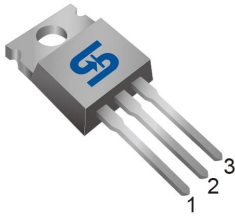
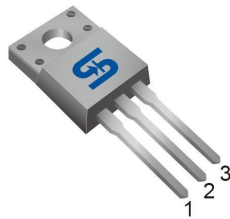




**TO-220**



**ITO-220**



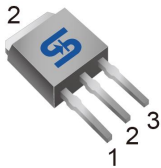
**Pin Definition:**

1. Gate
2. Drain
3. Source

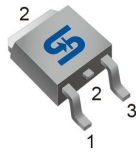
**Key Parameter Performance**

| 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)**

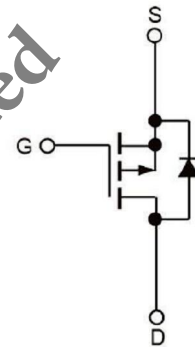


**Ordering Information**

| 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 / 130Reel |

**Note:** C0G 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** ( $T_c = 25^\circ\text{C}$  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 (Note 1)            | $I_D$     | $T_c = 25^\circ\text{C}$  |         |        | A                |
|                                              |           | $T_c = 100^\circ\text{C}$ |         |        | A                |
| Pulsed Drain Current (Note 2)                | $I_{DM}$  | -64                       |         |        | A                |
| Single Pulse Avalanche Energy (Note 3)       | $E_{AS}$  | 51                        |         |        | mJ               |
| Single Pulse Avalanche Current (Note 2)      | $I_{AS}$  | -32                       |         |        | A                |
| Power Dissipation @ $T_c = 25^\circ\text{C}$ | $P_D$     | 40                        | 27      | 66     | W                |
| Operating Junction Temperature               | $T_J$     | -50 to +150               |         |        | $^\circ\text{C}$ |
| Storage Temperature Range                    | $T_{STG}$ | -50 to +150               |         |        | $^\circ\text{C}$ |

