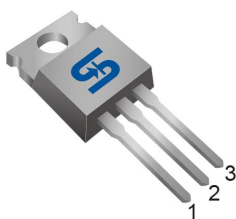
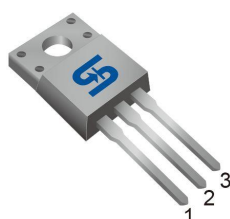




TO-220



ITO-220



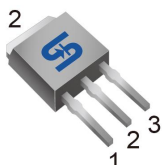
**Pin Definition:**

1. Gate
2. Drain
3. Source

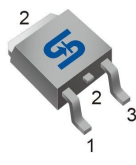
**Key Parameter Performance**

Parameter	Value	Unit
$V_{DS}$	-60	V
$R_{DS(on)}$ (max)	$V_{GS} = -10V$	48
	$V_{GS} = -4.5V$	65
$Q_g$	22.4	nC

TO-251S (IPAK)



TO-252 (DPAK)

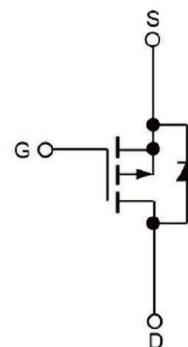


**Ordering Information**

Part No.	Package	Packing
TSM480P06CZ C0G	TO-220	50pcs / Tube
TSM480P06CI C0G	ITO-220	50pcs / Tube
TSM480P06CH X0G	TO-251S	75pcs / Tube
TSM480P06CP 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**



P-Channel MOSFET

**Absolute Maximum Ratings** ( $T_c = 25^\circ C$  unless otherwise noted)

Parameter	Symbol	Limit			Unit
		IPAK/DPAK	ITO-220	TO-220	
Drain-Source Voltage	$V_{DS}$	-60			V
Gate-Source Voltage	$V_{GS}$	$\pm 20$			V
Continuous Drain Current <sup>(Note 1)</sup>	$I_D$	$T_c = 25^\circ C$			A
		$T_c = 100^\circ C$			A
Pulsed Drain Current <sup>(Note 2)</sup>	$I_{DM}$	-64			A
Single Pulse Avalanche Energy <sup>(Note 3)</sup>	$E_{AS}$	51			mJ
Single Pulse Avalanche Current <sup>(Note 2)</sup>	$I_{AS}$	-32			A
Power Dissipation @ $T_c = 25^\circ C$	$P_D$	40	27	66	W
Operating Junction Temperature	$T_J$	-50 to +150			$^\circ C$
Storage Temperature Range	$T_{STG}$	-50 to +150			$^\circ C$

### Thermal Performance

Parameter	Symbol	Limit			Unit
		IPAK/DPAK	ITO-220	TO-220	
Thermal Resistance - Junction to Case	$R_{JC}$	3.1	4.7	1.9	°C/W
Thermal Resistance - Junction to Ambient	$R_{JA}$	62			°C/W

