

N-Channel Power MOSFET

800V, 3A, 4.2Ω

FEATURES

- Low $R_{DS(ON)}$ 3.3Ω (Typ.)
- Low gate charge typical @ 19nC (Typ.)
- Low C_{rss} typical @ 10.2pF (Typ.)
- Improved dv/dt capability

KEY PERFORMANCE PARAMETERS

| PARAMETER | VALUE | UNIT |
|--------------------|-------|------|
| V_{DS} | 800 | V |
| $R_{DS(on)}$ (max) | 4.2 | Ω |
| Q_g | 19 | nC |

APPLICATION

- Power Supply
- Lighting



Notes: MSL 3 (Moisture Sensitivity Level) for TO-252 (D-PAK) per J-STD-020

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

| PARAMETER | SYMBOL | LIMIT | | | UNIT |
|--|----------------|---------------------------|---------|--------|------|
| | | IPAK/DPAK | ITO-220 | TO-220 | |
| Drain-Source Voltage | V_{DS} | 800 | | | V |
| Gate-Source Voltage | V_{GS} | ±30 | | | V |
| Continuous Drain Current (Note 4) | I_D | $T_C = 25^\circ\text{C}$ | | | A |
| | | $T_C = 100^\circ\text{C}$ | | | |
| Pulsed Drain Current (Note 2) | I_{DM} | 12 | | | A |
| Single Pulsed Avalanche Energy (Note 3) | E_{AS} | 48 | | | mJ |
| Single Pulsed Avalanche Current (Note 3) | I_{AS} | 3 | | | A |
| Repetitive Avalanche Energy (Note 3) | E_{AR} | 9.4 | | | mJ |
| Repetitive Avalanche Energy (Note 4) | dV/dt | 4.5 | | | V/ns |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | P_{DTOT} | 94 | 32 | 94 | W |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | - 55 to +150 | | | °C |

THERMAL PERFORMANCE

| PARAMETER | SYMBOL | LIMIT | | | UNIT |
|--|-----------------|-----------|---------|--------|------|
| | | IPAK/DPAK | ITO-220 | TO-220 | |
| Junction to Case Thermal Resistance | $R_{\theta Jc}$ | 1.33 | 3.9 | 1.33 | °C/W |
| Junction to Ambient Thermal Resistance | $R_{\theta JA}$ | 110 | 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 ($T_A = 25^\circ\text{C}$ unless otherwise noted) | | | | | | |
|---|---|--------------|-----|------|-----------|----------|
| PARAMETER | CONDITIONS | SYMBOL | MIN | TYP | MAX | UNIT |
| Static (Note 5) | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS} = 0V, I_D = 250\mu A$ | BV_{DSS} | 800 | -- | -- | V |
| Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu A$ | $V_{GS(TH)}$ | 2 | -- | 4 | V |
| Gate Body Leakage | $V_{GS} = \pm 30V, V_{DS} = 0V$ | I_{GSS} | -- | -- | ± 100 | nA |
| Zero Gate Voltage Drain Current | $V_{DS} = 800V, V_{GS} = 0V$ | I_{DSS} | -- | -- | 10 | μA |
| Drain-Source On-State Resistance | $V_{GS} = 10V, I_D = 1.5A$ | $R_{DS(ON)}$ | -- | 3.3 | 4.2 | Ω |
| Forward Transfer Conductance | $V_{DS} = 30V, I_D = 1.5A$ | g_{fs} | -- | 3.7 | -- | S |
| Dynamic (Note 6) | | | | | | |
| Total Gate Charge | $V_{DS} = 640V, I_D = 3A, V_{GS} = 10V$ | Q_g | -- | 19 | -- | nC |
| Gate-Source Charge | | Q_{gs} | -- | 4 | -- | |
| Gate-Drain Charge | | Q_{gd} | -- | 7.6 | -- | |
| Input Capacitance | $V_{DS} = 25V, V_{GS} = 0V, f = 1.0\text{MHz}$ | C_{iss} | -- | 696 | -- | pF |
| Output Capacitance | | C_{oss} | -- | 65 | -- | |
| Reverse Transfer Capacitance | | C_{rss} | -- | 10.2 | -- | |
| Gate Resistance | $F = 1\text{MHz}$, open drain | R_g | -- | 3.2 | -- | Ω |
| Switching (Note 7) | | | | | | |
| Turn-On Delay Time | $V_{GS} = 10V, I_D = 3A, V_{DD} = 400V, R_G = 25\Omega$ | $t_{d(on)}$ | -- | 48 | -- | ns |
| Turn-On Rise Time | | t_r | -- | 36 | -- | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 106 | -- | |
| Turn-Off Fall Time | | t_f | -- | 41 | -- | |
| Source-Drain Diode (Note 5) | | | | | | |
| Source Current | Integral reverse diode in the MOSFET | I_S | -- | -- | 3 | A |
| Source Current (Pulse) | | I_{SM} | -- | -- | 12 | A |
| Diode Forward Voltage | $I_S = 3A, V_{GS} = 0V$ | V_{SD} | -- | -- | 1.5 | V |
| Reverse Recovery Time | $V_{GS} = 0V, I_S = 3A, dI_F/dt = 100A/\mu s$ | t_{rr} | -- | 370 | -- | ns |
| Reverse Recovery Charge | | Q_{rr} | -- | 1.8 | -- | μC |

