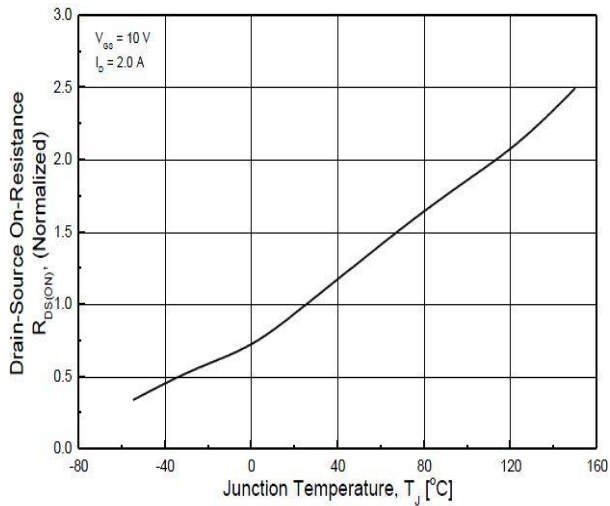
On-Resistance vs. Drain Current



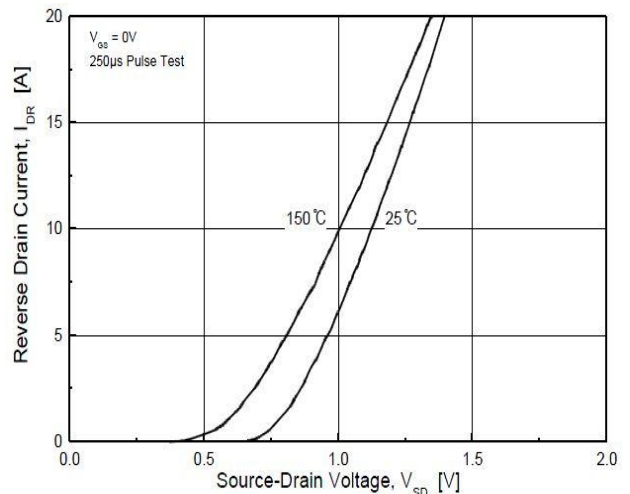
Gate Charge



On-Resistance vs. Junction Temperature

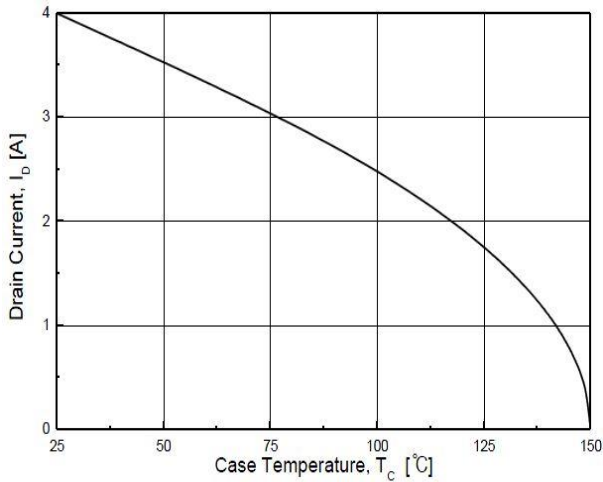


Source-Drain Diode Forward Voltage

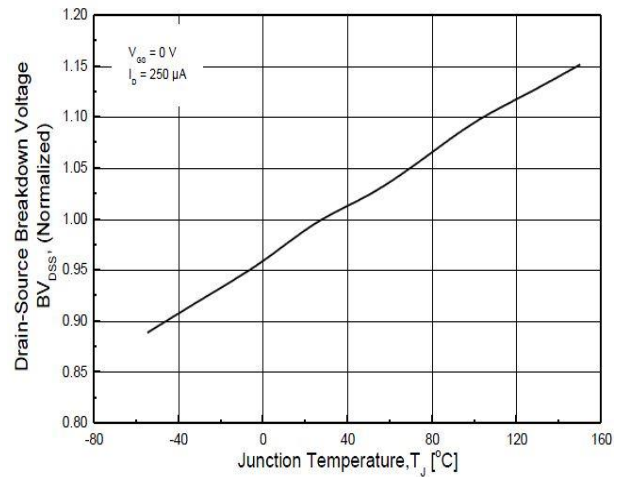


Electrical Characteristics Curve ($T_C = 25^\circ\text{C}$, unless otherwise noted)

