

## N-Channel Power MOSFET

900V, 7A, 1.9Ω

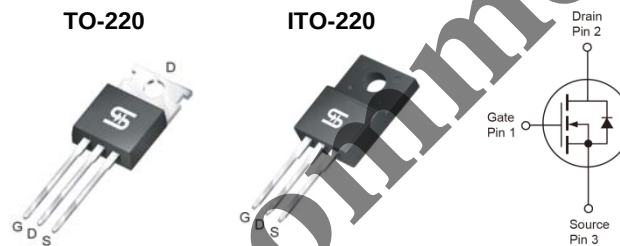
### FEATURES

- Low RDS(on) 1.9Ω (Max.)
- Low gate charge typical @49nC (Typ.)
- Improve dV/dt capability
- Pb-free plating
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21 definition

### APPLICATION

- Power Supply
- Lighting

| KEY PERFORMANCE PARAMETERS |       |      |
|----------------------------|-------|------|
| PARAMETER                  | VALUE | UNIT |
| $V_{DS}$                   | 900   | V    |
| $R_{DS(on)}$ (max)         | 1.9   | Ω    |
| $Q_g$                      | 49    | nC   |



| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |                |                                   |         |      |
|-----------------------------------------------------------------------------|----------------|-----------------------------------|---------|------|
| PARAMETER                                                                   | SYMBOL         | TO-220                            | ITO-220 | UNIT |
| Drain-Source Voltage                                                        | $V_{DS}$       | 900                               |         | V    |
| Gate-Source Voltage                                                         | $V_{GS}$       | ±30                               |         | V    |
| Continuous Drain Current (Note 1)                                           | $I_D$          | $T_C = 25^\circ\text{C}$<br>7     |         | A    |
|                                                                             |                | $T_C = 100^\circ\text{C}$<br>4.31 |         | A    |
| Pulsed Drain Current (Note 2)                                               | $I_{DM}$       | 28                                |         | A    |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$                          | $P_{DTOT}$     | 250                               | 40.3    | W    |
| Single Pulsed Avalanche Energy (Note 3)                                     | $E_{AS}$       | 106                               |         | mJ   |
| Single Pulsed Avalanche Current (Note 3)                                    | $I_{AS}$       | 7                                 |         | A    |
| Operating Junction and Storage Temperature Range                            | $T_J, T_{STG}$ | - 55 to +150                      |         | °C   |

| THERMAL PERFORMANCE                    |                 |        |         |      |
|----------------------------------------|-----------------|--------|---------|------|
| PARAMETER                              | SYMBOL          | TO-220 | ITO-220 | UNIT |
| Junction to Case Thermal Resistance    | $R_{\theta JC}$ | 0.5    | 3.1     | °C/W |
| Junction to Ambient Thermal Resistance | $R_{\theta JA}$ | 62.5   |         | °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 with minimum recommended footprint in still air.

| ELECTRICAL SPECIFICATIONS (T <sub>A</sub> = 25°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>   | 900 | --   | --   | V    |
| Gate Threshold Voltage                                                   | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                         | V <sub>GS(TH)</sub> | 2   | --   | 4    | 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> = 900V, V <sub>GS</sub> = 0V                                                       | I <sub>DSS</sub>    | --  | --   | 10   | μA   |
| Drain-Source On-State Resistance                                         | V <sub>GS</sub> = 10V, I <sub>D</sub> = 3.5A                                                       | R <sub>DS(on)</sub> | --  | 1.52 | 1.9  | Ω    |
| Dynamic <sup>(Note 5)</sup>                                              |                                                                                                    |                     |     |      |      |      |
| Total Gate Charge                                                        | V <sub>DS</sub> = 720V, I <sub>D</sub> = 7A,<br>V <sub>GS</sub> = 10V                              | Q <sub>g</sub>      | --  | 49   | --   | nC   |
| Gate-Source Charge                                                       |                                                                                                    | Q <sub>gs</sub>     | --  | 7    | --   |      |
| Gate-Drain Charge                                                        |                                                                                                    | Q <sub>gd</sub>     | --  | 20   | --   |      |
| Input Capacitance                                                        | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                         | C <sub>iss</sub>    | --  | 1969 | --   | pF   |
| Output Capacitance                                                       |                                                                                                    | C <sub>oss</sub>    | --  | 133  | --   |      |
| Reverse Transfer Capacitance                                             |                                                                                                    | C <sub>rss</sub>    | --  | 11   | --   |      |
| Switching <sup>(Note 6)</sup>                                            |                                                                                                    |                     |     |      |      |      |
| Turn-On Delay Time                                                       | V <sub>DD</sub> = 380V,<br>R <sub>GEN</sub> = 25Ω,<br>I <sub>D</sub> = 10A, V <sub>GS</sub> = 10V, | t <sub>d(on)</sub>  | --  | 39   | --   | ns   |
| Turn-On Rise Time                                                        |                                                                                                    | t <sub>r</sub>      | --  | 38   | --   |      |
| Turn-Off Delay Time                                                      |                                                                                                    | t <sub>d(off)</sub> | --  | 155  | --   |      |
| Turn-Off Fall Time                                                       |                                                                                                    | t <sub>f</sub>      | --  | 45   | --   |      |
| Source-Drain Diode <sup>(Note 4)</sup>                                   |                                                                                                    |                     |     |      |      |      |
| Forward On Voltage                                                       | I <sub>S</sub> = 10A, V <sub>GS</sub> = 0V                                                         | V <sub>SD</sub>     | --  | --   | 1.4  | V    |
| Reverse Recovery Time                                                    | I <sub>S</sub> = 7A,                                                                               | t <sub>rr</sub>     | --  | 464  | --   | ns   |
| Reverse Recovery Charge                                                  | di <sub>F</sub> /dt = 100A/μs                                                                      | Q <sub>rr</sub>     | --  | 4.7  | --   | μC   |

