

## N-Channel Power MOSFET

700V, 4.5A, 0.9Ω

### FEATURES

- Super-Junction technology
- High performance due to small figure-of-merit
- High ruggedness performance
- High commutation performance

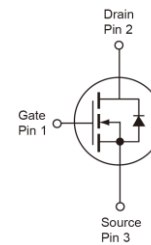
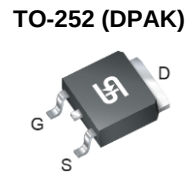
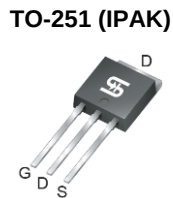
### APPLICATION

- Power Supply
- Lighting

### KEY PERFORMANCE PARAMETERS

| PARAMETER          | VALUE | UNIT |
|--------------------|-------|------|
| $V_{DS}$           | 700   | V    |
| $R_{DS(on)}$ (max) | 0.9   | Ω    |
| $Q_g$              | 9.7   | nC   |


**ROHS**  
COMPLIANT

**HALOGEN**  
**FREE**


**Notes:** MSL 3 (Moisture Sensitivity Level) for TO-252 (DPAK) per J-STD-020.

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

| PARAMETER                                           | SYMBOL         | IPAK/DPAK    | ITO-220 | UNIT |
|-----------------------------------------------------|----------------|--------------|---------|------|
| Drain-Source Voltage                                | $V_{DS}$       | 700          |         | V    |
| Gate-Source Voltage                                 | $V_{GS}$       | ±30          |         | V    |
| Continuous Drain Current <sup>(Note 1)</sup>        | $I_D$          | 4.5          |         | A    |
|                                                     |                | 2.7          |         |      |
| Pulsed Drain Current <sup>(Note 2)</sup>            | $I_{DM}$       | 13.5         |         | A    |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$  | $P_{DTOT}$     | 50           | 20      | W    |
| Single Pulsed Avalanche Energy <sup>(Note 3)</sup>  | $E_{AS}$       | 64           |         | mJ   |
| Single Pulsed Avalanche Current <sup>(Note 3)</sup> | $I_{AS}$       | 1.6          |         | A    |
| Operating Junction and Storage Temperature Range    | $T_J, T_{STG}$ | - 55 to +150 |         | °C   |

### THERMAL PERFORMANCE

| PARAMETER                              | SYMBOL          | IPAK/DPAK | ITO-220 | UNIT |
|----------------------------------------|-----------------|-----------|---------|------|
| Junction to Case Thermal Resistance    | $R_{\theta JC}$ | 2.5       | 6.25    | °C/W |
| Junction to Ambient Thermal Resistance | $R_{\theta JA}$ | 62        |         | °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** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

