



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



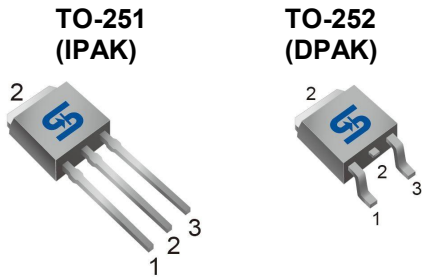
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**Pin Definition:**  
 1. Gate  
 2. Drain  
 3. Source

### Key Parameter Performance

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

### Features

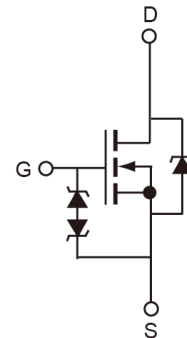
- ✓ 100% Avalanche Tested
- ✓ G-S ESD Protection Diode Embedded

### Ordering Information

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

**Note:** G<sub>2</sub> 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<sub>c</sub>=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 <sup>(Note 1)</sup>	$I_D$	T <sub>c</sub> =25°C	4
		T <sub>c</sub> =100°C	2.34
Pulsed Drain Current <sup>(Note 2)</sup>	$I_{DM}$	16	A
Repetitive Avalanche Current <sup>(Note 1)</sup>	$I_{AR}$	4	A
Repetitive Avalanche Energy <sup>(Note 1)</sup>	$E_{AR}$	8.62	mJ
Single Pulse Avalanche Energy <sup>(Note 3)</sup>	$E_{AS}$	192	mJ
Total Power Dissipation	$P_D$	@ T <sub>c</sub> = 25°C	86.2
		Derate above T <sub>c</sub> = 25°C	0.68
Peak Diode Recovery dV/dt <sup>(Note 4)</sup>	dV/dt	4.5	V/ns
Operating Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-55 to +150	°C

### Thermal Performance

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

## Electrical Specifications (T<sub>C</sub> = 25°C unless otherwise noted)

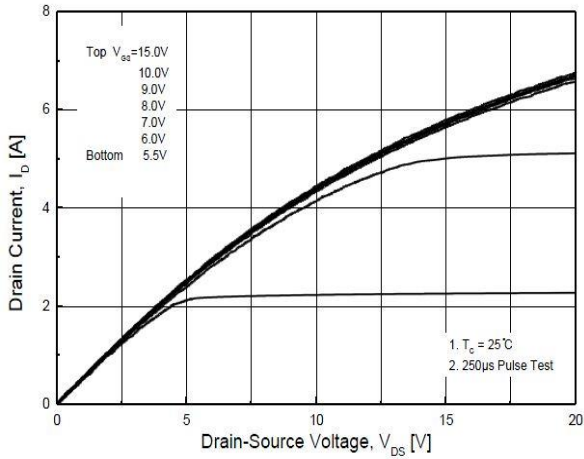
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b> (Note 5)						
Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	BV <sub>DSS</sub>	600	--	--	V
Drain-Source On-State Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 2A	R <sub>DS(ON)</sub>	--	2	2.5	
Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	V <sub>GS(TH)</sub>	3	--	5	V
Zero Gate Voltage Drain Current	V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V	I <sub>DSS</sub>	--	--	1	μA
	V <sub>DS</sub> = 480V, T <sub>J</sub> = 125°C		--	--	10	
Gate Body Leakage	V <sub>GS</sub> = ±30V, V <sub>DS</sub> = 0V	I <sub>GSS</sub>	--	--	±100	μA
Forward Transconductance	V <sub>DS</sub> = 30V, I <sub>D</sub> = 2A	g <sub>fs</sub>	--	6	--	S
<b>Dynamic</b> (Note 6)						
Total Gate Charge	V <sub>DS</sub> = 480V, I <sub>D</sub> = 4A, V <sub>GS</sub> = 10V	Q <sub>g</sub>	--	12	--	nC
Gate-Source Charge		Q <sub>gs</sub>	--	3	--	
Gate-Drain Charge		Q <sub>gd</sub>	--	6	--	
Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1MHz	C <sub>iss</sub>	--	545	--	pF
Output Capacitance		C <sub>oss</sub>	--	61	--	
Reverse Transfer Capacitance		C <sub>rss</sub>	--	10	--	
<b>Switching</b> (Note 7)						
Turn-On Delay Time	V <sub>DD</sub> = 300V, V <sub>GS</sub> = 10V, R <sub>G</sub> = 25Ω, I <sub>D</sub> = 4A	t <sub>d(on)</sub>	--	18	--	ns
Turn-On Rise Time		t <sub>r</sub>	--	27	--	
Turn-Off Delay Time		t <sub>d(off)</sub>	--	47	--	
Turn-Off Fall Time		t <sub>f</sub>	--	21	--	
<b>Source-Drain Diode Ratings and Characteristic</b> (Note 5)						
Maximum Continuous Drain-Source Diode Forward Current		I <sub>S</sub>	--	--	4	A
Maximum Pulse Drain-Source Diode Forward Current		I <sub>SM</sub>	--	--	16	A
Diode-Source Forward Voltage	V <sub>GS</sub> = 0V, I <sub>S</sub> = 4A	V <sub>SD</sub>	--	--	1.5	V
Reverse Recovery Time	V <sub>GS</sub> = 0V, I <sub>S</sub> = 4A	t <sub>rr</sub>	--	316	--	ns
Reverse Recovery Charge	di <sub>F</sub> /dt = 100A/μs	Q <sub>rr</sub>	--	1.2	--	nC

