# N-Channel Power MOSFET

800V, 4A, 3.0Ω

## FEATURES

- Low $R_{DS(ON)}$ 3Ω (Max.)
- Low gate charge typical @ 20nC (Typ.)
- Improve dV/dt capability

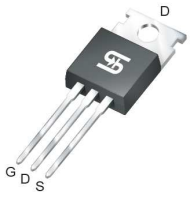
## APPLICATION

- Power Supply
- Lighting

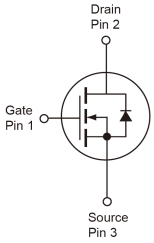
| KEY PERFORMANCE PARAMETERS | | |
|---|---|---|
| **PARAMETER** | **VALUE** | **UNIT** |
| $V_{DS}$ | 800 | V |
| $R_{DS(on)}$ (max) | 3.0 | Ω |
| $Q_g$ | 20 | nC |

Pb-Free RoHS COMPLIANT HALOGEN FREE

**TO-220** **ITO-220**








| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise noted) | | | | | |
|---|---|---|---|---|---|
| **PARAMETER** | | **SYMBOL** | **TO-220** | **ITO-220** | **UNIT** |
| Drain-Source Voltage | | $V_{DS}$ | 800 | | V |
| Gate-Source Voltage | | $V_{GS}$ | ±30 | | V |
| Continuous Drain Current (Note 1) | $T_C$ = 25°C | $I_D$ | 4 | | A |
| | $T_C$ = 100°C | | 2.5 | | |
| Pulsed Drain Current (Note 2) | | $I_{DM}$ | 16 | | A |
| Total Power Dissipation @ $T_C$ = 25°C | | $P_{DTOT}$ | 123 | 38.7 | W |
| Single Pulsed Avalanche Energy (Note 3) | | $E_{AS}$ | 76 | | mJ |
| Single Pulsed Avalanche Current (Note 3) | | $I_{AS}$ | 4 | | A |
| Repetitive Avalanche Energy | | $E_{AR}$ | 12.3 | | mJ |
| Peak Diode Recovery (Note 7) | | dV/dt | 4.5 | | V |
| 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 | $R_{\Theta JC}$ | 1.01 | 3.23 | °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 in still air.

| **ELECTRICAL SPECIFICATIONS** ($T_A$ = 25°C unless otherwise noted) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **CONDITIONS** | **SYMBOL** | **MIN** | **TYP** | **MAX** | **UNIT** |
| **Static** (Note 4) | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250μA | $BV_{DSS}$ | 800 | -- | -- | V |
| Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | $V_{GS(TH)}$ | 2.0 | -- | 4.0 | V |
| Gate Body Leakage | $V_{GS}$ = ±30V, $V_{DS}$ = 0V | $I_{GSS}$ | -- | -- | ±100 | nA |
| Zero Gate Voltage Drain Current | $V_{DS}$ = 700V, $V_{GS}$ = 0V | $I_{DSS}$ | -- | -- | 10 | μA |
| Drain-Source On-State Resistance | $V_{GS}$ = 10V, $I_D$ = 1.2A | $R_{DS(on)}$ | -- | 2.5 | 3.0 | Ω |
| Forward Transconductance | $V_{DS}$ = 30V, $I_D$ = 1.2A | $g_{fs}$ | -- | 7.1 | -- | S |
| **Dynamic** (Note 5) | | | | | | |
| Total Gate Charge | $V_{DS}$ = 640V, $I_D$ = 4.0A, $V_{GS}$ = 10V | $Q_g$ | -- | 20 | -- | nC |
| Gate-Source Charge | | $Q_{gs}$ | -- | 3.7 | -- | |
| Gate-Drain Charge | | $Q_{gd}$ | -- | 8.2 | -- | |
| Input Capacitance | $V_{DS}$ = 25V, $V_{GS}$ = 0V, f = 1.0MHz | $C_{iss}$ | -- | 955 | -- | pF |
| Output Capacitance | | $C_{oss}$ | -- | 80 | -- | |
| Reverse Transfer Capacitance | | $C_{rss}$ | -- | 13 | -- | |
| Gate Resistance | F = 1MHz, open drain | $R_g$ | -- | -- | 3 | Ω |
| **Switching** (Note 6) | | | | | | |
| Turn-On Delay Time | $V_{DD}$ = 400V, $R_{GEN}$ = 25Ω, $I_D$ = 4.0A, $V_{GS}$ = 10V, | $t_{d(on)}$ | -- | 49 | -- | ns |
| Turn-On Rise Time | | $t_r$ | -- | 38 | -- | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 146 | -- | |
| Turn-Off Fall Time | | $t_f$ | -- | 50 | -- | |
| **Source-Drain Diode** (Note 4) | | | | | | |
| Forward On Voltage | $I_S$ = 4.0A, $V_{GS}$ = 0V | $V_{SD}$ | -- | -- | 1.5 | V |
| Reverse Recovery Time | $V_{GS}$ = 0V, $I_S$ = 4A $dI_F/dt$ = 100A/μs | $t_{rr}$ | -- | 487 | -- | ns |
| Reverse Recovery Charge | | $Q_{rr}$ | -- | 2.8 | -- | μC |