| PARAMETER                              | CONDITIONS                                                                                          | SYMBOL              | MIN | TYP  | MAX  | UNIT |
|----------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------|-----|------|------|------|
| Static <sup>(Note 4)</sup>             |                                                                                                     |                     |     |      |      |      |
| Drain-Source Breakdown Voltage         | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                                        | BV <sub>DSS</sub>   | 700 | --   | --   | V    |
| Gate Threshold Voltage                 | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                          | V <sub>GS(TH)</sub> | 2.0 | 3.1  | 4.0  | V    |
| Gate Body Leakage                      | V <sub>GS</sub> = ±30V, V <sub>DS</sub> = 0V                                                        | I <sub>GSS</sub>    | --  | --   | ±100 | nA   |
| Zero Gate Voltage Drain Current        | V <sub>DS</sub> = 700V, V <sub>GS</sub> = 0V                                                        | I <sub>DSS</sub>    | --  | --   | 1    | μA   |
| Drain-Source On-State Resistance       | V <sub>GS</sub> = 10V, I <sub>D</sub> = 1.5A                                                        | R <sub>DS(on)</sub> | --  | 0.83 | 0.9  | Ω    |
| Dynamic <sup>(Note 5)</sup>            |                                                                                                     |                     |     |      |      |      |
| Total Gate Charge                      | V <sub>DS</sub> = 380V, I <sub>D</sub> = 2.3A,<br>V <sub>GS</sub> = 10V                             | Q <sub>g</sub>      | --  | 9.7  | --   | nC   |
| Gate-Source Charge                     |                                                                                                     | Q <sub>gs</sub>     | --  | 2.9  | --   |      |
| Gate-Drain Charge                      |                                                                                                     | Q <sub>gd</sub>     | --  | 3.5  | --   |      |
| Input Capacitance                      | V <sub>DS</sub> = 100V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                         | C <sub>iss</sub>    | --  | 482  | --   | pF   |
| Output Capacitance                     |                                                                                                     | C <sub>oss</sub>    | --  | 34   | --   |      |
| Gate Resistance                        | F = 1MHz, open drain                                                                                | R <sub>g</sub>      | --  | 3.6  | --   | Ω    |
| Switching <sup>(Note 6)</sup>          |                                                                                                     |                     |     |      |      |      |
| Turn-On Delay Time                     | V <sub>DD</sub> = 380V,<br>R <sub>GEN</sub> = 40Ω,<br>I <sub>D</sub> = 2.3A, V <sub>GS</sub> = 10V, | t <sub>d(on)</sub>  | --  | 20   | --   | ns   |
| Turn-On Rise Time                      |                                                                                                     | t <sub>r</sub>      | --  | 54   | --   |      |
| Turn-Off Delay Time                    |                                                                                                     | t <sub>d(off)</sub> | --  | 34   | --   |      |
| Turn-Off Fall Time                     |                                                                                                     | t <sub>f</sub>      | --  | 48   | --   |      |
| Source-Drain Diode <sup>(Note 4)</sup> |                                                                                                     |                     |     |      |      |      |
| Forward On Voltage                     | I <sub>S</sub> = 4.5A, V <sub>GS</sub> = 0V                                                         | V <sub>SD</sub>     | --  | --   | 1.4  | V    |
| Reverse Recovery Time                  | V <sub>R</sub> =200V, I <sub>S</sub> = 2.3A<br>dI <sub>F</sub> /dt = 100A/μs                        | t <sub>rr</sub>     | --  | 176  | --   | ns   |
| Reverse Recovery Charge                |                                                                                                     | Q <sub>rr</sub>     | --  | 1.1  | --   | μC   |

**Notes:**

- Current limited by package
- Pulse width limited by the maximum junction temperature
- $L = 50mH, I_{AS} = 1.6A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ C$
- Pulse test:  $PW \leq 300\mu s$ , duty cycle  $\leq 2\%$
- For DESIGN AID ONLY, not subject to production testing.
- Switching time is essentially independent of operating temperature.

**ORDERING INFORMATION**

| <b>PART NO.</b> | <b>PACKAGE</b> | <b>PACKING</b>      |
|-----------------|----------------|---------------------|
| TSM70N900CI C0G | ITO-220        | 50pcs / Tube        |
| TSM70N900CH C5G | TO-251 (IPAK)  | 75pcs / Tube        |
| TSM70N900CP ROG | TO-252 (DPAK)  | 2,500pcs / 13" Reel |