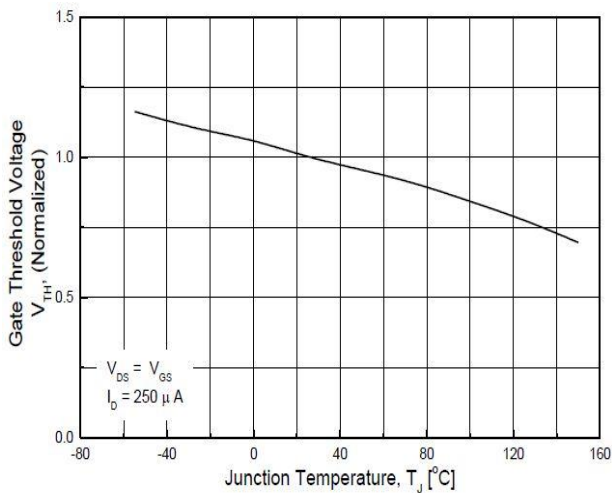
Drain Current vs. Case Temperature



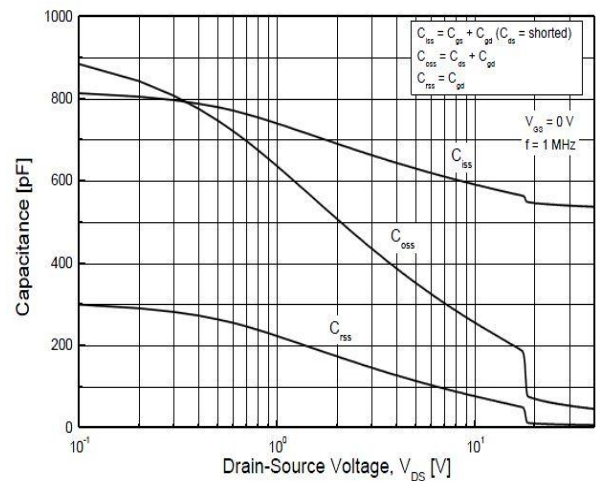
BV_{DSS} vs. Junction Temperature



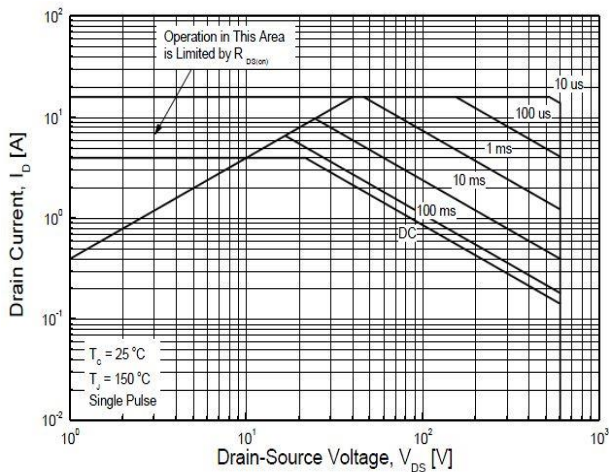
Threshold Voltage vs. Junction Temperature