**Notes:**

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. L = 10mH, $I_{AS}$ = 4.0A, $V_{DD}$ = 50V, $R_G$ = 25Ω, Starting $T_J$ = 25°C
4. Pulse test: PW ≤ 300μs, duty cycle ≤ 2%
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.
7. $I_{SD}$ ≤ 8A, dI/dt ≤ 200A/uS, Vdd ≤ $BV_{DSS}$, Starting $T_J$ = 25°C.

## ORDERING INFORMATION

| PART NO. | PACKAGE | PACKING |
|---|---|---|
| TSM4N80CZ C0G | TO-220 | 50pcs / Tube |
| TSM4N80CI C0G | ITO-220 | 50pcs / Tube |

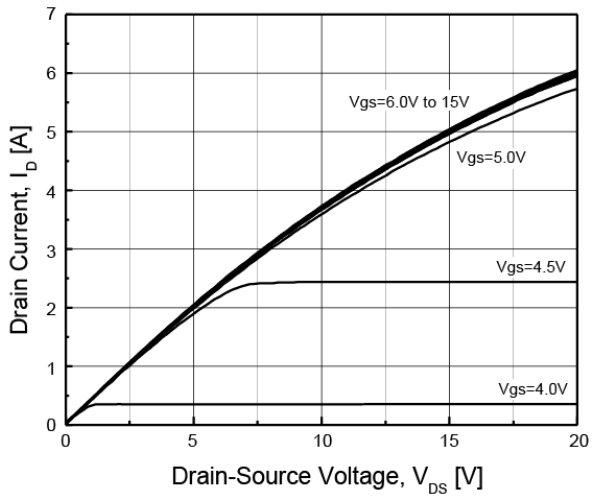
**Note:**

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

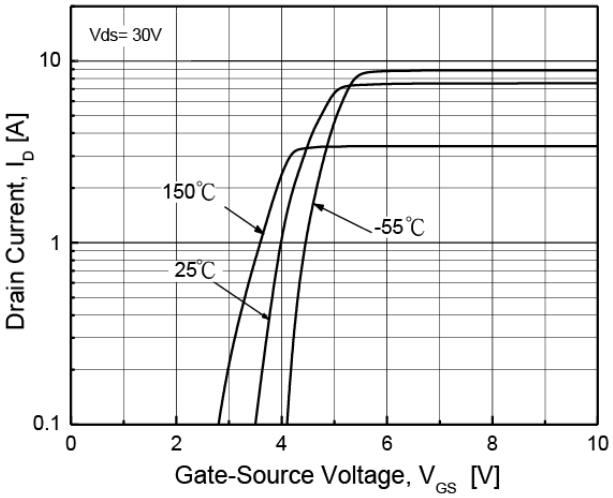
## CHARACTERISTICS CURVES

($T_C$ = 25°C unless otherwise noted)