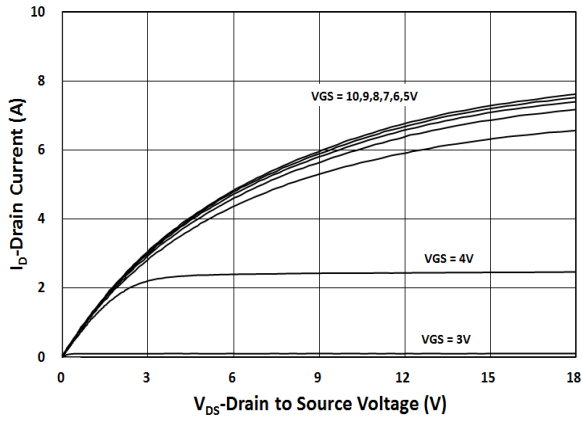
**Note:**

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

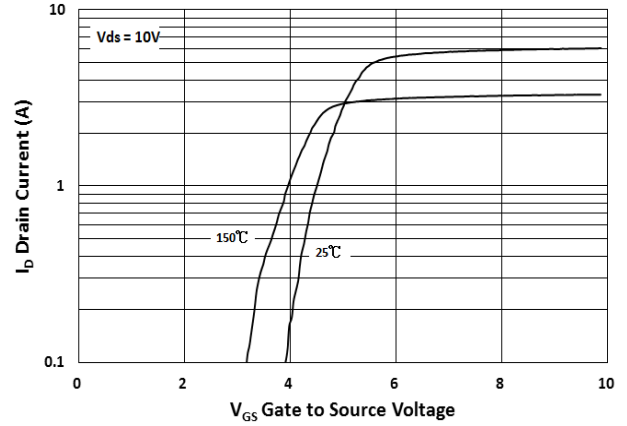
## CHARACTERISTICS CURVES

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

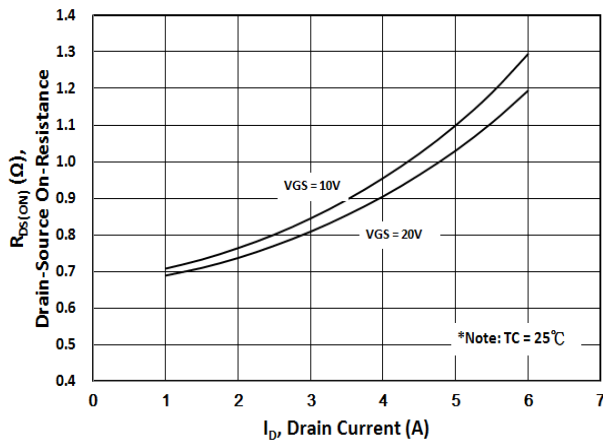
**Output Characteristics**



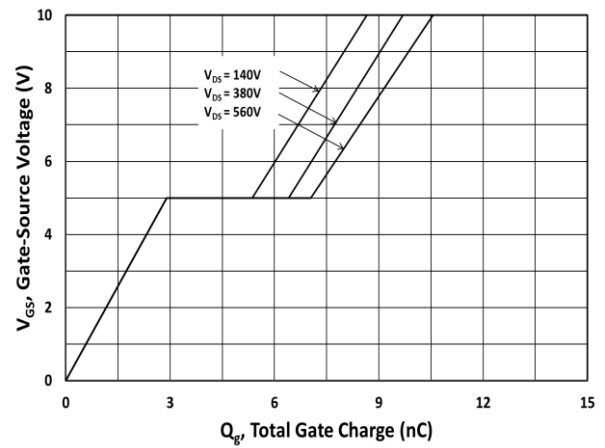
**Transfer Characteristics**



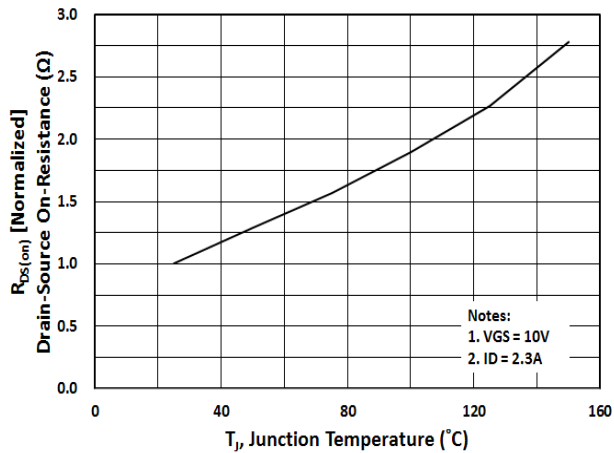