**Notes:**

- Current limited by package.
- Pulse width limited by the maximum junction temperature.
- $L = 4.1mH, I_{AS} = 7A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$   
100% Eas Test Condition:  $L = 1mH, I_{AS} = 3.5A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
- 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.

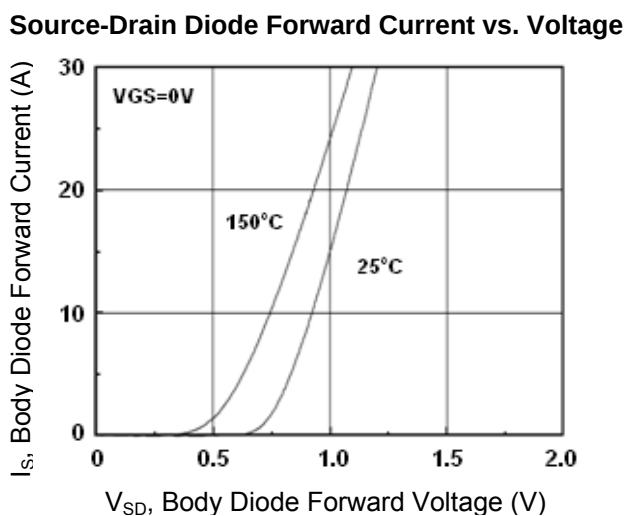
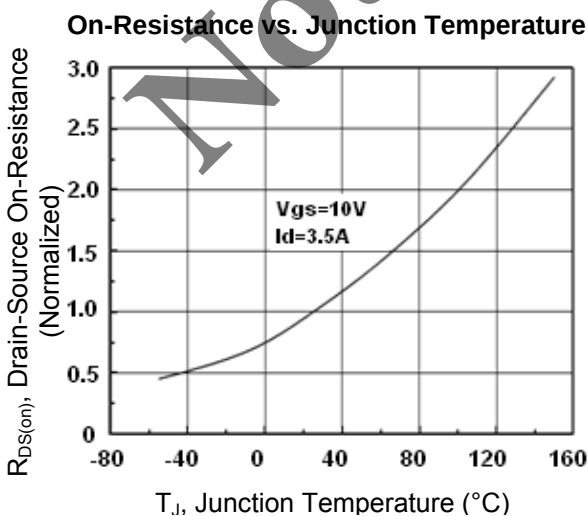
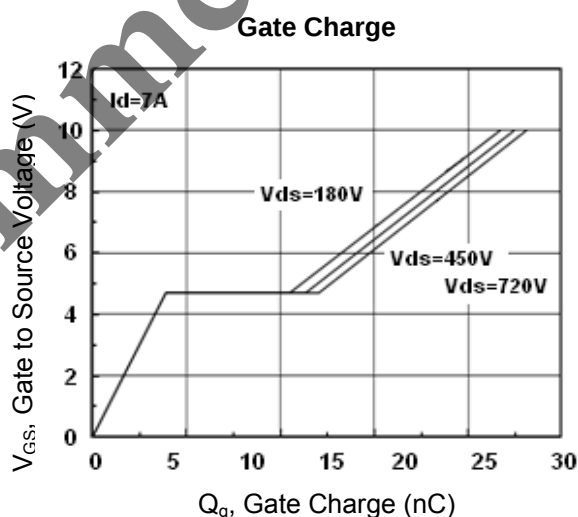