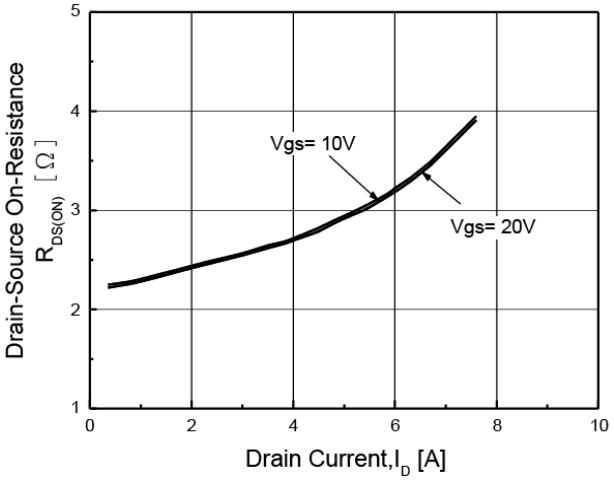
### Output Characteristics



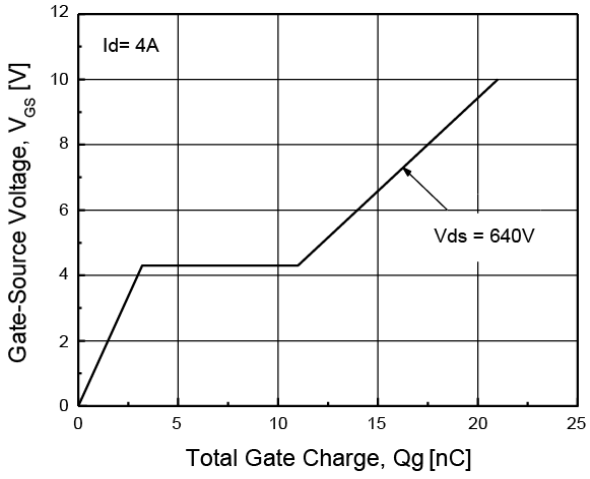

### Transfer Characteristics



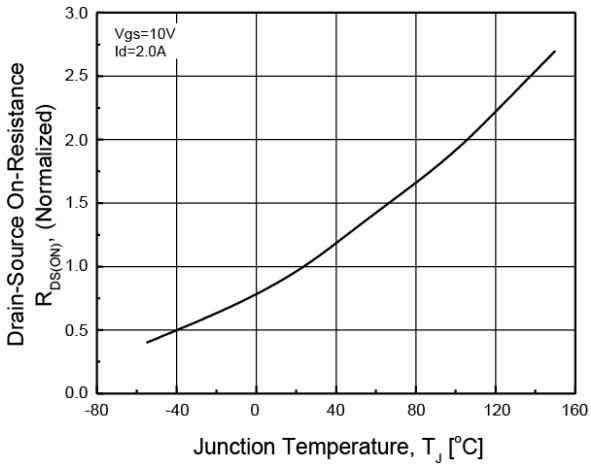

### On-Resistance vs. Drain Current



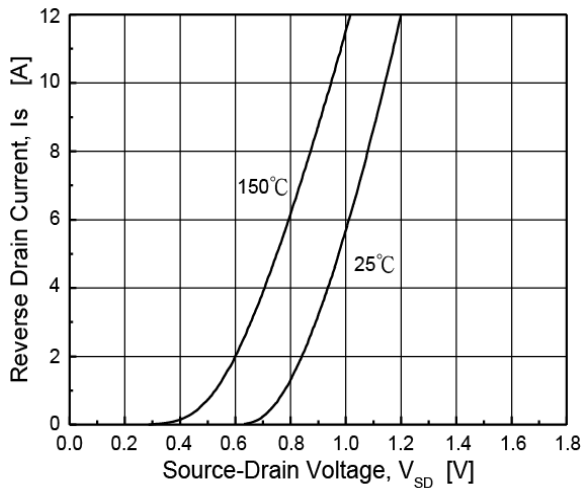

### Gate Charge




### On-Resistance vs. Junction Temperature



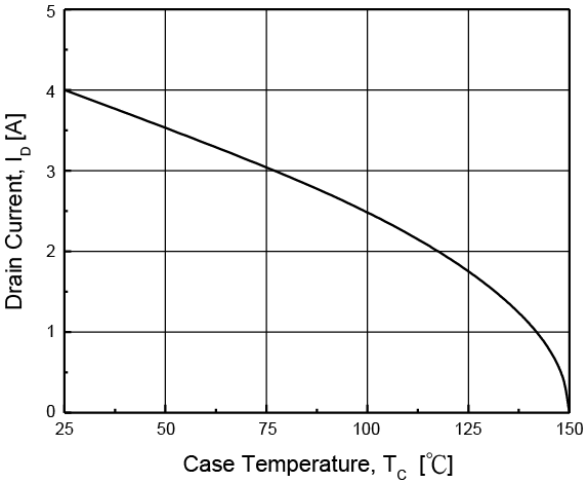

### Source-Drain Diode Forward Voltage



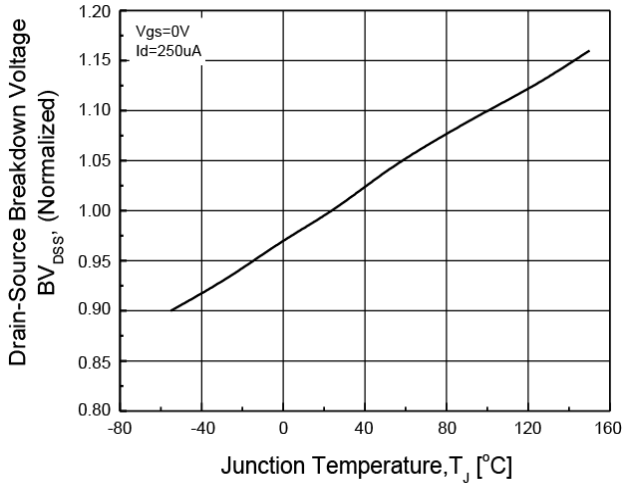
## CHARACTERISTICS CURVES

($T_C$ = 25°C unless otherwise noted)