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

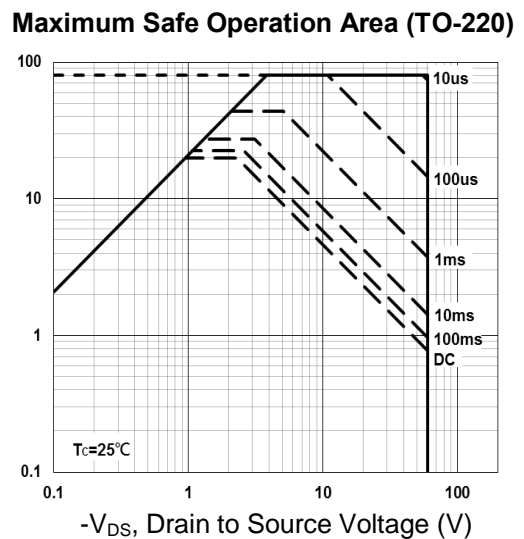
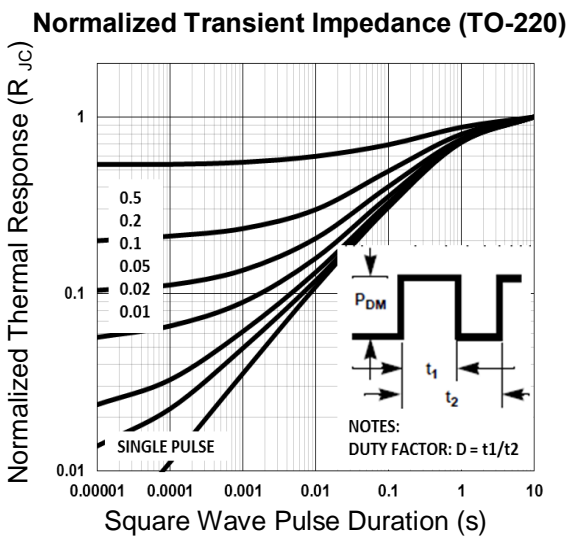
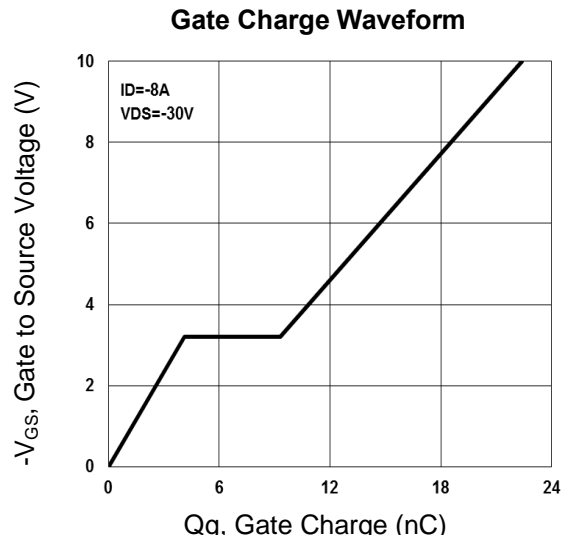
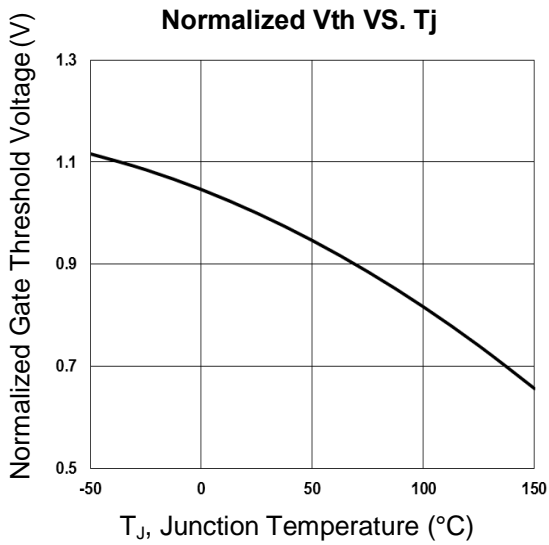
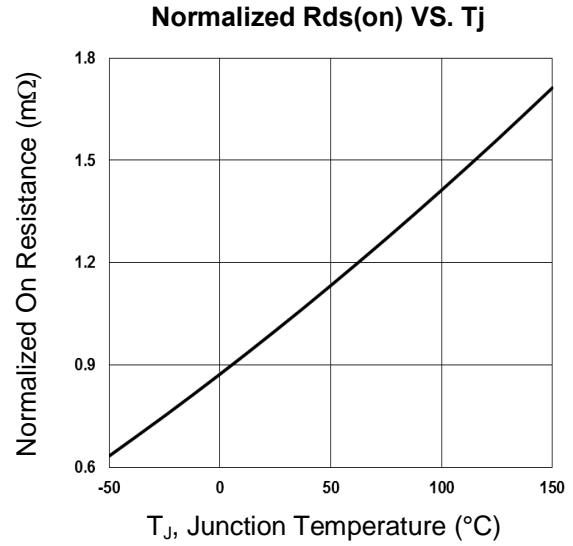
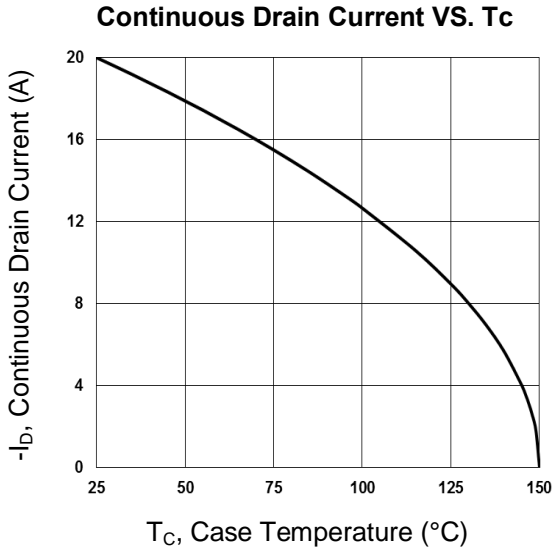
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$	$BV_{DSS}$	-60	--	--	V
Drain-Source On-State Resistance	$V_{GS} = -10\text{V}, I_D = -8\text{A}$	$R_{DS(ON)}$	--	39	48	m
	$V_{GS} = -4.5\text{V}, I_D = -4\text{A}$		--	53	65	
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$	$V_{GS(TH)}$	-1.2	-1.6	-2.2	V
Zero Gate Voltage Drain Current	$V_{DS} = -60\text{V}, V_{GS} = 0\text{V}$	$I_{DSS}$	--	--	-1	$\mu\text{A}$
	$V_{DS} = -48\text{V}, T_C = 125^\circ\text{C}$		--	--	-10	
Gate Body Leakage	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	$I_{GSS}$	--	--	$\pm 100$	nA
Forward Transconductance <sup>(Note 4)</sup>	$V_{DS} = -10\text{V}, I_D = -8\text{A}$	$g_{fs}$	--	10	--	S
<b>Dynamic</b>						
