

N-Channel Power MOSFET

500V, 5A, 1.5Ω

FEATURES

- 100% UIS and R_g tested
- Advanced planar process
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

| KEY PERFORMANCE PARAMETERS | | |
|----------------------------|-------|------|
| PARAMETER | VALUE | UNIT |
| V _{DS} | 500 | V |
| R _{DS(on)} (max) | 1.5 | Ω |
| Q _g | 16 | nC |

APPLICATIONS

- Power Supply
- AC/DC LED Lighting



| ABSOLUTE MAXIMUM RATINGS (T _A = 25°C unless otherwise noted) | | | | |
|---|------------------------|-----------------------------------|--------------|------|
| PARAMETER | | SYMBOL | LIMIT | UNIT |
| Drain-Source Voltage | | V _{DS} | 500 | V |
| Gate-Source Voltage | | V _{GS} | ±30 | V |
| Continuous Drain Current (Note 1) | T _C = 25°C | I _D | 5 | A |
| | T _C = 100°C | | 3.2 | A |
| Pulsed Drain Current (Note 2) | | I _{DM} | 20 | A |
| Total Power Dissipation @ T _C = 25°C | | P _{DTOT} | 42 | W |
| Single Pulse Avalanche Energy (Note 3) | | E _{AS} | 160 | mJ |
| Single Pulse Avalanche Current (Note 3) | | I _{AS} | 4 | A |
| Operating Junction and Storage Temperature Range | | T _J , T _{STG} | - 55 to +150 | °C |

| THERMAL PERFORMANCE | | | |
|--|------------------|-------|------|
| PARAMETER | SYMBOL | LIMIT | UNIT |
| Junction to Case Thermal Resistance | R _{θJC} | 3 | °C/W |
| Junction to Ambient Thermal Resistance | R _{θJA} | 62 | °C/W |

Thermal Performance Notes: R_{θJA} 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_{θJA} is guaranteed by design while R_{θCA} is determined by the user's board design. R_{θJA} shown below for single device operation on FR-4 PCB with minimum recommended footprint in still air.

| ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted) | | | | | | |
|---|---|-------------------------------------|----------|------|-----------|---------------|
| PARAMETER | CONDITIONS | SYMBOL | MIN | TYP | MAX | UNIT |
| Static (Note 4) | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$ | BV_{DSS} | 500 | -- | -- | V |
| Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ | $V_{GS(TH)}$ | 2.5 | 3 | 3.8 | V |
| Gate Body Leakage | $V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$ | I_{GSS} | -- | -- | ± 100 | nA |
| Zero Gate Voltage Drain Current | $V_{DS} = 500\text{V}, V_{GS} = 0\text{V}$ | I_{DSS} | -- | -- | 1 | μA |
| Drain-Source On-State Resistance | $V_{GS} = 10\text{V}, I_D = 1.6\text{A}$ | $R_{DS(on)}$ | -- | 1.16 | 1.5 | Ω |
| Dynamic (Note 5) | | | | | | |
| Total Gate Charge | $V_{DS} = 400\text{V}, I_D = 3.2\text{A}, V_{GS} = 10\text{V}$ | Q_g | -- | 16 | -- | nC |
| Gate-Source Charge | | Q_{gs} | -- | 3.2 | -- | |
| Gate-Drain Charge | | Q_{gd} | -- | 7.2 | -- | |
| Input Capacitance | $V_{DS} = 50\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$ | C_{iss} | -- | 603 | -- | pF |
| Output Capacitance | | C_{oss} | -- | 50 | -- | |
| Reverse Transfer Capacitance | | C_{rss} | -- | 1 | -- | |
| Gate Resistance | | R_g | -- | 2 | 4 | Ω |
| Switching (Note 6) | | | | | | |
| Turn-On Delay Time | $V_{DD} = 250\text{V}, R_G = 5\Omega, I_D = 3.2\text{A}, V_{GS} = 10\text{V}$ | $t_{d(on)}$ | -- | 6.2 | -- | ns |
| Turn-On Rise Time | | t_r | -- | 19 | -- | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 16 | -- | |
| Turn-Off Fall Time | | t_f | -- | 21 | -- | |
| Source-Drain Diode (Note 4) | | | | | | |
| Body-Diode Continuous Forward Current | | I_S | -- | -- | 5 | A |
| Body-Diode Pulsed Current | | I_{SM} | -- | -- | 20 | A |
| Forward On Voltage | $I_S = 3.2\text{A}, V_{GS} = 0\text{V}$ | V_{SD} | -- | -- | 1.2 | V |
| Reverse Recovery Time | $I_S = 3.2\text{A}$ | t_{rr} | -- | 191 | -- | ns |
| Reverse Recovery Charge | | $di_f/dt = 100\text{A}/\mu\text{s}$ | Q_{rr} | -- | 1.2 | -- |

Notes:

- Current limited by package.
- Pulse width limited by the maximum junction temperature.
- $L = 20\text{mH}, I_{AS} = 4\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
- Pulse test: $PW \leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
- For DESIGN AID ONLY, not subject to production testing.
- Switching time is essentially independent of operating temperature.