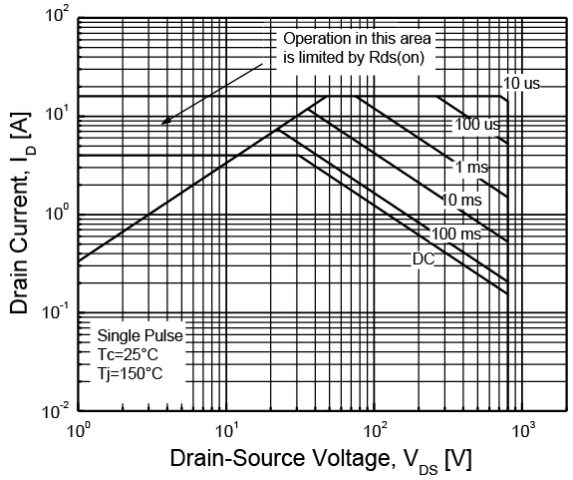
### Drain Current vs. Case Temperature



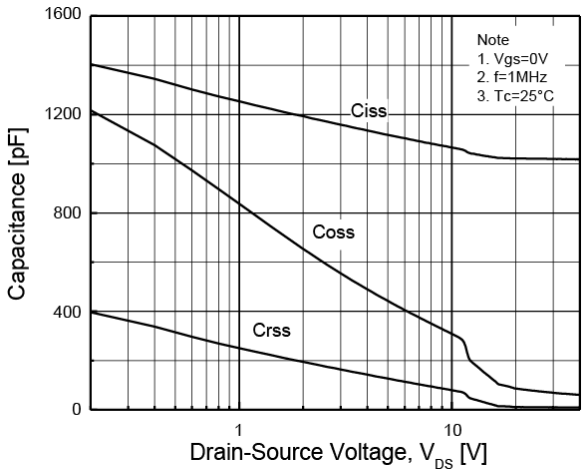

### $BV_{DSS}$ vs. Junction Temperature



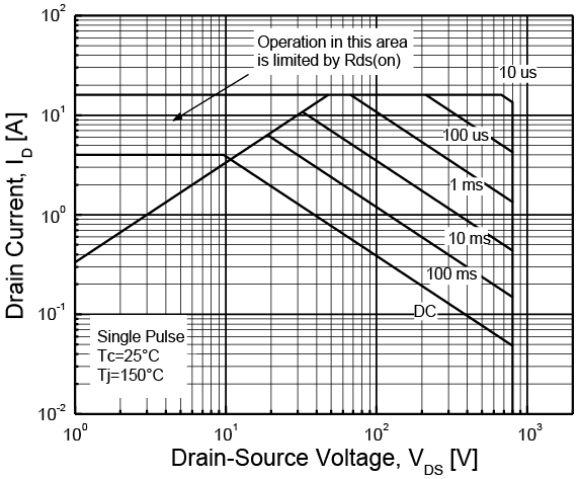

### Maximum Safe Operating Area (TO-220)




### Capacitance vs. Drain-Source Voltage



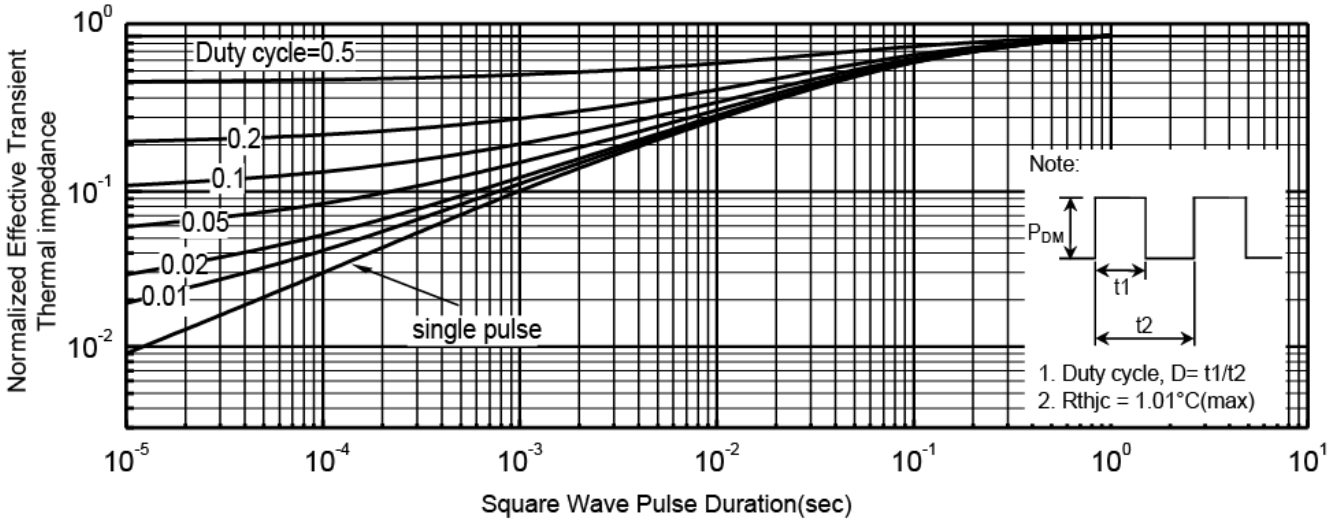

### Maximum Safe Operating Area (ITO-220)



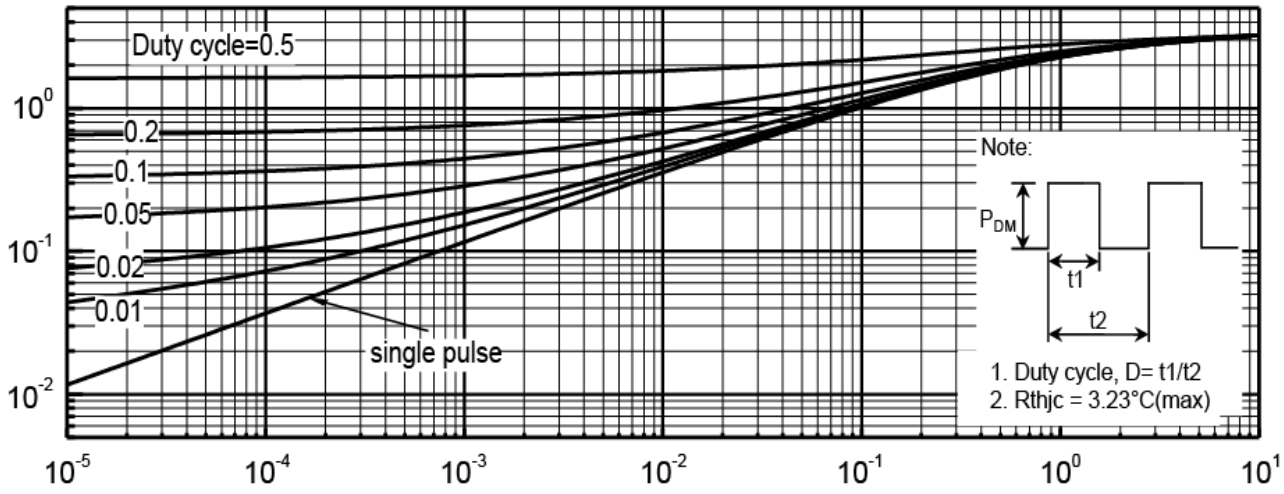