Total Gate Charge <sup>(Note 4,5)</sup>	$V_{DS} = -30\text{V}, I_D = -8\text{A},$ $V_{GS} = -10\text{V}$	$Q_g$	--	22.4	--	nC
Gate-Source Charge <sup>(Note 4,5)</sup>		$Q_{gs}$	--	4.1	--	
Gate-Drain Charge <sup>(Note 4,5)</sup>		$Q_{gd}$	--	5.2	--	
Input Capacitance	$V_{DS} = -30\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$	$C_{iss}$	--	1250	--	pF
Output Capacitance		$C_{oss}$	--	85	--	
Reverse Transfer Capacitance		$C_{rss}$	--	65	--	
<b>Switching</b>						
Turn-On Delay Time <sup>(Note 4,5)</sup>	$V_{DD} = -30\text{V}, I_D = -1\text{A},$ $R_{GEN} = 6$	$t_{d(on)}$	--	13	--	ns
Turn-On Rise Time <sup>(Note 4,5)</sup>		$t_r$	--	42.4	--	
Turn-Off Delay Time <sup>(Note 4,5)</sup>		$t_{d(off)}$	--	64.6	--	
Turn-Off Fall Time <sup>(Note 4,5)</sup>		$t_f$	--	16.4	--	
<b>Source-Drain Diode Ratings and Characteristic</b>						
Maximum Continuous Drain-Source Diode Forward Current	Integral reverse diode in the MOSFET	$I_S$	--	--	-16	A
Maximum Pulse Drain-Source Diode Forward Current		$I_{SM}$	--	--	-64	A
Diode-Source Forward Voltage	$V_{GS} = 0\text{V}, I_S = -1\text{A}$	$V_{SD}$	--	--	-1	V