### Thermal Performance

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

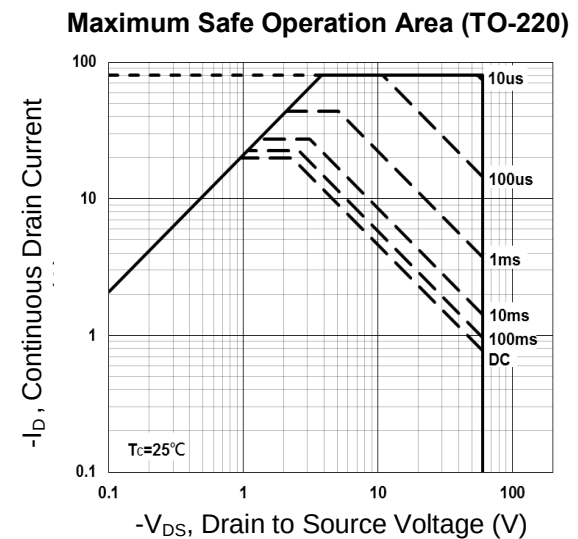
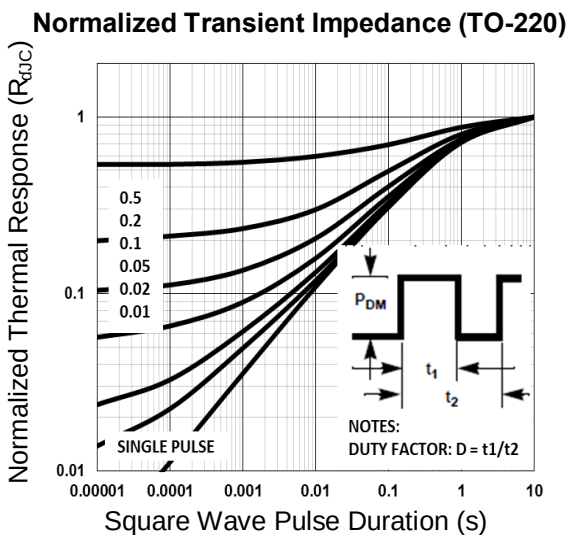
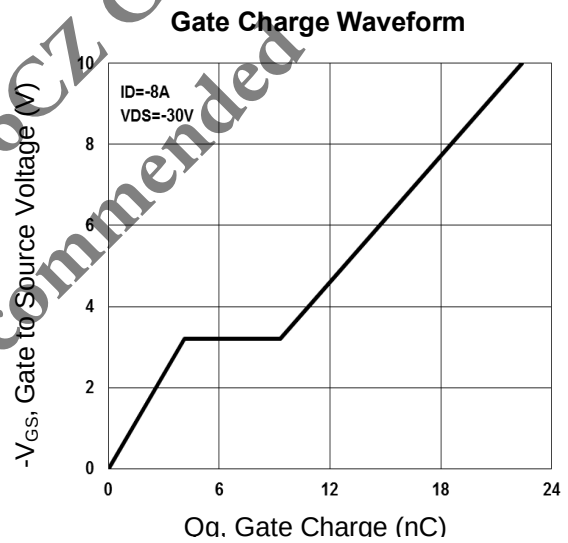
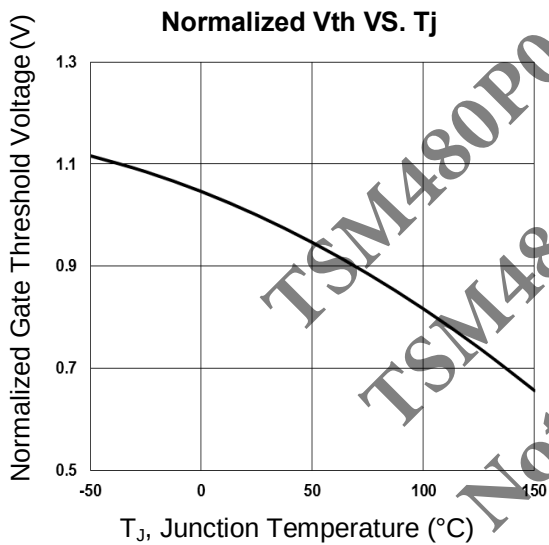
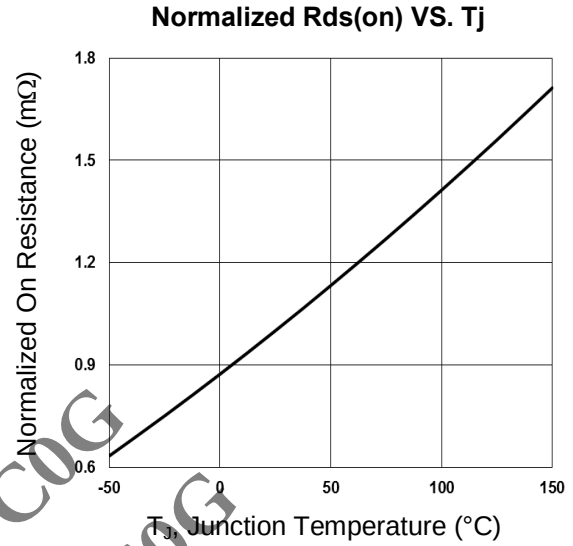
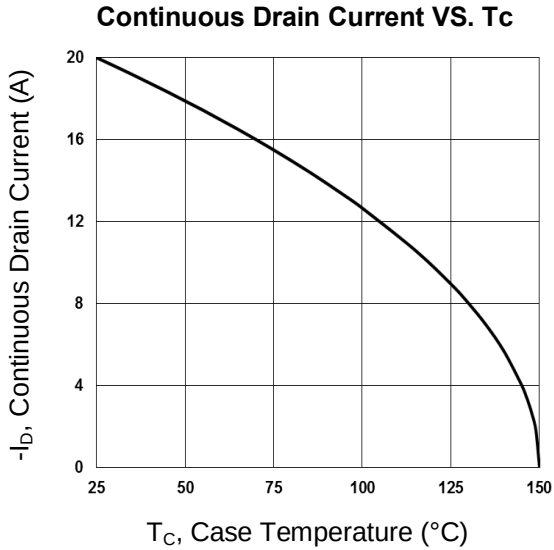
### Electrical Specifications ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