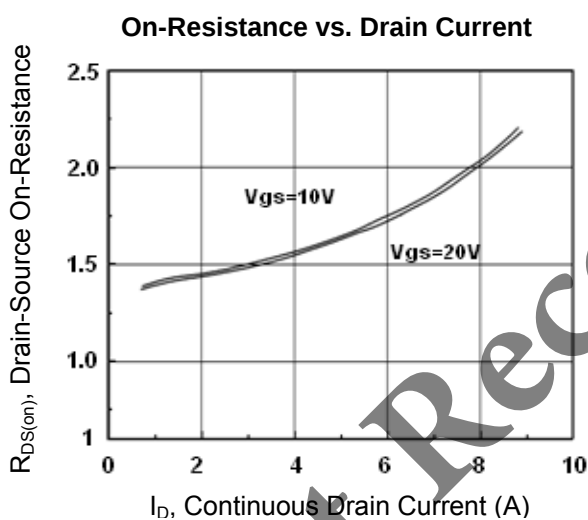
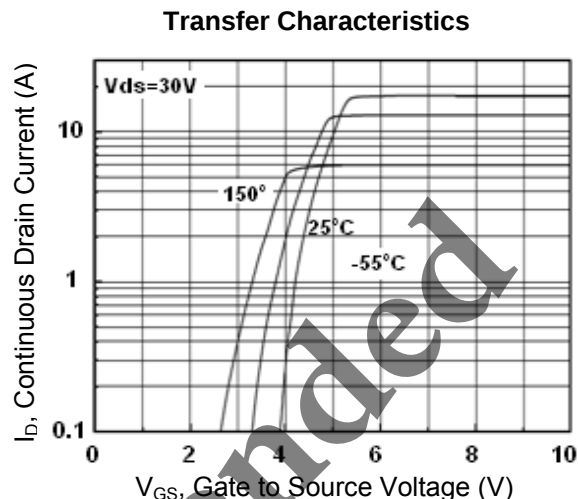
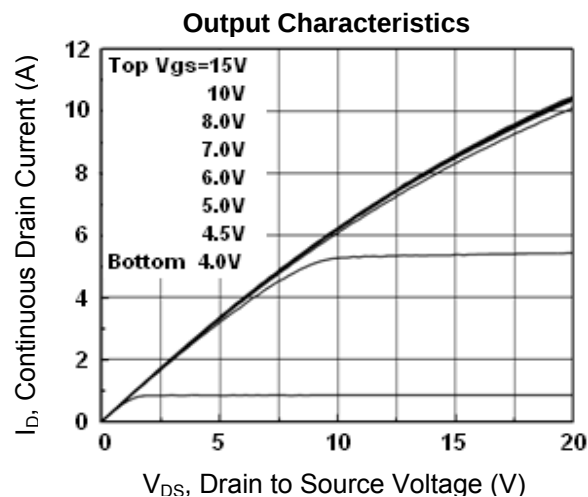
**ORDERING INFORMATION**

| PART NO.      | PACKAGE | PACKING    |
|---------------|---------|------------|
| TSM7N90CZ C0G | TO-220  | 50pcs/Tube |
| TSM7N90CI C0G | ITO-220 | 50pcs/Tube |

Not Recommended

## CHARACTERISTICS CURVES

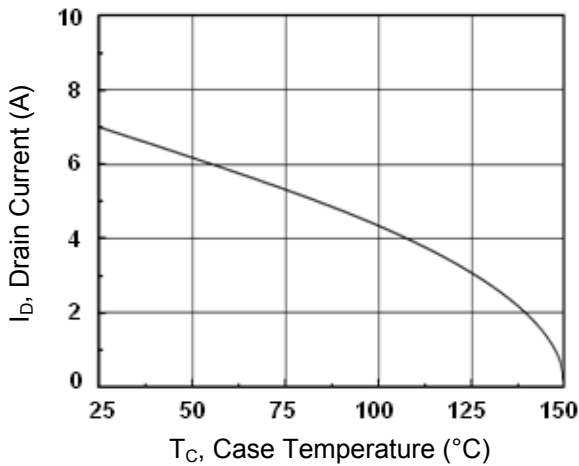
( $T_C = 25^\circ\text{C}$  unless otherwise noted)