**On-Resistance vs. Drain Current**



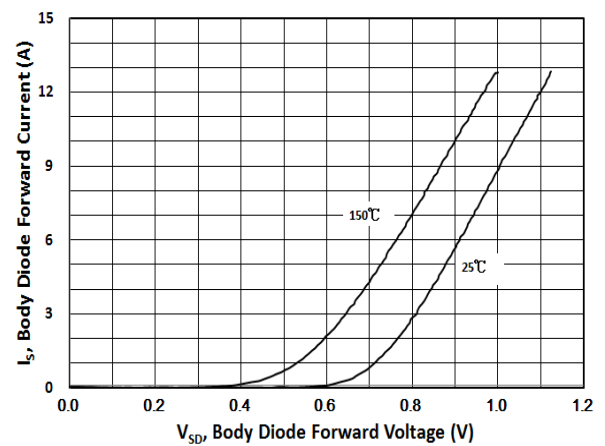
**Gate-Source Voltage vs. Gate Charge**



**On-Resistance vs. Junction Temperature**



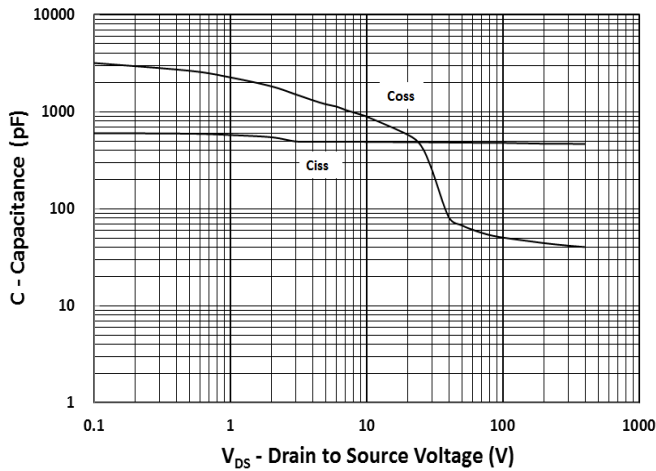
**Source-Drain Diode Forward Current vs. Voltage**



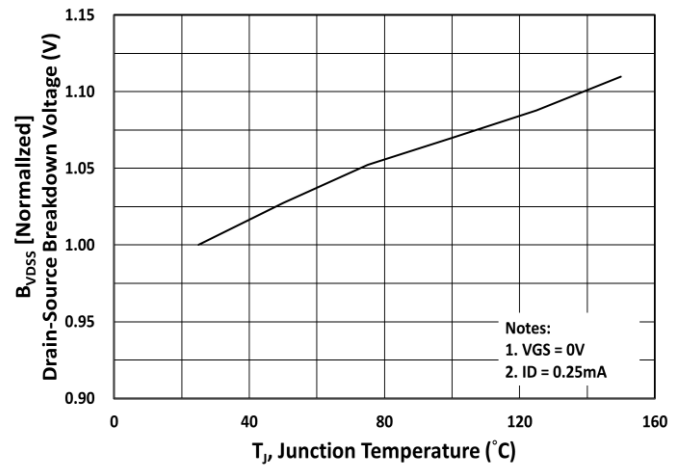
## CHARACTERISTICS CURVES

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

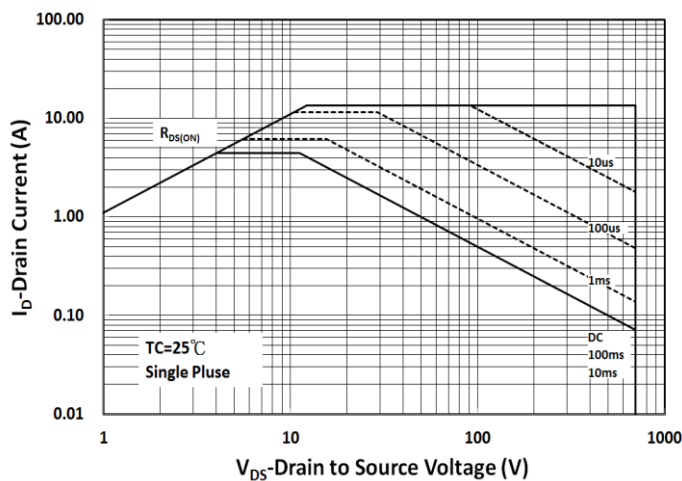
**Capacitance vs. Drain-Source Voltage**