### Notes:

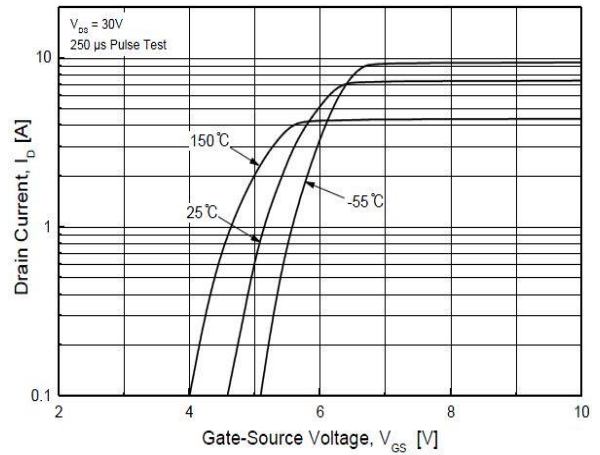
1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. V<sub>DD</sub> = 50V, L = 22mH, I<sub>AS</sub> = 4A, R<sub>G</sub> = 25Ω, Starting T<sub>J</sub> = 25°C
4. I<sub>SD</sub> ≯ 4A, di/dt ≯ 200A/μs, V<sub>DD</sub> ≯ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C
5. Pulse test: PW ≯ 300μs, duty cycle ≯ 2%
6. For DESIGN AID ONLY, not subject to production testing.
7. Switching time is essentially independent of operating temperature.