## CHARACTERISTICS CURVES

($T_C$ = 25°C unless otherwise noted)

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

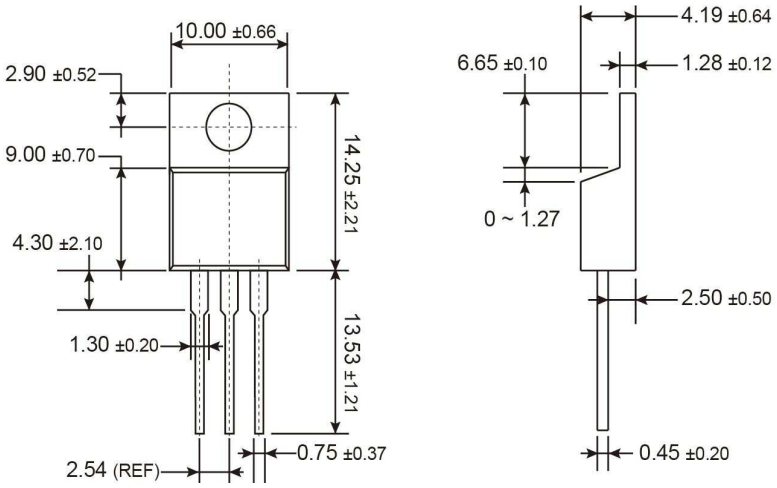



**Normalized Thermal Transient Impedance, Junction-to-Ambient (ITO-220)**

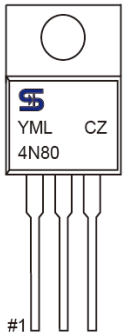


## PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

**TO-220**




## MARKING DIAGRAM




**Y** = Year Code

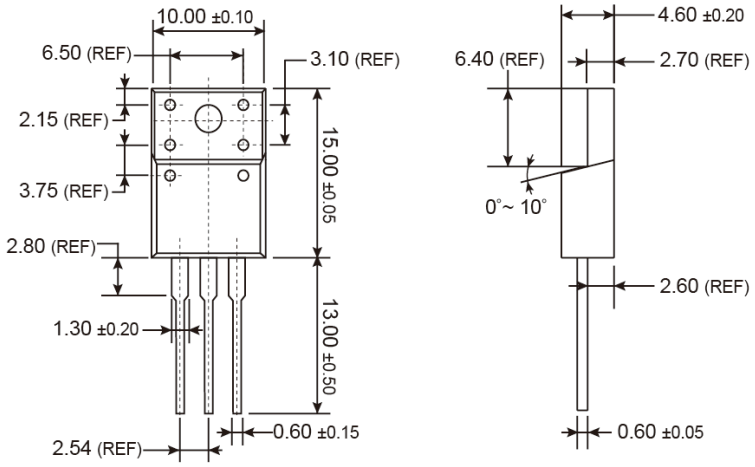
**M** = Month Code for Halogen Free Product

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **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)

**ITO-220**

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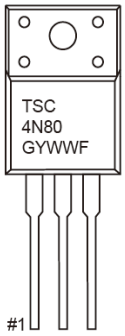


**G** = Halogen Free
**Y** = Year Code
**WW** = Week Code (01~52)
**F** = Factory Code

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