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

#### Note:

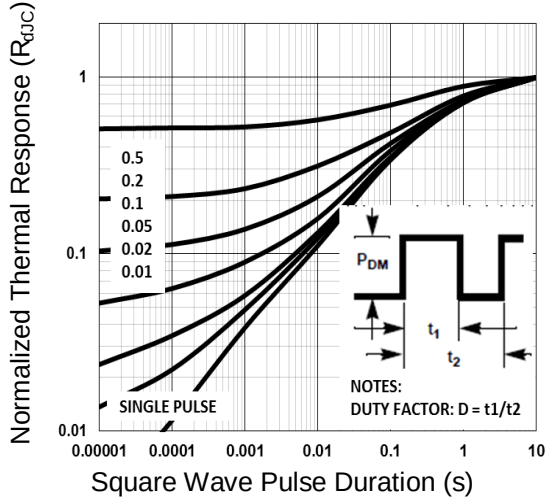
- Limited by maximum junction temperature
- Pulse width limited by safe operating area
- $L = 3.68\text{mH}, I_{AS} = 8A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
- Pulse test: pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$
- Switching time is essentially independent of operating temperature

### Electrical Characteristics Curve

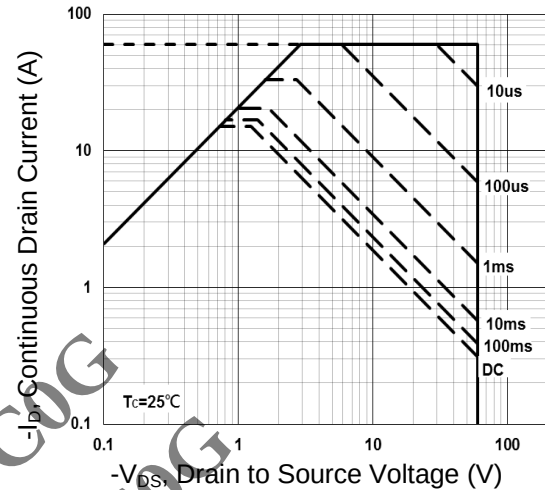


## Electrical Characteristics Curve

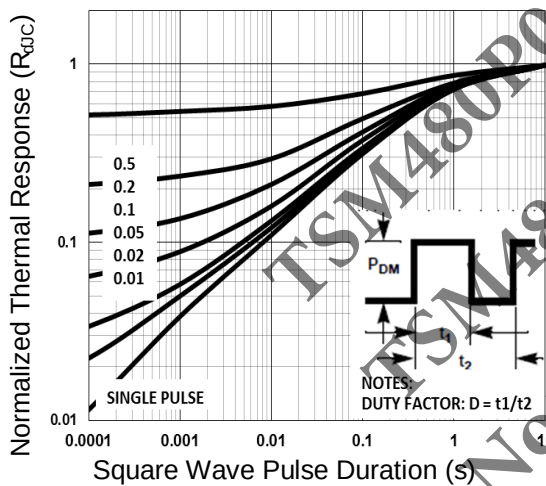
**Normalized Transient Impedance (ITO-220)**