Notes:

- Current limited by package
- Pulse width limited by the maximum junction temperature
- $L = 10\text{mH}, I_{AS} = 3A, V_{DD} = 50V, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
- $I_{SD} \leq 3A, dI/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$, 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 |
|-----------------|----------------|---------------------|
| TSM3N80CZ C0G | TO-220 | 50pcs / Tube |
| TSM3N80CI C0G | ITO-220 | 50pcs / Tube |
| TSM3N80CH C5G | TO-251 (IPAK) | 75pcs / Tube |
| TSM3N80CP ROG | TO-252 (DPAK) | 2,500pcs / 13" Reel |

Note:

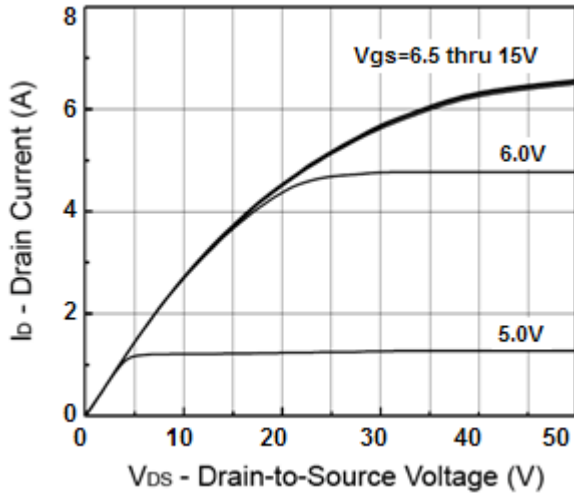
1. Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
2. Halogen-free according to IEC 61249-2-21 definition