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

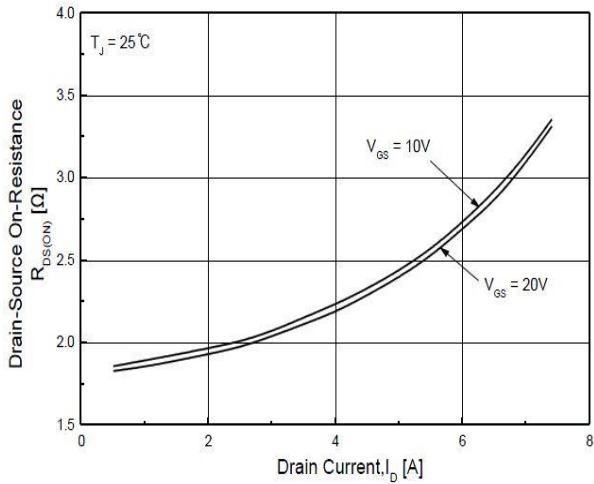
**Output Characteristics**



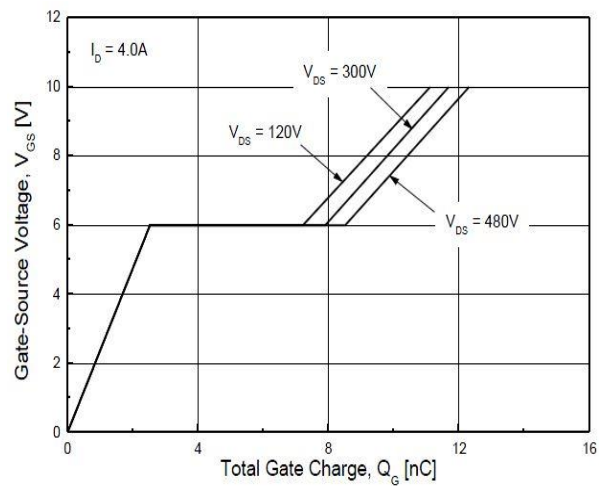
**Transfer Characteristics**



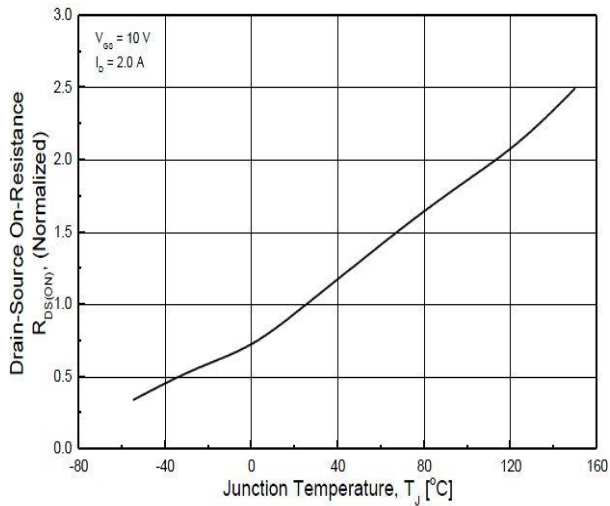
**On-Resistance vs. Drain Current**



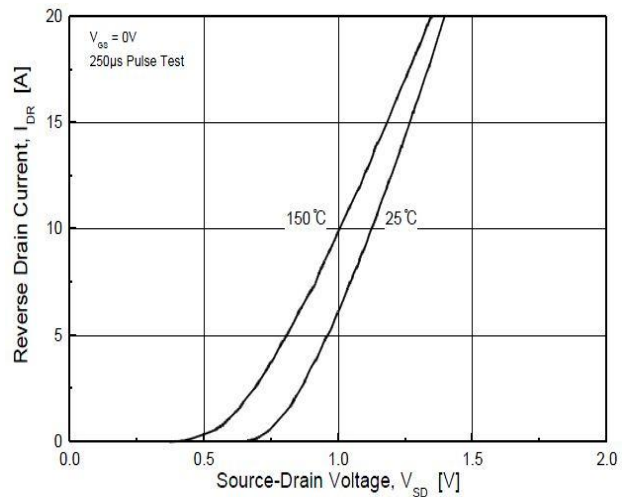
**Gate Charge**



**On-Resistance vs. Junction Temperature**

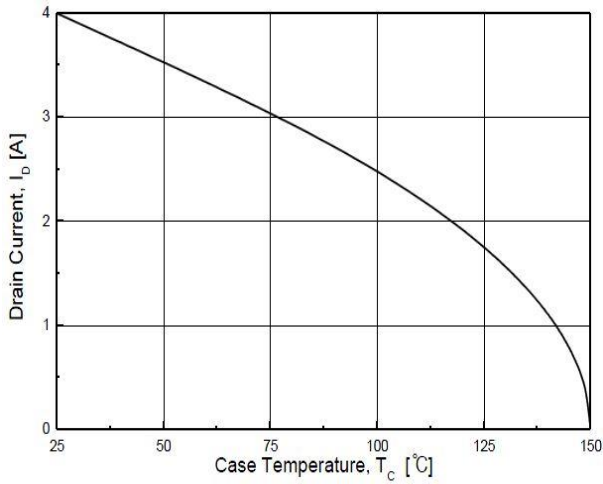