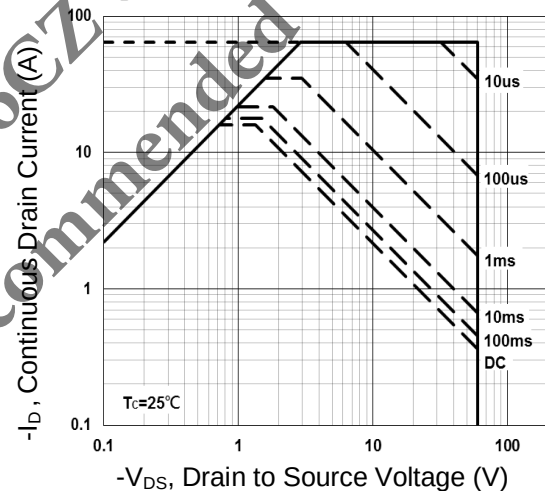
**Maximum Safe Operation Area (ITO-220)**



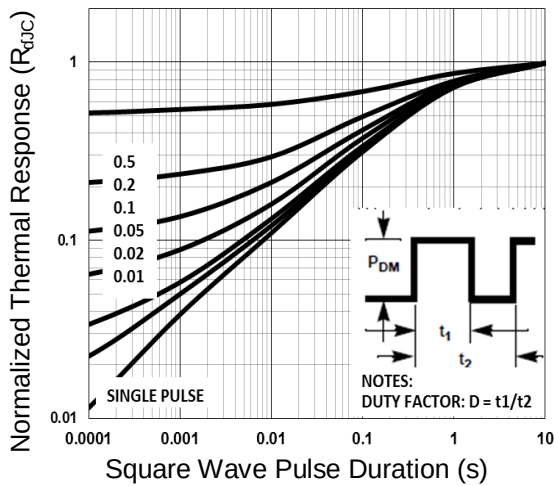
**Normalized Transient Impedance (TO-251S)**



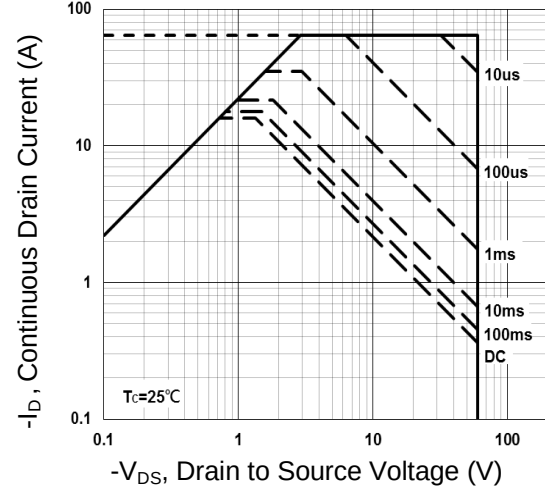
**Maximum Safe Operation Area (TO-251S)**



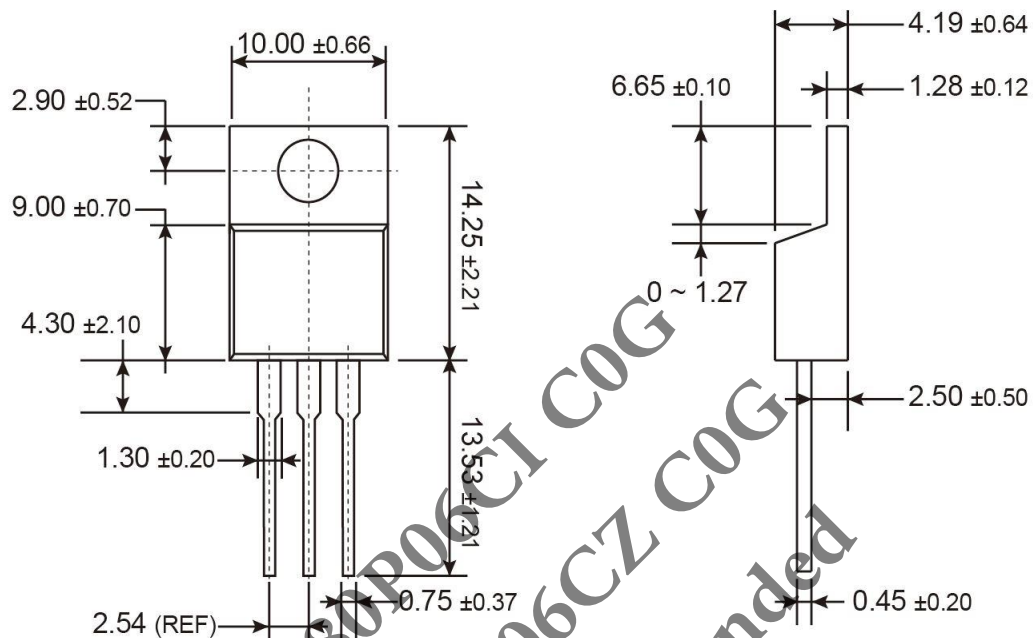
**Normalized Transient Impedance (TO-252)**