Not Recommended

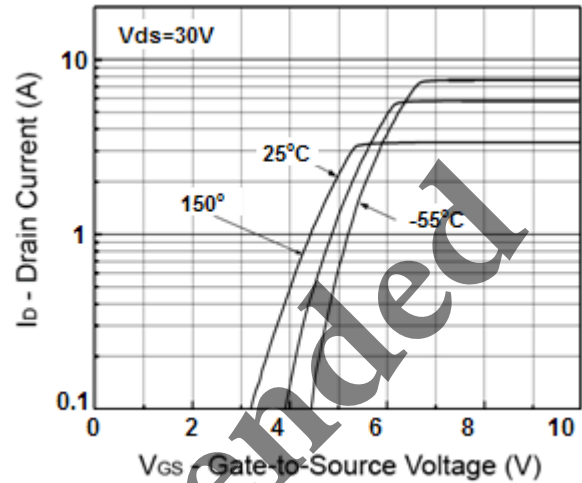
CHARACTERISTICS CURVES

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

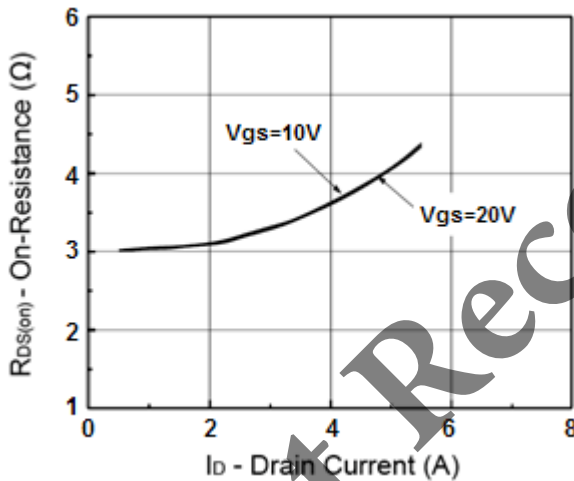
Output Characteristics



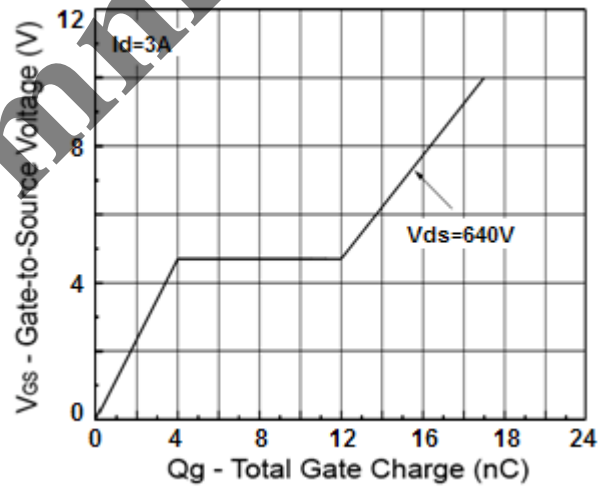
Transfer Characteristics



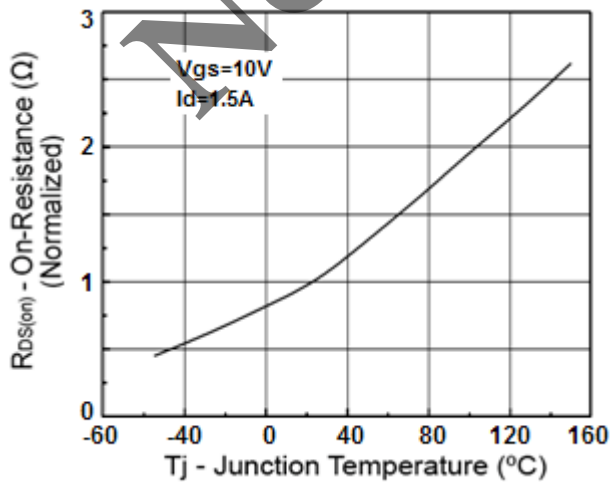
On-Resistance vs. Drain Current