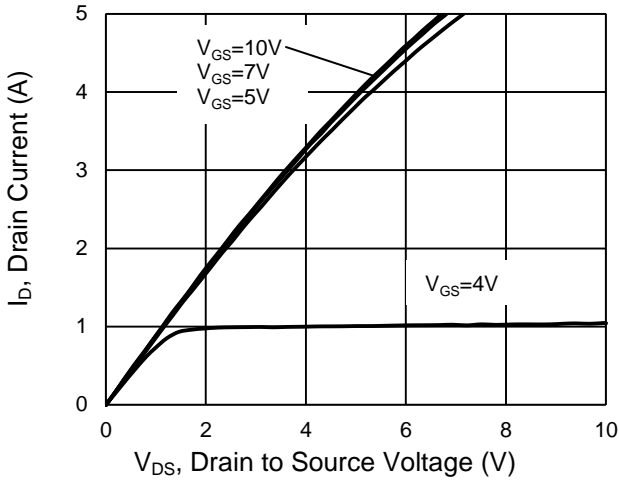
ORDERING INFORMATION

| PART NO. | PACKAGE | PACKING |
|----------------|---------|--------------|
| TSM5ND50CI C0G | ITO-220 | 50pcs / Tube |

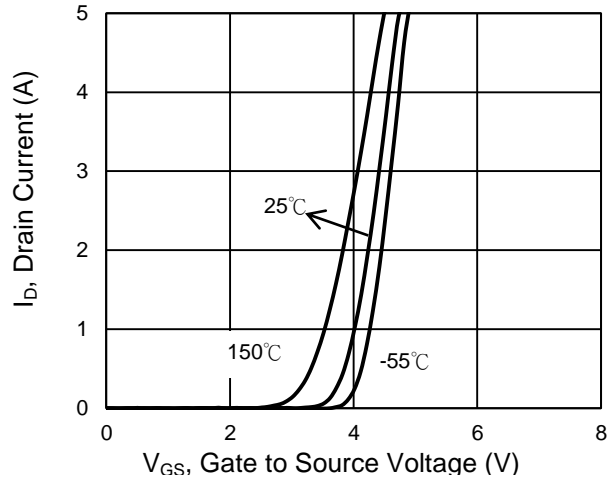
CHARACTERISTICS CURVES

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

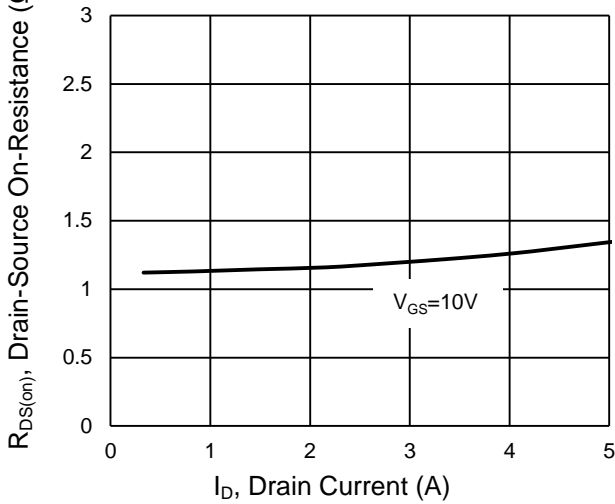
Output Characteristics



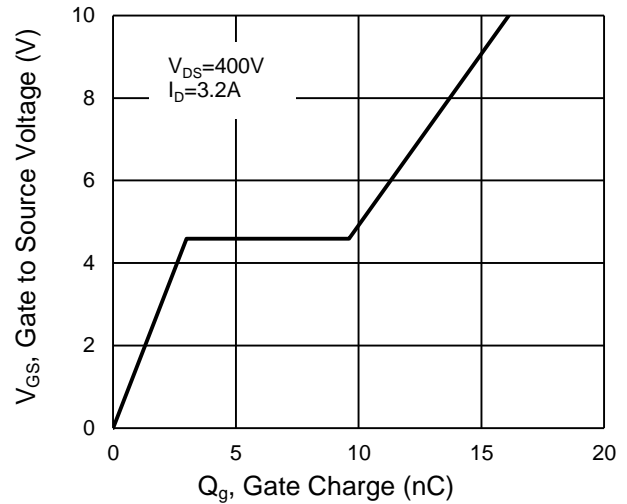
Transfer Characteristics