#### Note:

- Limited by maximum junction temperature
- Pulse width limited by safe operating area
- $L = 3.68\text{mH}, I_{AS} = 8\text{A}, V_{DD} = 50\text{V}, R_G = 25 \Omega$ , Starting  $T_J = 25^\circ\text{C}$
- Pulse test: pulse width  $m300\mu\text{s}$ , duty cycle  $m2\%$
- Switching time is essentially independent of operating temperature



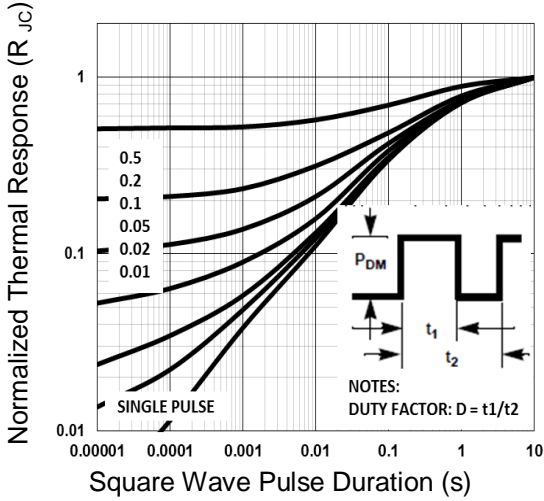
### Electrical Characteristics Curve



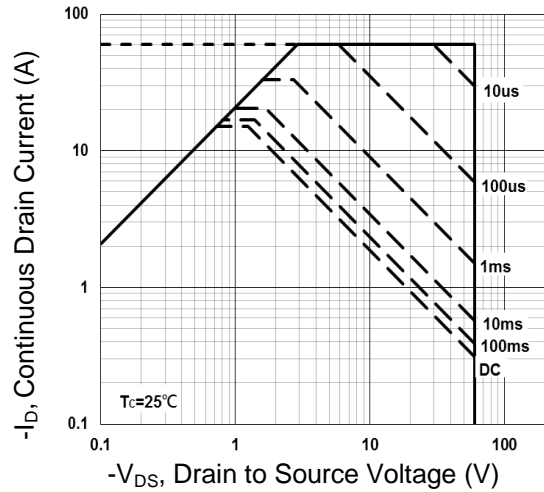


### Electrical Characteristics Curve

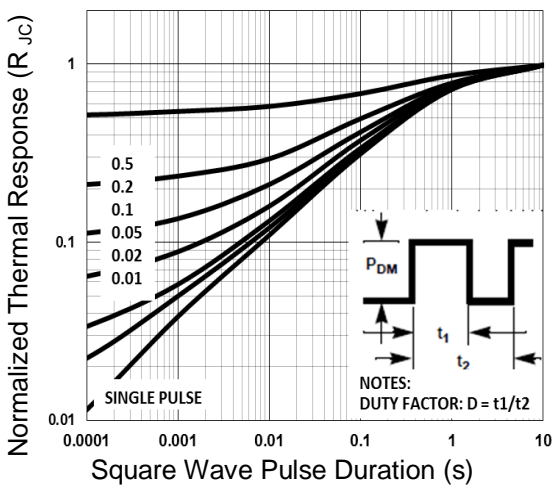
**Normalized Transient Impedance (ITO-220)**



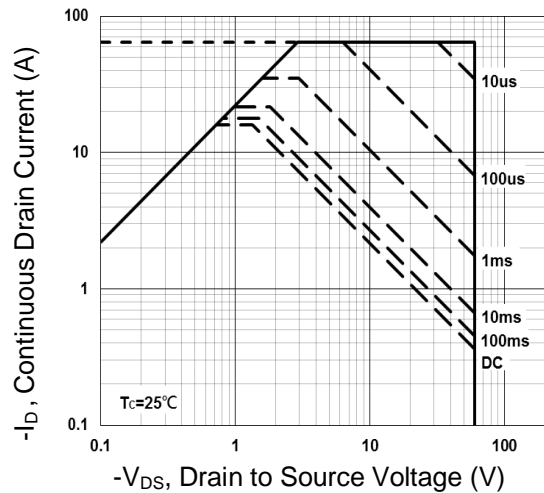
**Maximum Safe Operation Area (ITO-220)**



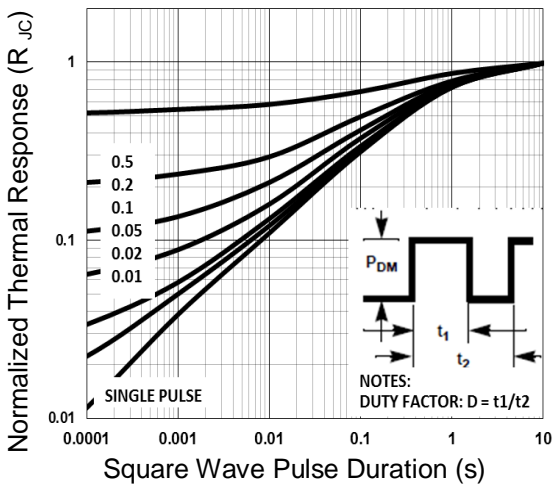
**Normalized Transient Impedance (TO-251S)**



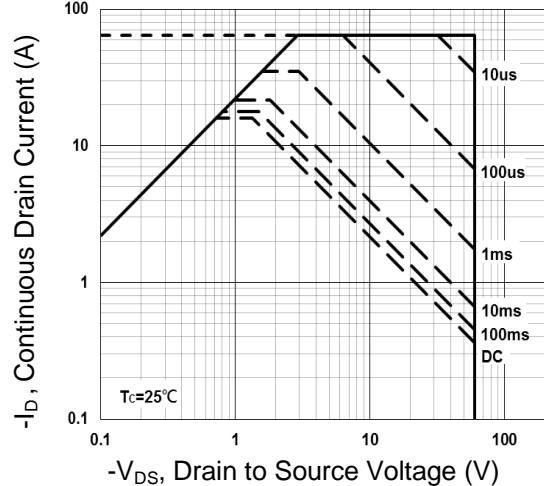
**Maximum Safe Operation Area (TO-251S)**