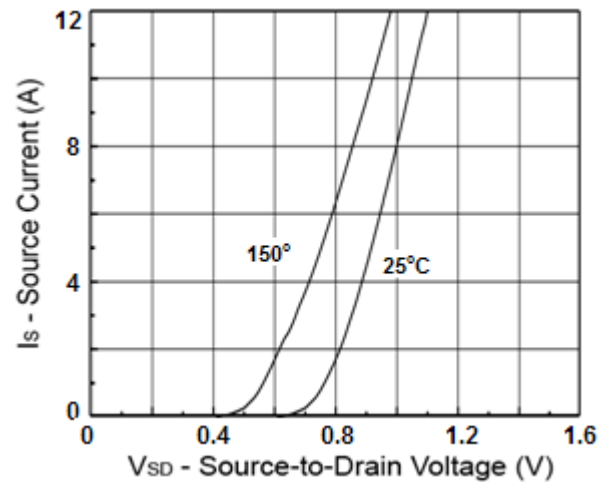
Gate Charge



On-Resistance vs. Junction Temperature



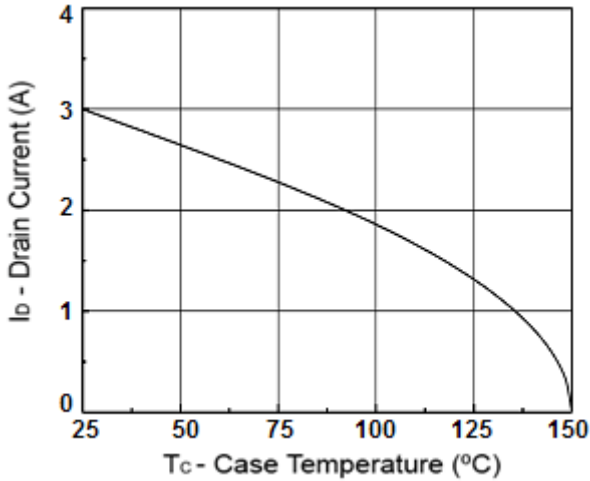
Source-Drain Diode Forward Voltage



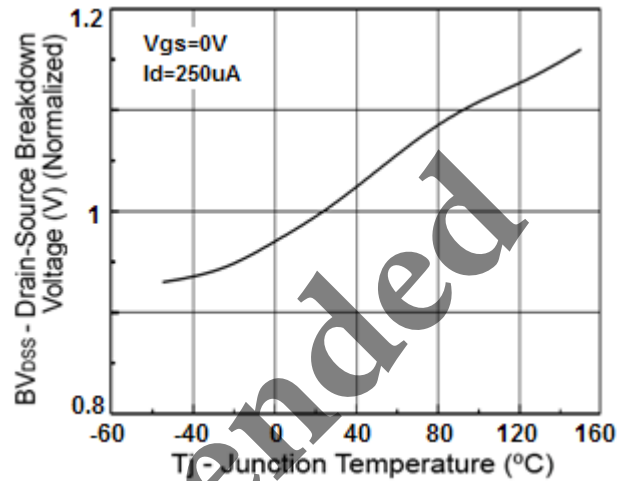
CHARACTERISTICS CURVES

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

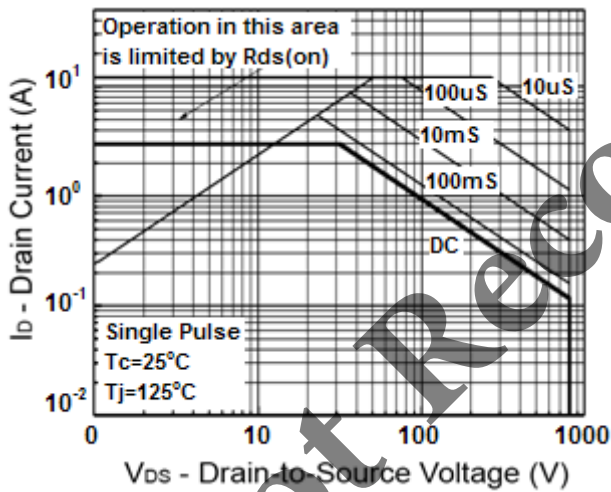