**Source-Drain Diode Forward Voltage**

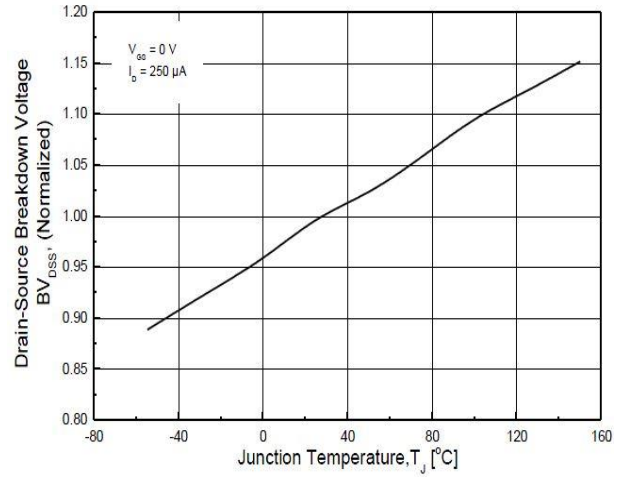


**Electrical Characteristics Curve** ( $T_C = 25^\circ\text{C}$ , unless otherwise noted)

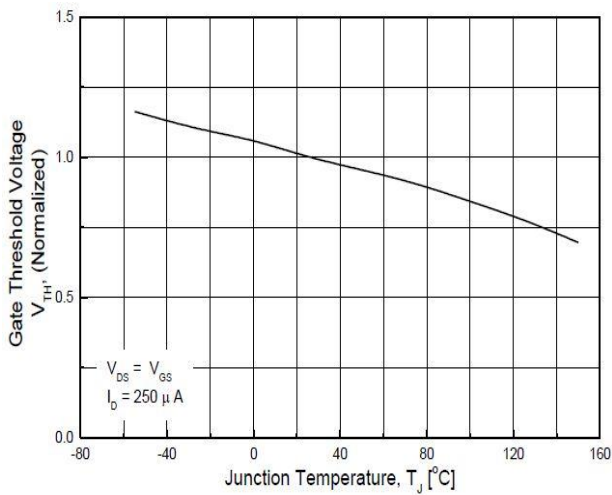
**Drain Current vs. Case Temperature**



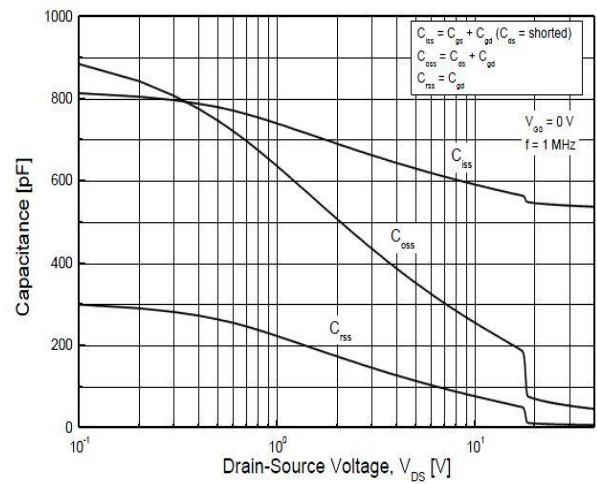
**$BV_{DSS}$  vs. Junction Temperature**