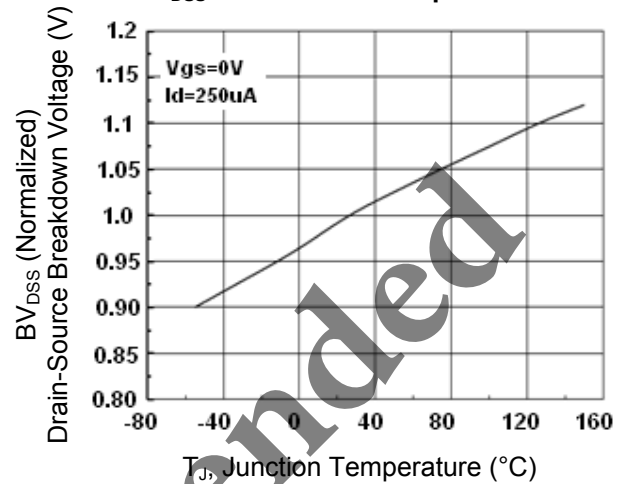
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( $T_C = 25^\circ\text{C}$  unless otherwise noted)

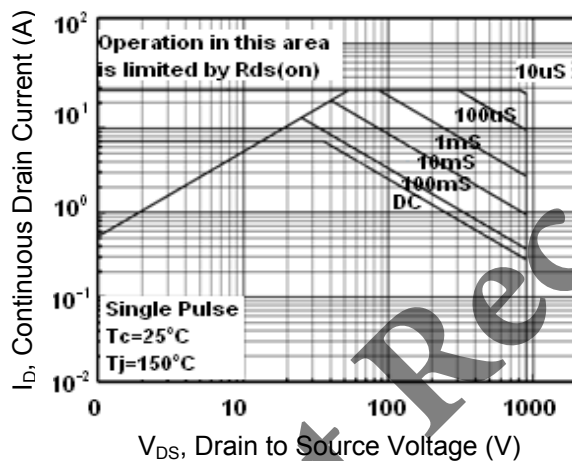
**Drain Current vs. Case Temperature**



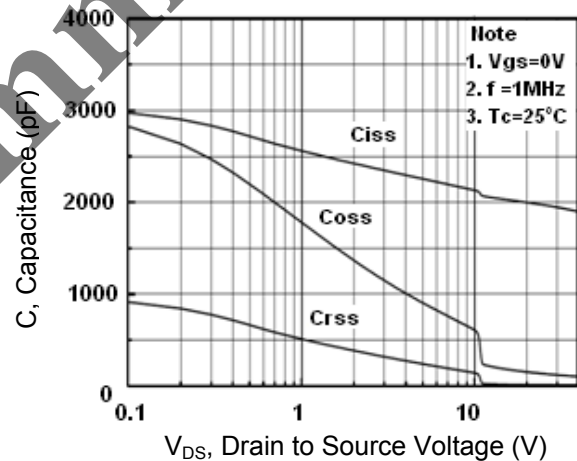
**$BV_{DSS}$  vs. Junction Temperature**



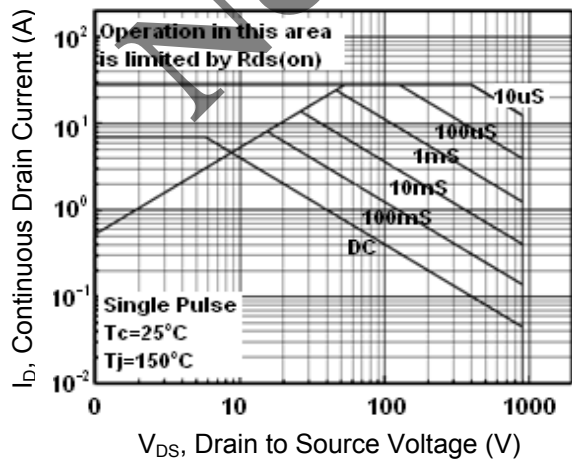
**Maximum Safe Operating Area (TO-220)**



