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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.

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## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



## N-Channel Power MOSFET

60V, 38A, 17mΩ

### FEATURES

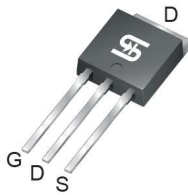
- 100% avalanche tested
- Suitable for 5V drive applications
- Pb-free plating
- RoHS compliant
- Halogen-free mold compound

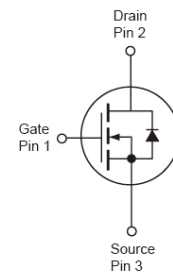
### KEY PERFORMANCE PARAMETERS

PARAMETER		VALUE	UNIT
$V_{DS}$		60	V
$R_{DS(on)}$ (max)	$V_{GS}=10V$	17	mΩ
	$V_{GS}=4.5V$	20	
$Q_g$		15	nC

### APPLICATION

- SMPS Synchronous Rectification
- Networking DC-DC Power System


**TO-251 (IPAK)**

**TO-251S (IPAK SL)**

**TO-252 (DPAK)**

**Notes:** Moisture sensitivity level: level 3. Per J-STD-020

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		$V_{DS}$	60	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	V
Continuous Drain Current (Note 1)	$T_C = 25^\circ\text{C}$	$I_D$	38	A
	$T_C = 100^\circ\text{C}$		24	
Pulsed Drain Current (Note 2)		$I_{DM}$	152	A
Single Pulsed Avalanche Energy (Note 3)		$E_{AS}$	20	mJ
Single Pulsed Avalanche Current (Note 3)		$I_{AS}$	20	A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$		$P_{DTOT}$	46	W
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	- 55 to +150	$^\circ\text{C}$

### THERMAL PERFORMANCE

PARAMETER	SYMBOL	LIMIT	UNIT
Junction to Case Thermal Resistance	$R_{\theta JC}$	2.7	$^\circ\text{C/W}$
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	62	$^\circ\text{C/W}$

**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 in still air

ELECTRICAL SPECIFICATIONS (T <sub>A</sub> = 25°C unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static (Note 4)						
Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	BV <sub>DSS</sub>	60	--	--	V
Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250uA	V <sub>GS(TH)</sub>	1.2	1.7	2.5	V
Gate Body Leakage	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V	I <sub>GSS</sub>	--	--	±100	nA
Zero Gate Voltage Drain Current	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V	I <sub>DSS</sub>	--	--	1	μA
	V <sub>DS</sub> = 48V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C		--	--	10	
Drain-Source On-State Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A	R <sub>DS(ON)</sub>	--	15	17	mΩ
	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 10A		--	17.5	20	
Dynamic (Note 5)						
Total Gate Charge	V <sub>DS</sub> = 30V, I <sub>D</sub> = 10A, V <sub>GS</sub> = 4.5V	Q <sub>g</sub>	--	15	--	nC
Gate-Source Charge		Q <sub>gs</sub>	--	5.5	--	
Gate-Drain Charge		Q <sub>gd</sub>	--	5	--	
Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz	C <sub>iss</sub>	--	900	--	pF
Output Capacitance		C <sub>oss</sub>	--	130	--	
Reverse Transfer Capacitance		C <sub>rss</sub>	--	90	--	
Gate Resistance	F = 1MHz, open drain	R <sub>g</sub>	--	2.2	--	Ω
Switching (Note 6)						
Turn-On Delay Time	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 15V, R <sub>G</sub> = 6Ω, I <sub>D</sub> = 1A	t <sub>d(on)</sub>	--	8.6	--	ns
Turn-On Rise Time		t <sub>r</sub>	--	24.2	--	
Turn-Off Delay Time		t <sub>d(off)</sub>	--	32.3	--	
Turn-Off Fall Time		t <sub>f</sub>	--	7.9	--	
Source-Drain Diode (Note 4)						
Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =10A	V <sub>SD</sub>	--	--	1	V
Reverse Recovery Time	V <sub>GS</sub> = 0V, I <sub>S</sub> = 10A	t <sub>rr</sub>	--	18	--	ns
Reverse Recovery Charge	dl <sub>F</sub> /dt = 100A/μs	Q <sub>rr</sub>	--	10	--	nC