**Normalized Transient Impedance (TO-252)**

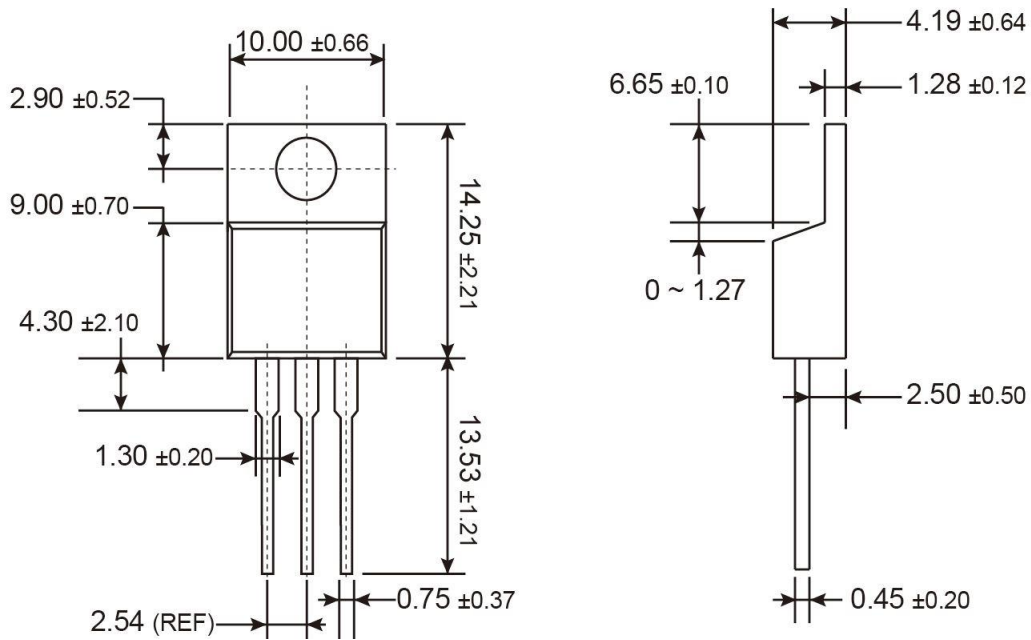


**Maximum Safe Operation Area (TO-252)**



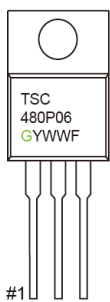


### TO-220 Mechanical Drawing



Unit: Millimeters

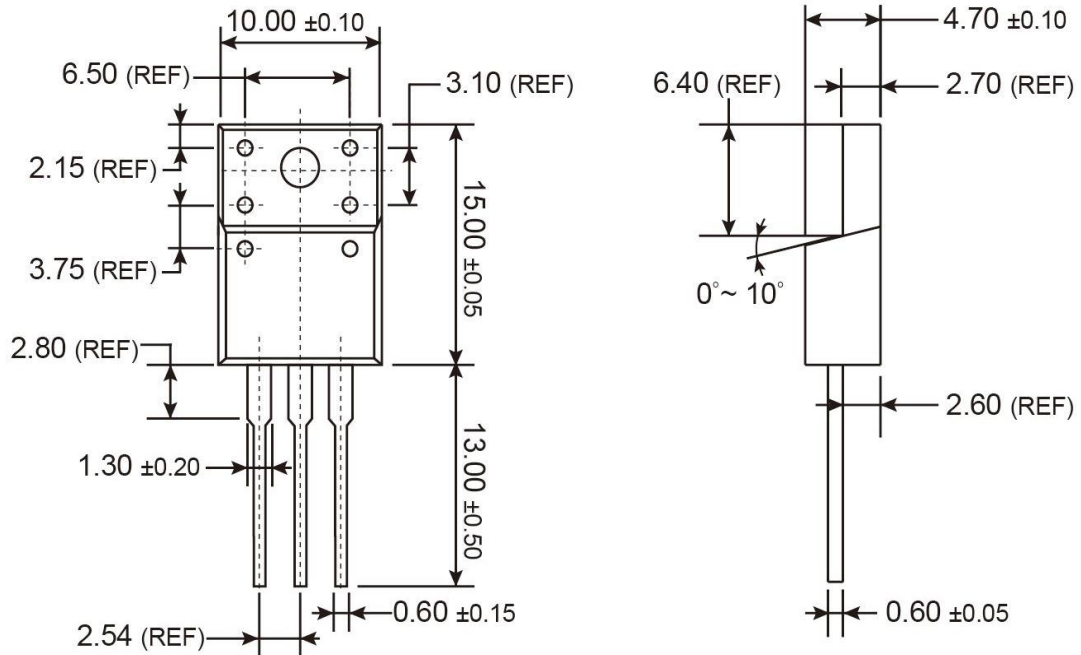
### Marking Diagram



- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code



### ITO-220 Mechanical Drawing



Unit: Millimeters

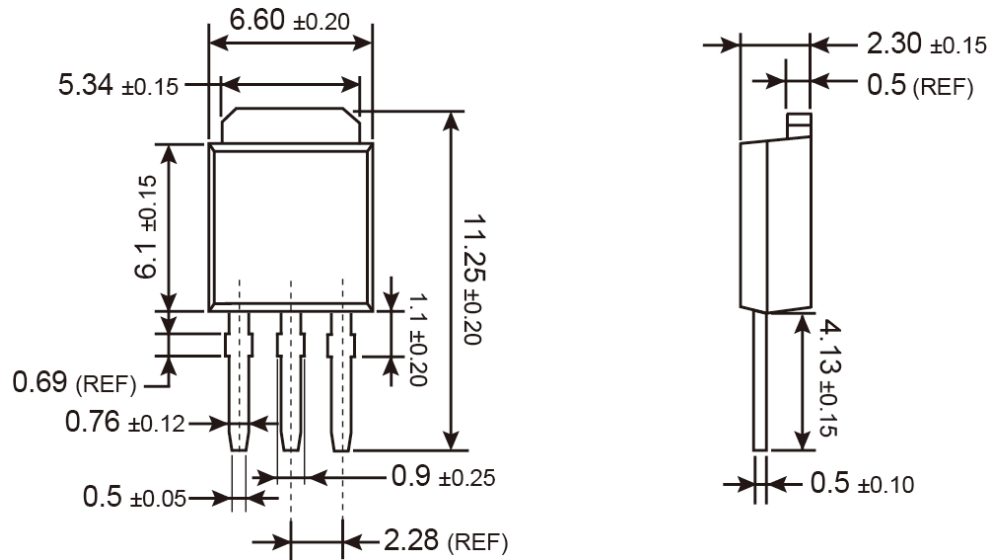