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

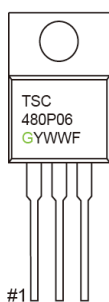


## TO-220 Mechanical Drawing



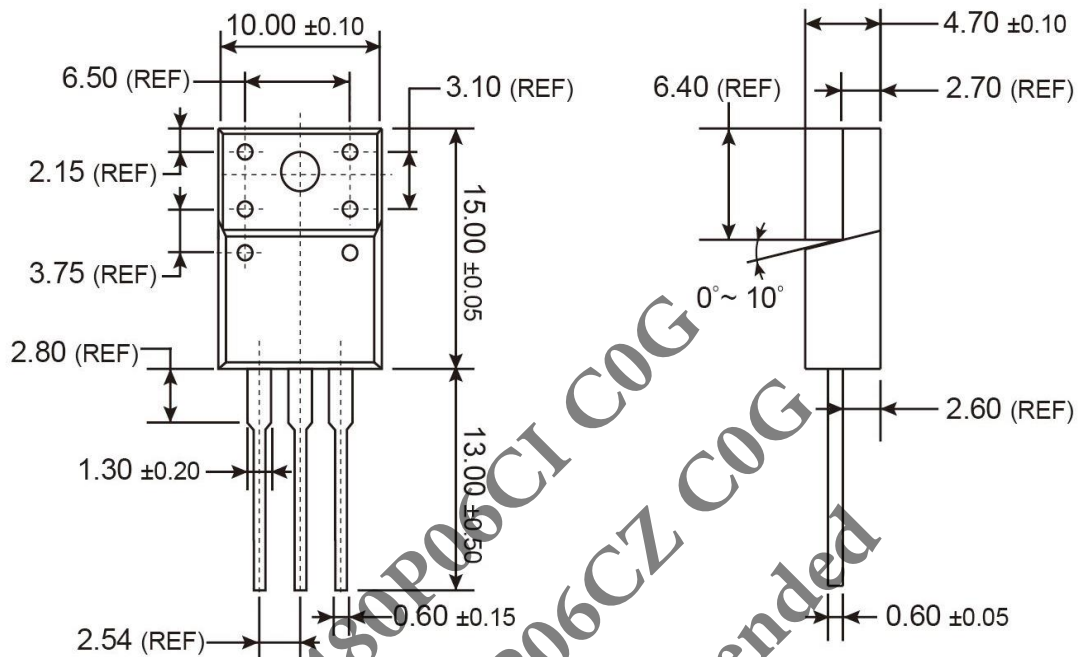
Unit: Millimeters

## Marking Diagram



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

## ITO-220 Mechanical Drawing



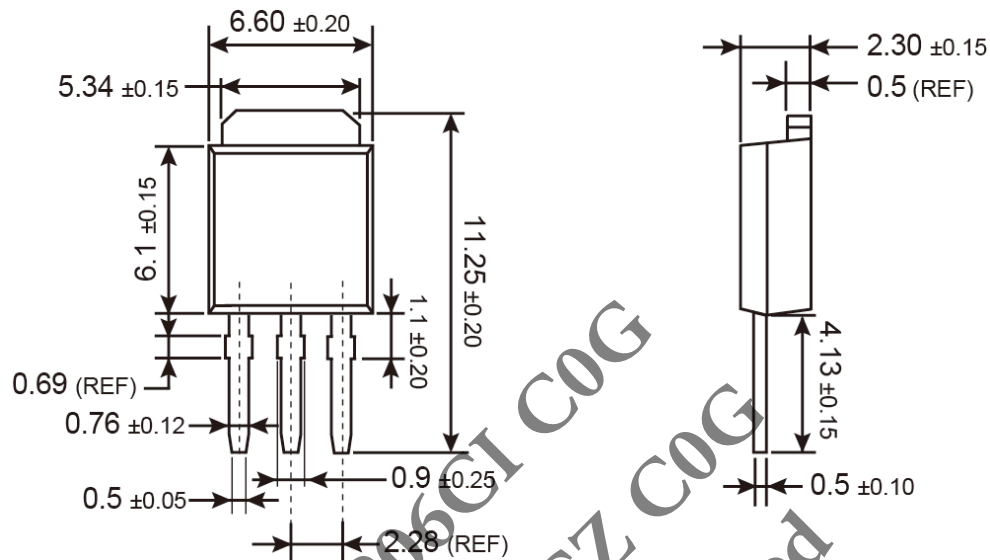
Unit: Millimeters

## Marking Diagram



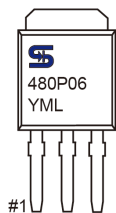
**G** = Halogen Free  
**Y** = Year Code  
**WW** = Week Code (01~52)  
**F** = Factory Code

## TO-251S Mechanical Drawing



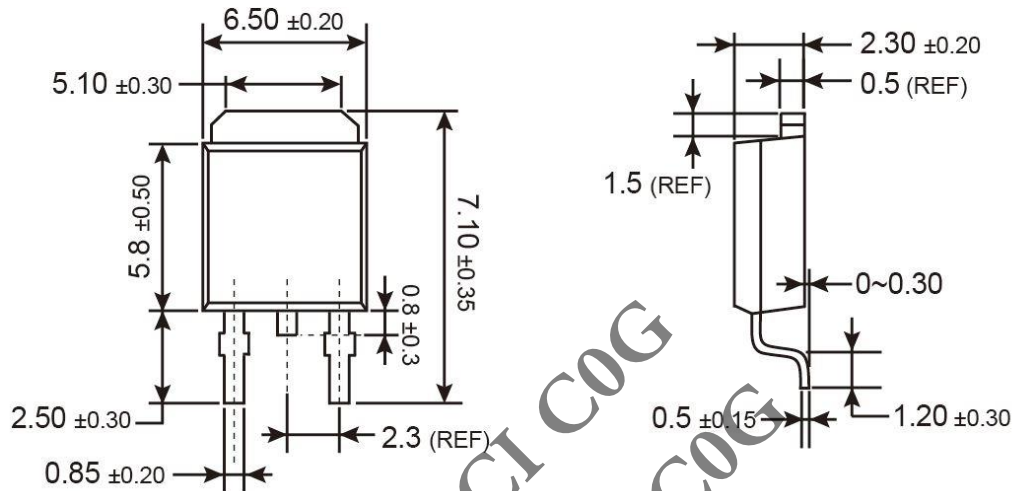
Unit: Millimeters

## Marking Diagram



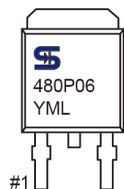
- Y** = Year Code  
**M** = Month Code for Halogen Free Product  
 (O=Jan, P=Feb, Q=Mar, R=Apr, S=May, T=Jun, U=Jul, V=Aug, W=Sep, X=Oct, Y=Nov, Z=Dec)  
**L** = Lot Code

### TO-252 Mechanical Drawing



Unit: Millimeters

### Marking Diagram



**Y** = Year Code

**M** = Month Code for Halogen Free Product

(**Q**=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



TSM480P06CI C0G  
TSM480P06CZ C0G  
Not Recommended

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