**Notes:**

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3.  $L = 0.1\text{mH}, I_{AS} = 20A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse test:  $PW \leq 300\mu s$ , 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
TSM170N06CP ROG	TO-252(DPAK)	2,500pcs / 13" Reel
TSM170N06CH C5G	TO-251(IPAK)	75pcs / Tube
TSM170N06CH X0G	TO-251S(IPAK SL)	75pcs / Tube

**Note:**

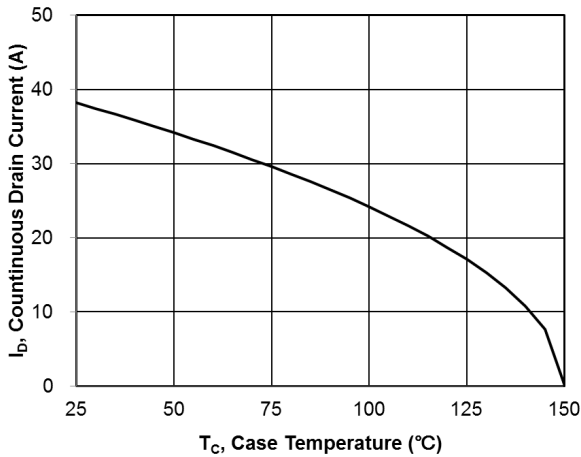
1. Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
2. Halogen-free according to IEC 61249-2-21 definition