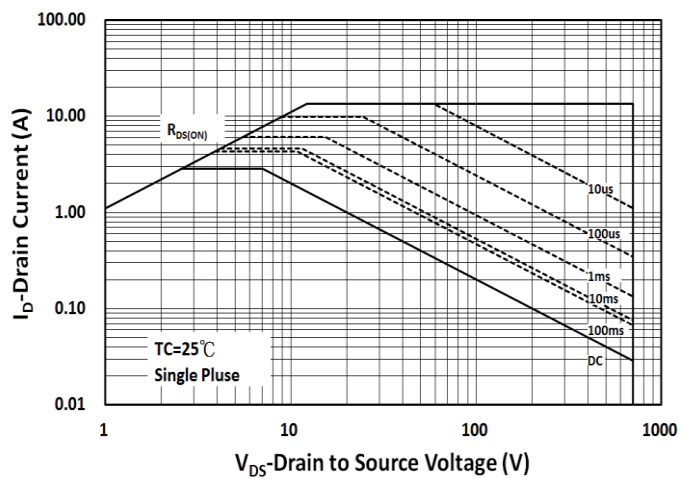
**$BV_{DSS}$  vs. Junction Temperature**



**Maximum Safe Operating Area (DPAK/IPAK)**



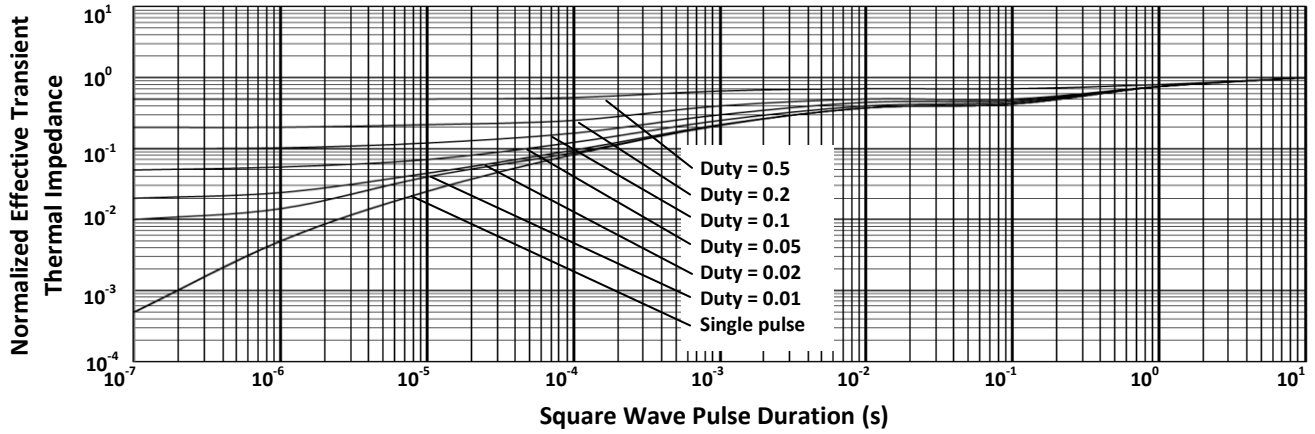
**Maximum Safe Operating Area (ITO-220)**