Drain Current vs. Case Temperature



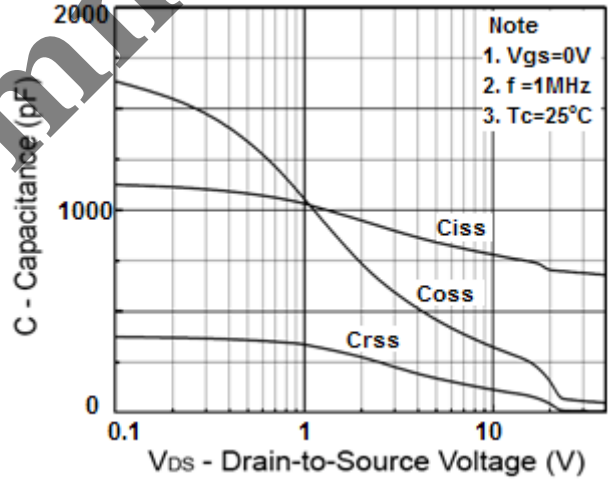
BV_{DSS} vs. Junction Temperature



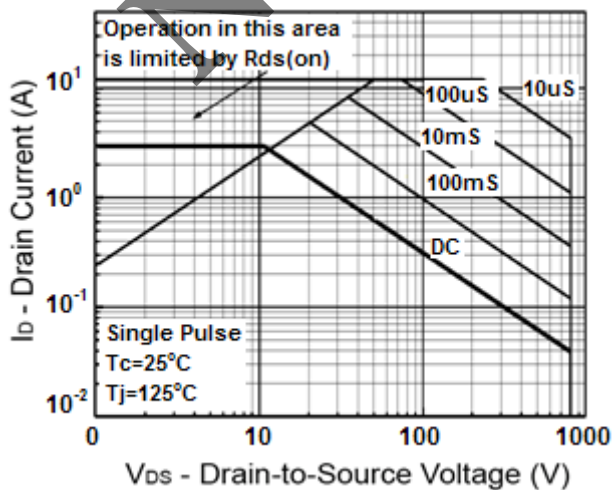
Maximum Safe Operating Area(TO-220, I/D-PAK)



Capacitance vs. Drain-Source Voltage



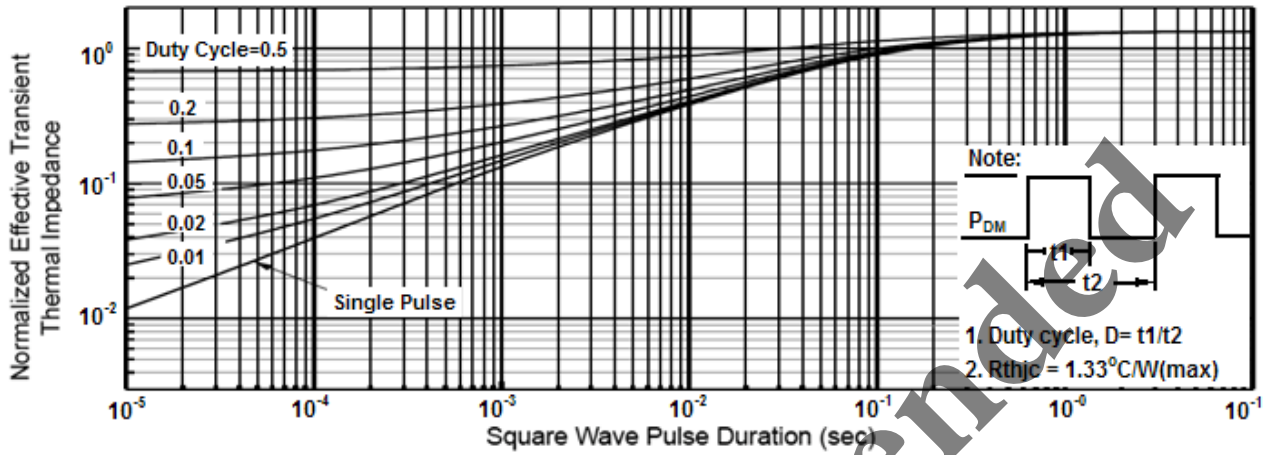
Maximum Safe Operating Area(ITO-220)