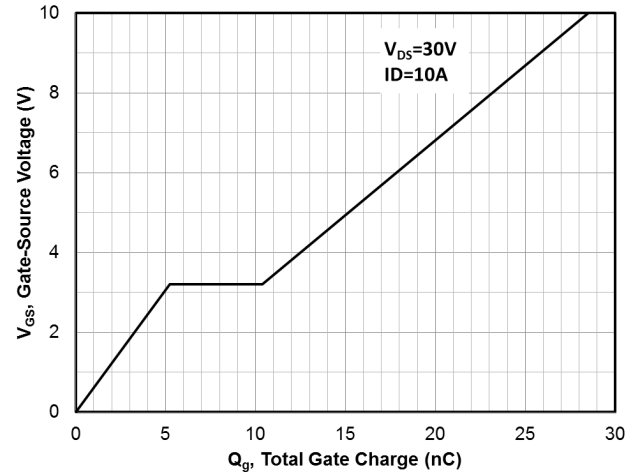
## CHARACTERISTICS CURVES

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

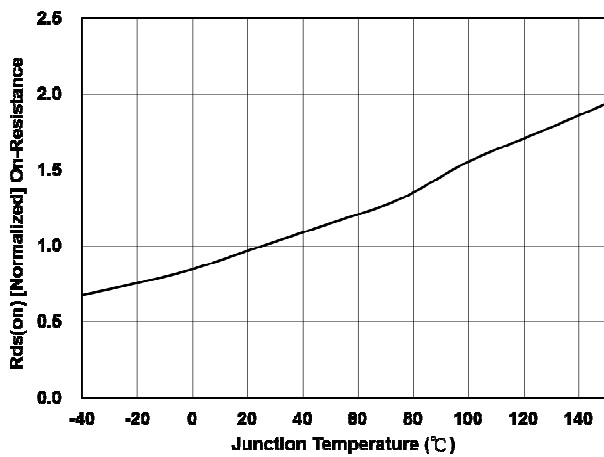
**Continuous Drain Current vs.  $T_C$**



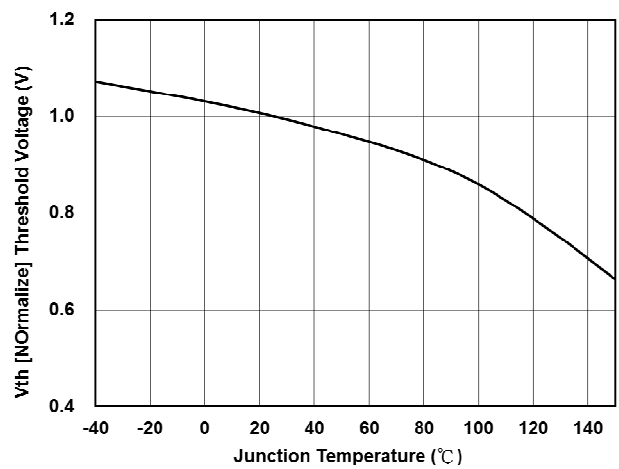
**Gate Charge**



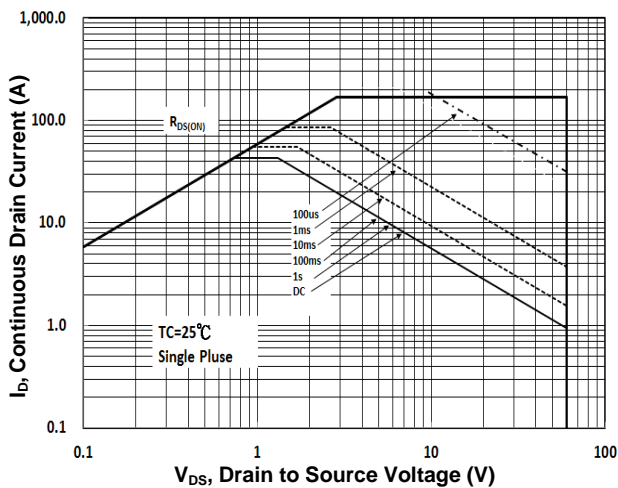
**On-Resistance vs. Junction Temperature**



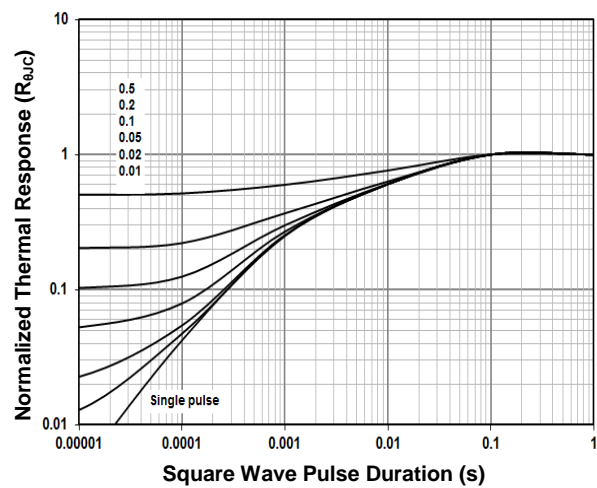
**Threshold Voltage vs. Junction Temperature**



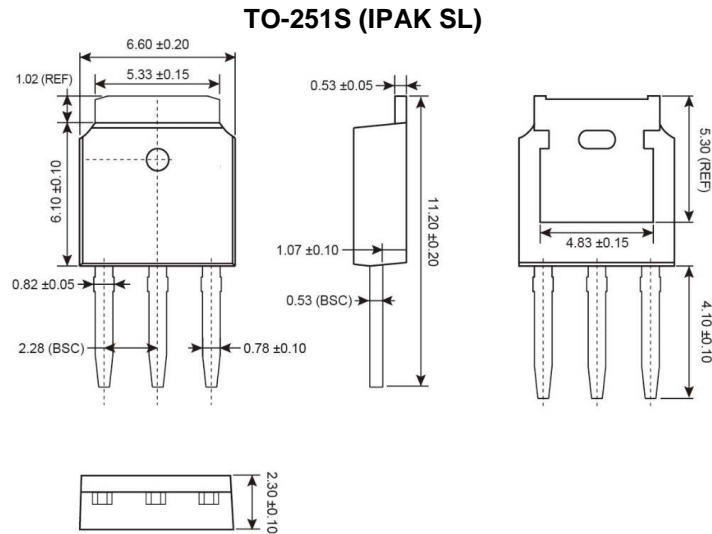
**Maximum Safe Operating Area**



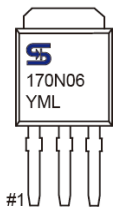
**Normalized Thermal Transient Impedance Curve**



PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

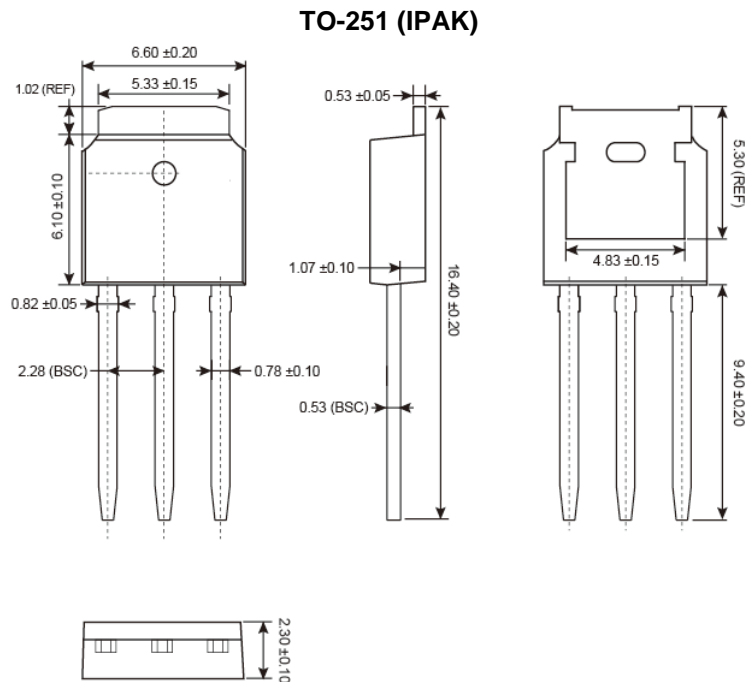


MARKING DIAGRAM

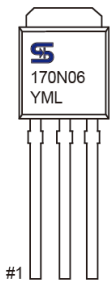


**Y** = Year Code  
**M** = Month Code for Halogen Free Product  
**O** =Jan   **P** =Feb   **Q** =Mar   **R** =Apr  
**S** =May   **T** =Jun   **U** =Jul   **V** =Aug  
**W** =Sep   **X** =Oct   **Y** =Nov   **Z** =Dec  
**L** = Lot Code (1~9, A~Z)

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)



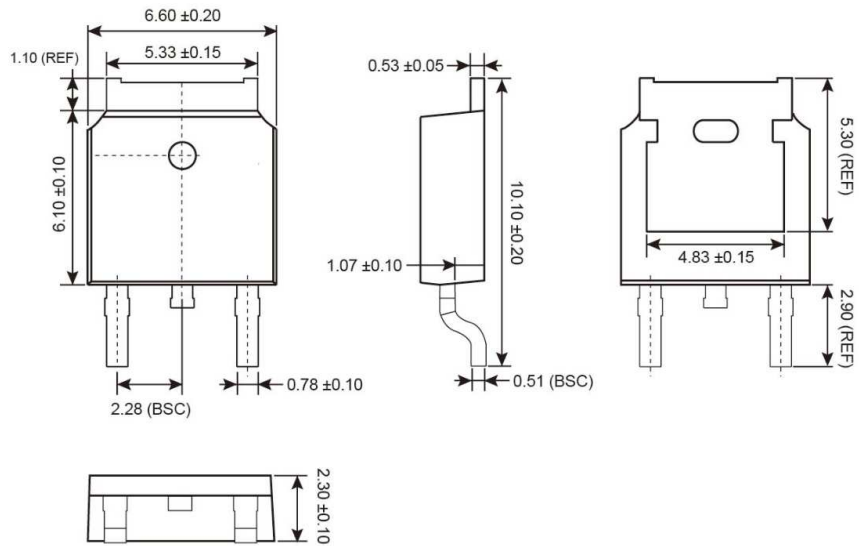
MARKING DIAGRAM



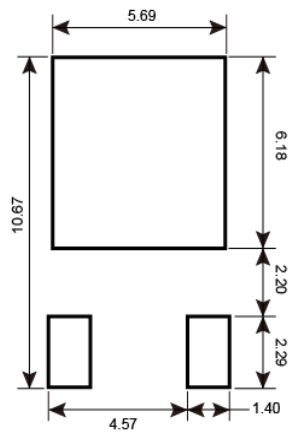
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PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

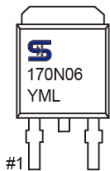
**TO-252 (DPAK)**



SUGGESTED PAD LAYOUT (Unit: Millimeters)



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