**Capacitance vs. Drain-Source Voltage**



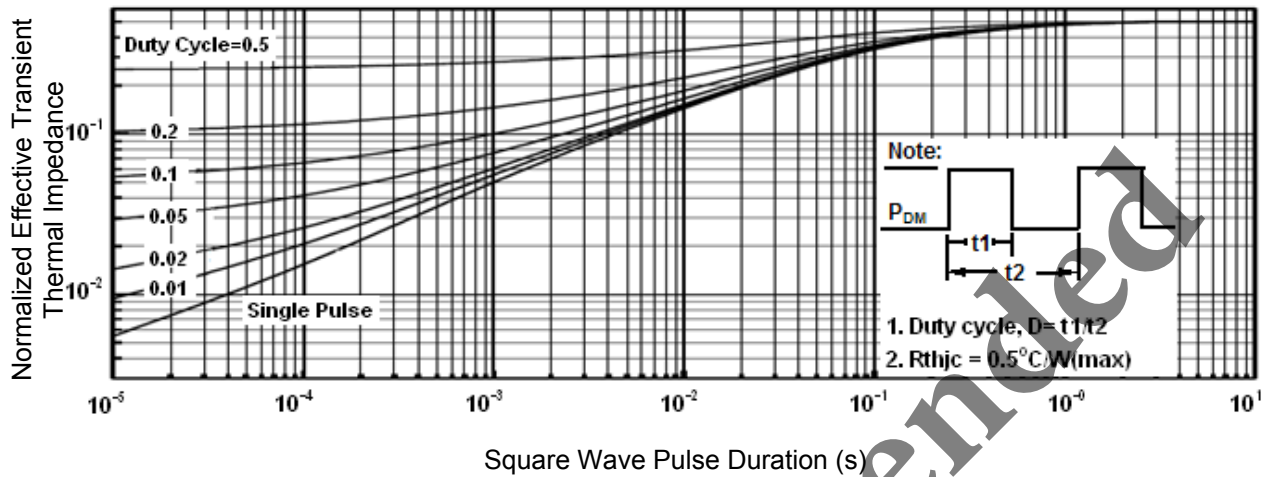
**Maximum Safe Operating Area (ITO-220)**