### Marking Diagram



- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

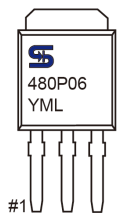


### TO-251S Mechanical Drawing



Unit: Millimeters

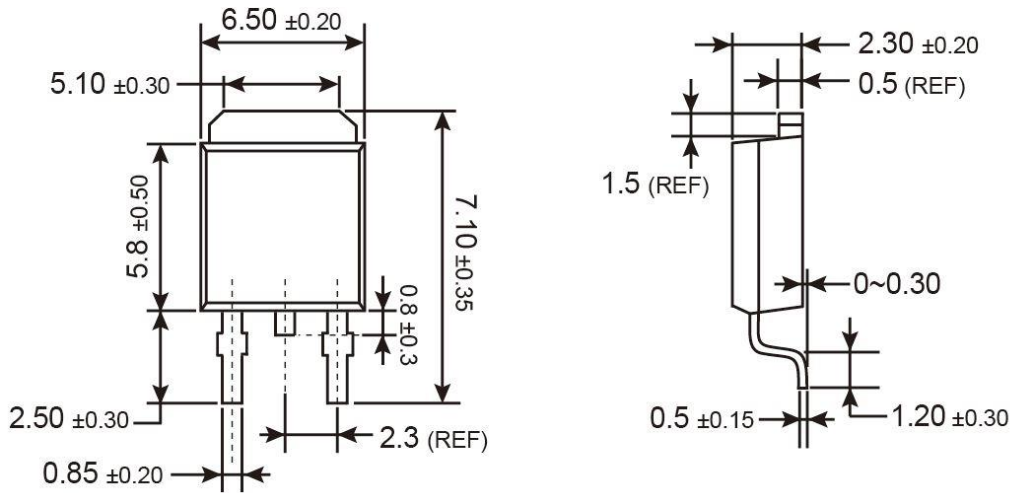
### Marking Diagram



- 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

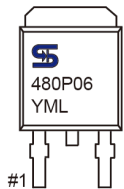


### TO-252 Mechanical Drawing



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



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