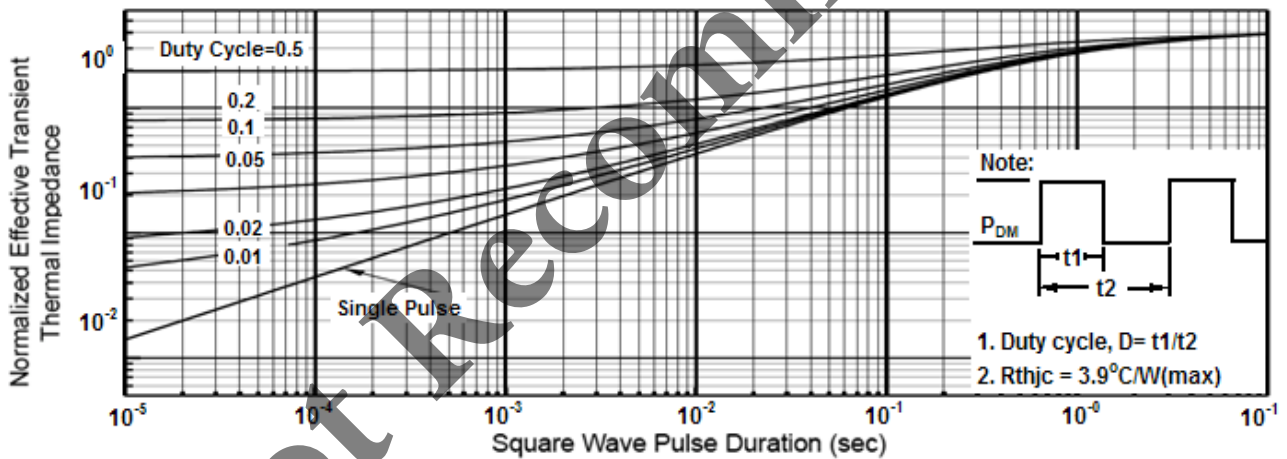
CHARACTERISTICS CURVES

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

Normalized Thermal Transient Impedance, Junction-to-Ambient (TO-220, I/D-PAK)

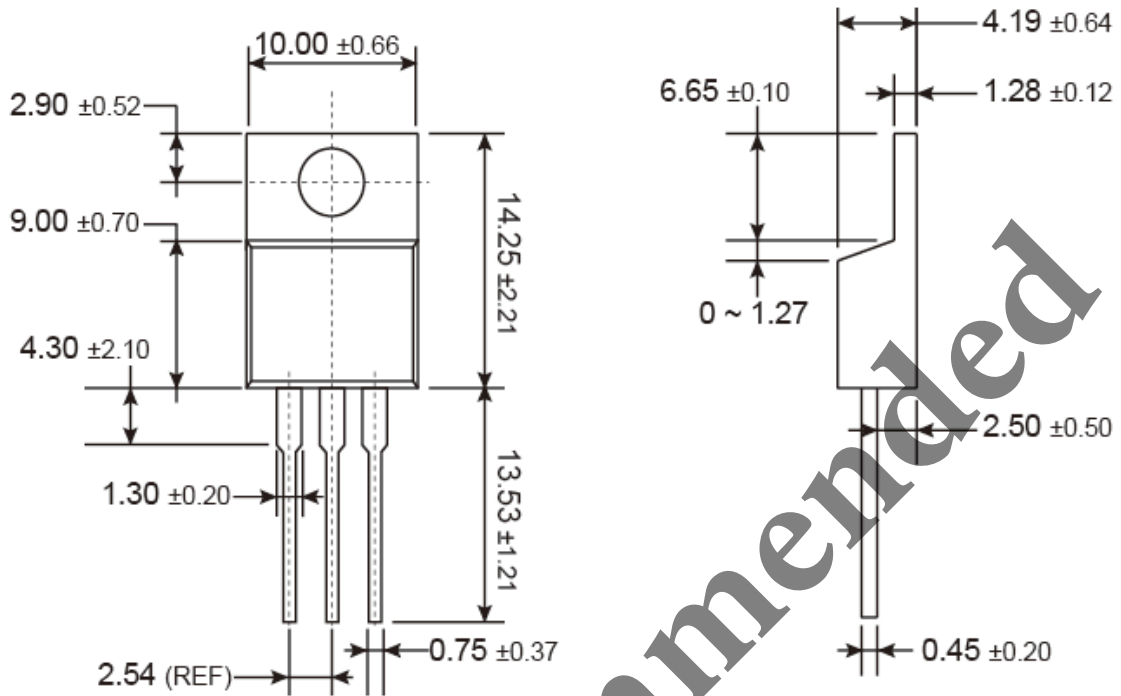


Normalized Thermal Transient Impedance, Junction-to-Ambient (ITO-220)