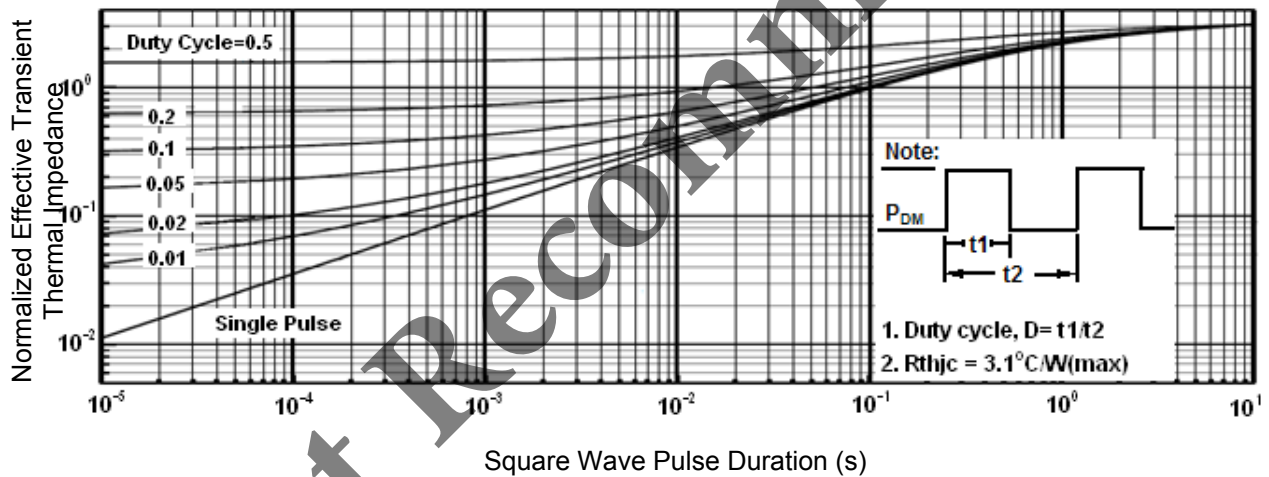
## CHARACTERISTICS CURVES

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

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

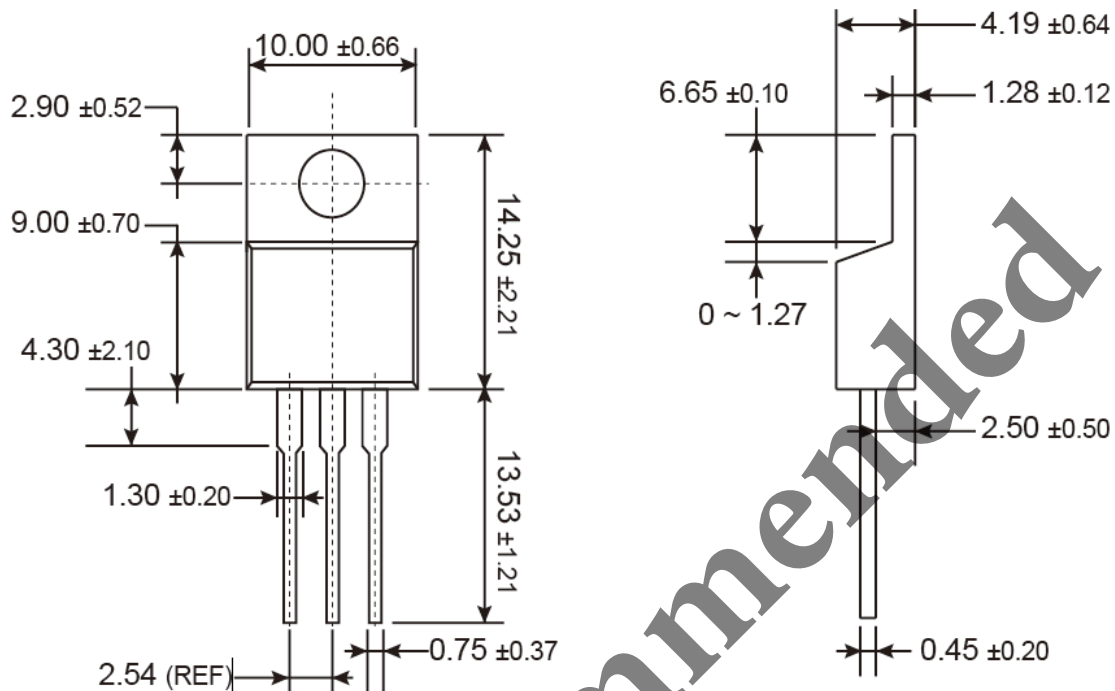


Normalized Thermal Transient Impedance, Junction-to-Case (ITO-220)

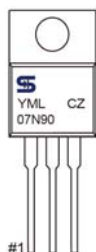


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**TO-220**



**MARKING DIAGRAM**



**Y** = Year Code

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

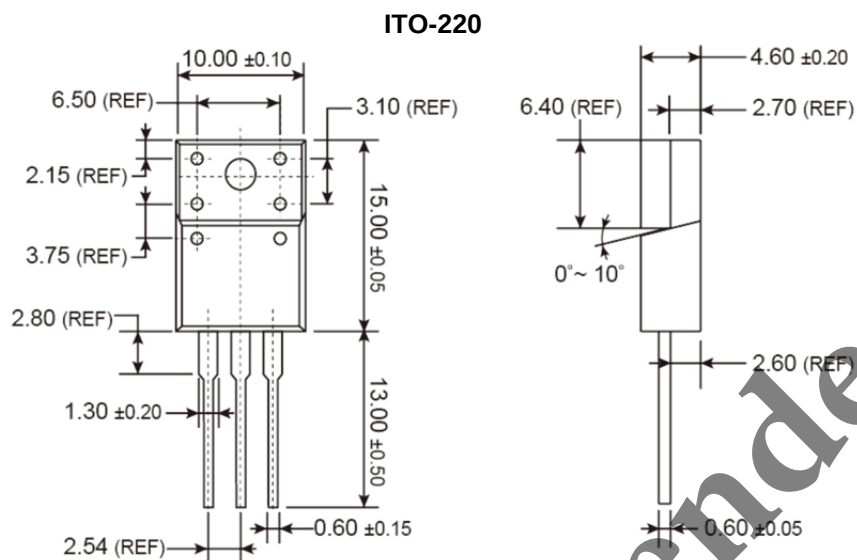
**O** =Jan **P** =Feb **Q** =Mar **R** =Apr

**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**



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

Not Recommended

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