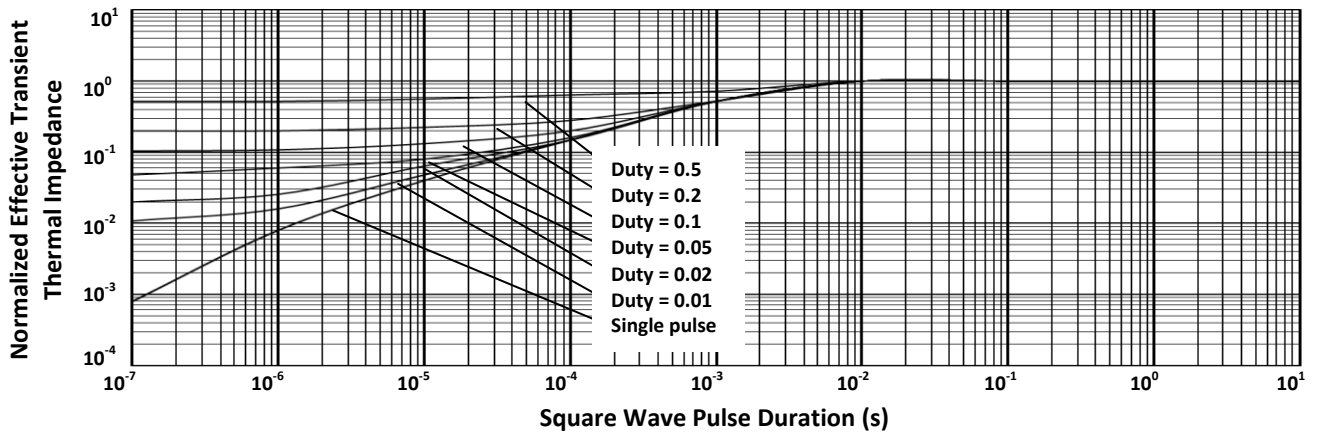
## ELECTRICAL CHARACTERISTICS CURVES

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

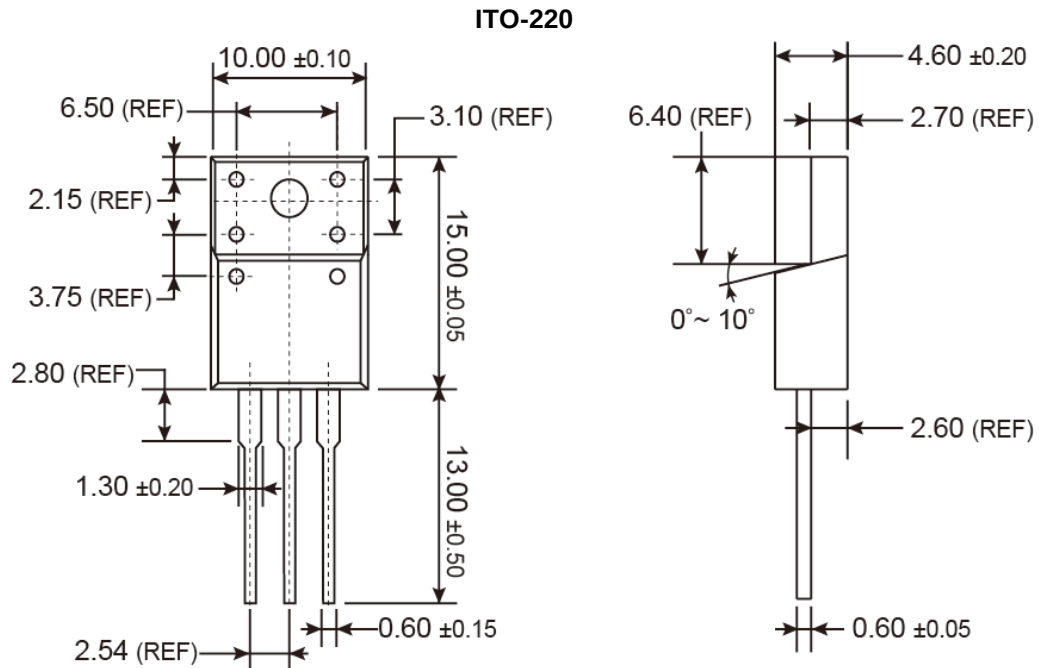
Normalized Thermal Transient Impedance, Junction-to-Case (ITO-220)



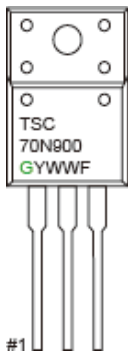
Normalized Thermal Transient Impedance, Junction-to-Case (DPAK/IPAK)