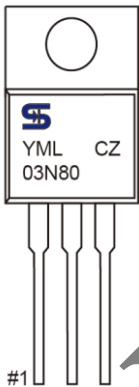


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-220



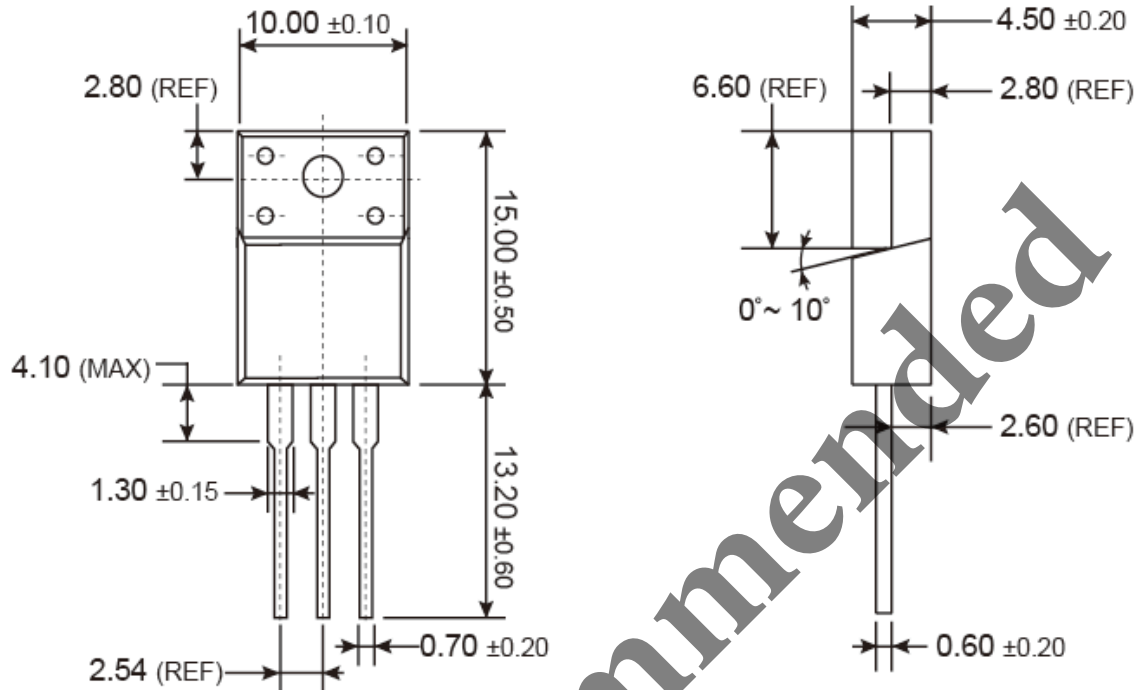
MARKING DIAGRAM



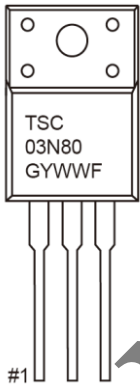
- Y = Year Code
- M = Month Code for Halogen Free Product
- | | | | |
|--------|--------|--------|--------|
| O =Jan | P =Feb | Q =Mar | R =Apr |
| S =May | T =Jun | U =Jul | V =Aug |
| W =Sep | X =Oct | Y =Nov | Z =Dec |
- L = Lot Code (1~9, A~Z)