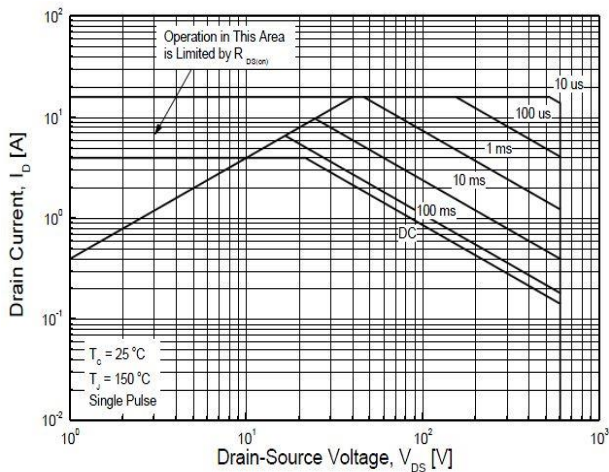
**Threshold Voltage vs. Junction Temperature**



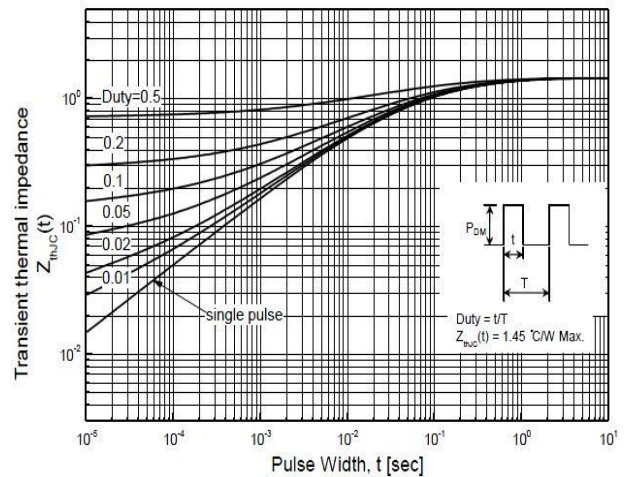
**Capacitance vs. Drain-Source Voltage**



**Maximum Safe Operating Area**

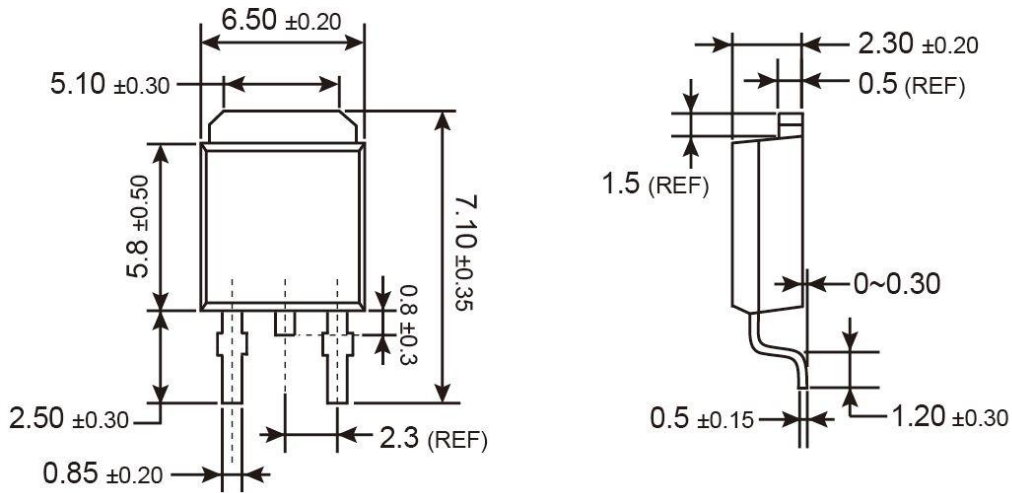


**Normalized Transient Impedance**



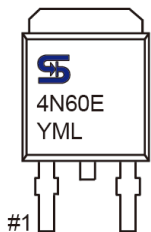


**TO-252 Mechanical Drawing**



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

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