**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)



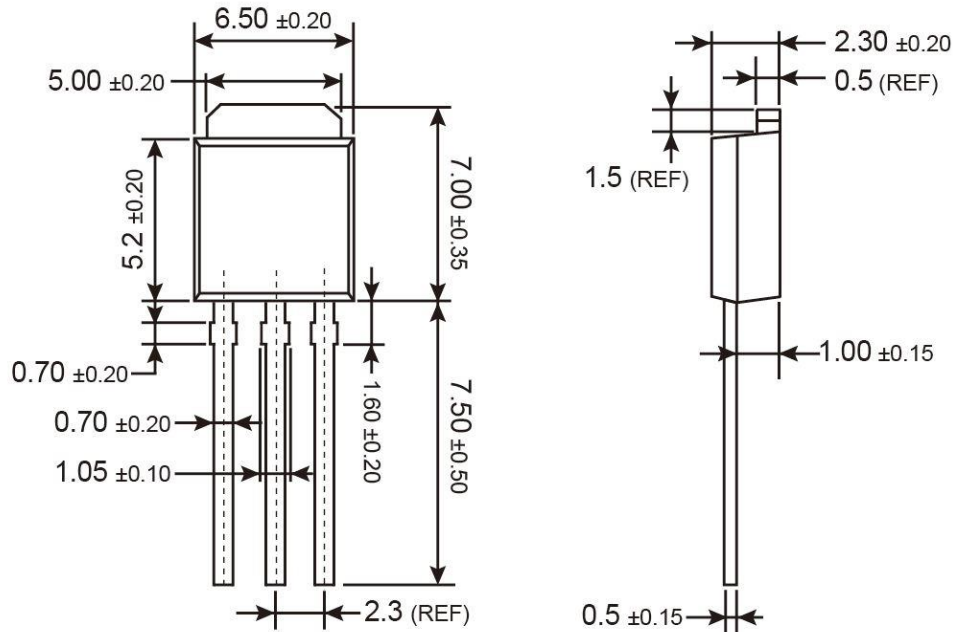
**MARKING DIAGRAM**



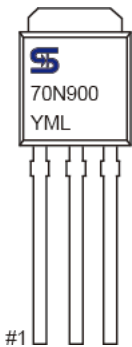
- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**TO-251**



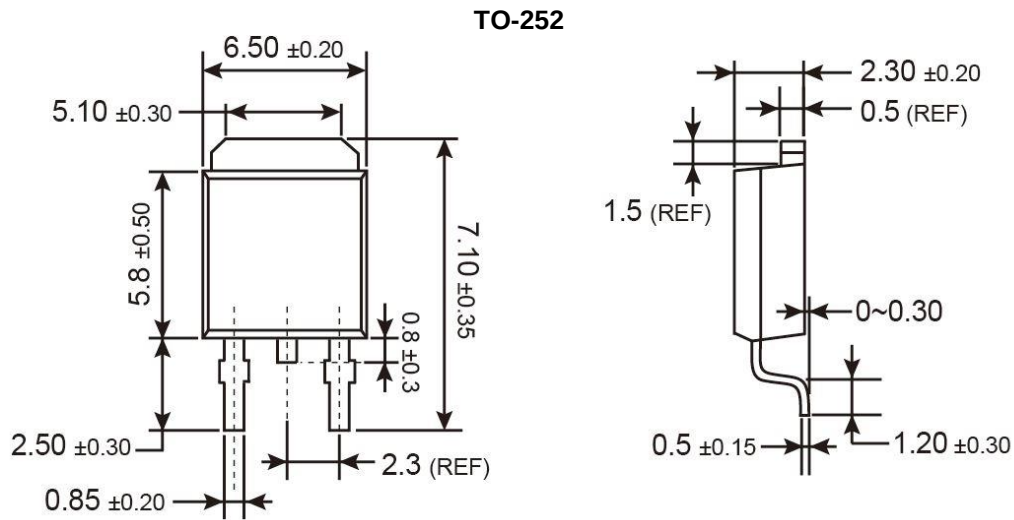
**MARKING DIAGRAM**



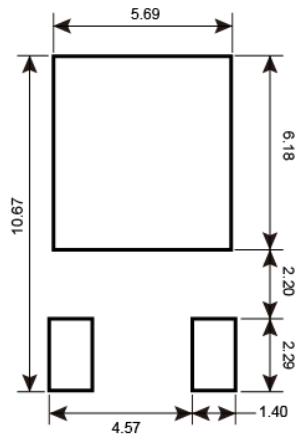
**Y** = Year Code  
**M** = Month Code for Halogen Free Product  
**O** =Jan **P** =Feb **Q** =Mar **R** =Apr  
**S** =May **T** =Jun **U** =Jul **V** =Aug  
**W** =Sep **X** =Oct **Y** =Nov **Z** =Dec  
**L** = Lot Code (1~9, A~Z)



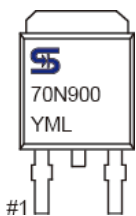
**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)



**SUGGESTED PAD LAYOUT** (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)

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- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
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