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

ITO-220



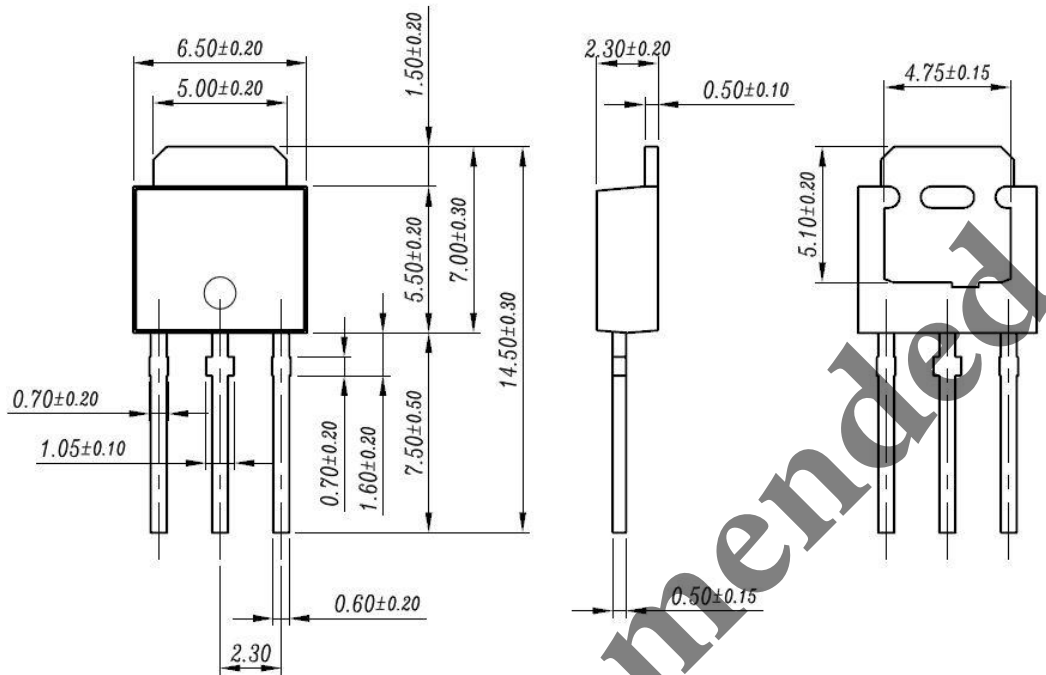
MARKING DIAGRAM



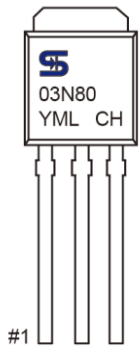
- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-251(IPAK)



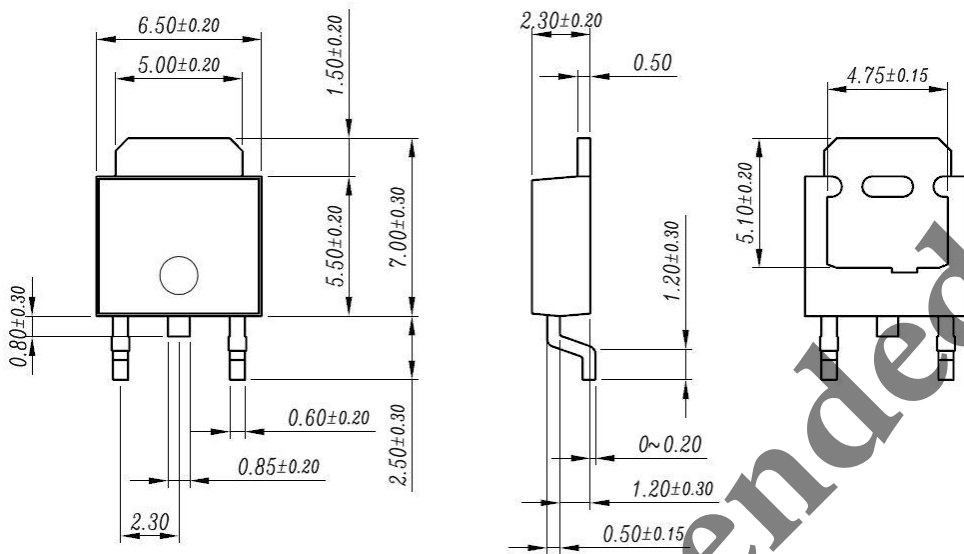
MARKING DIAGRAM



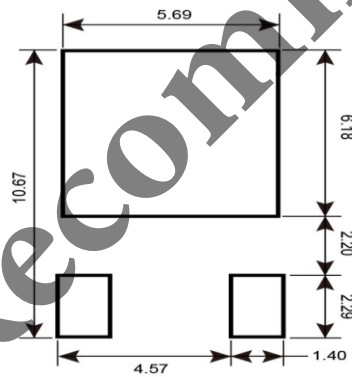
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PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

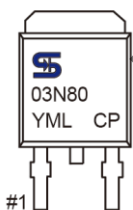
TO-252(DPAK)



SUGGESTED PAD LAYOUT (Unit: Millimeters)



MARKING DIAGRAM



- Y** = Year Code
- M** = Month Code for Halogen Free Product
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Not Recommended

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