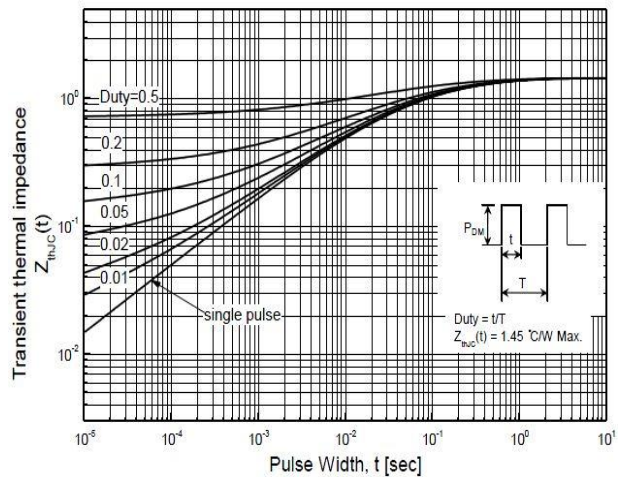
Capacitance vs. Drain-Source Voltage



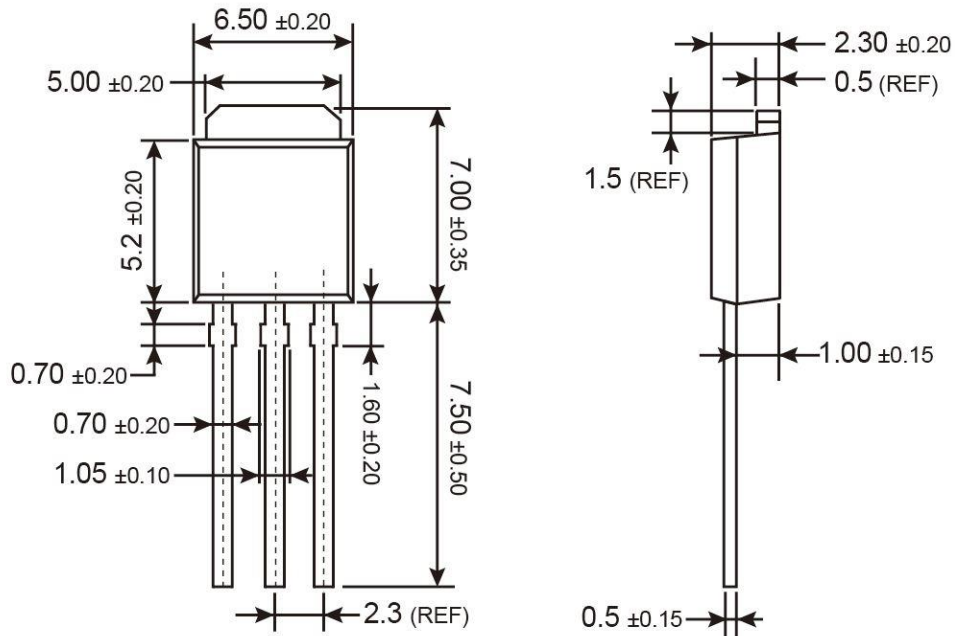
Maximum Safe Operating Area



Normalized Transient Impedance

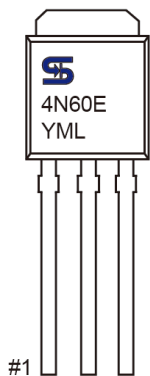


TO-251 Mechanical Drawing



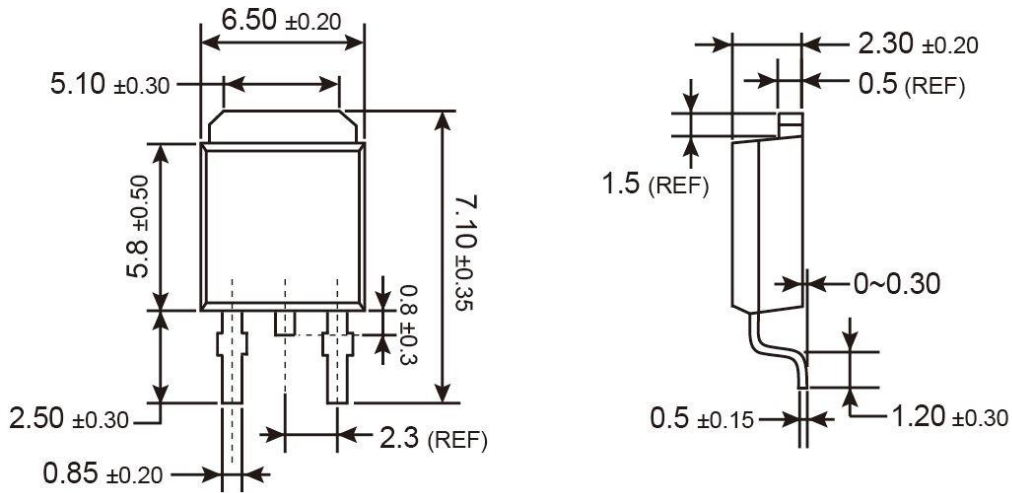
Unit: Millimeters

Marking Diagram



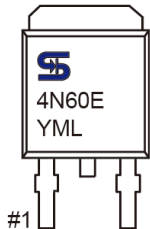
- Y** = Year Code
- M** = Month Code for Halogen Free Product
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apr, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
- L** = Lot Code

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**=Apr, **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 TSC's 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.