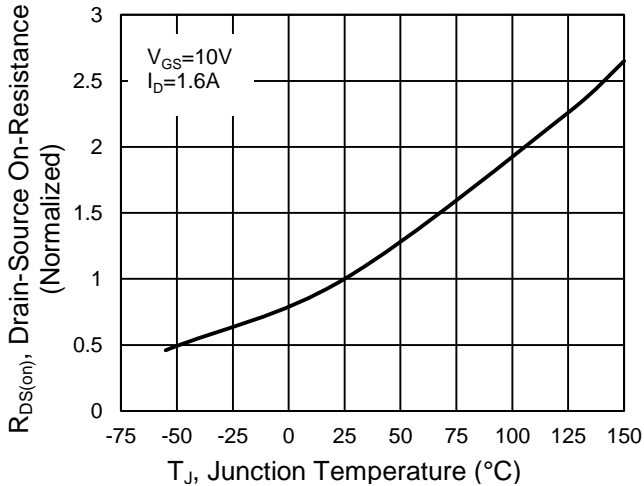
On-Resistance vs. Drain Current



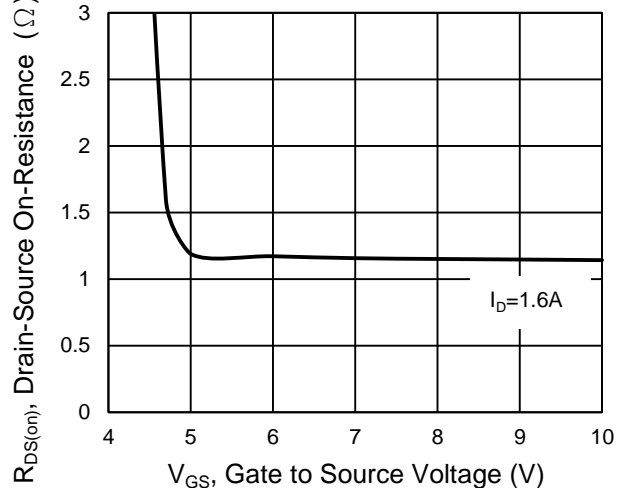
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



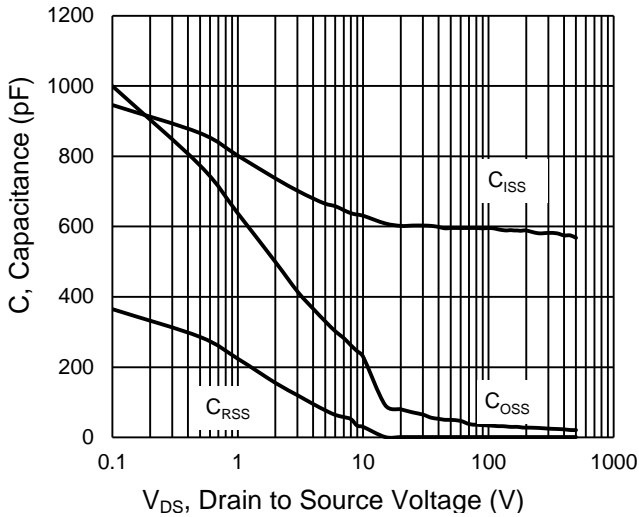
On-Resistance vs. Gate-Source Voltage



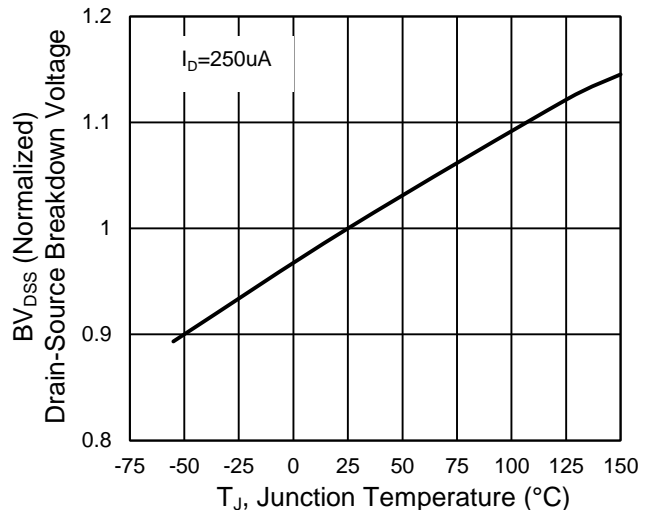
CHARACTERISTICS CURVES

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

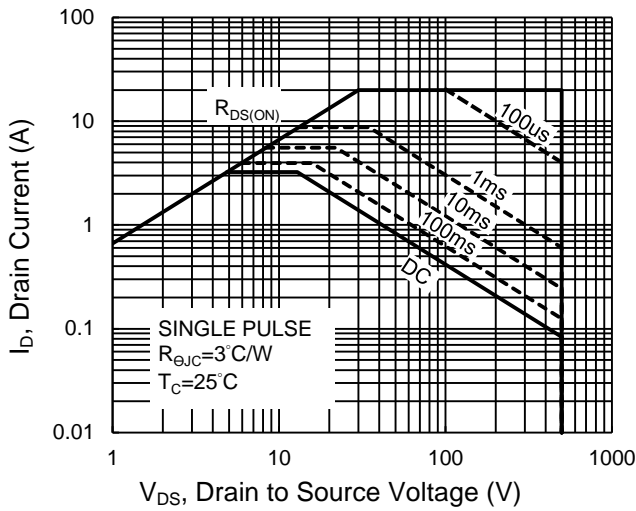
Capacitance vs. Drain-Source Voltage



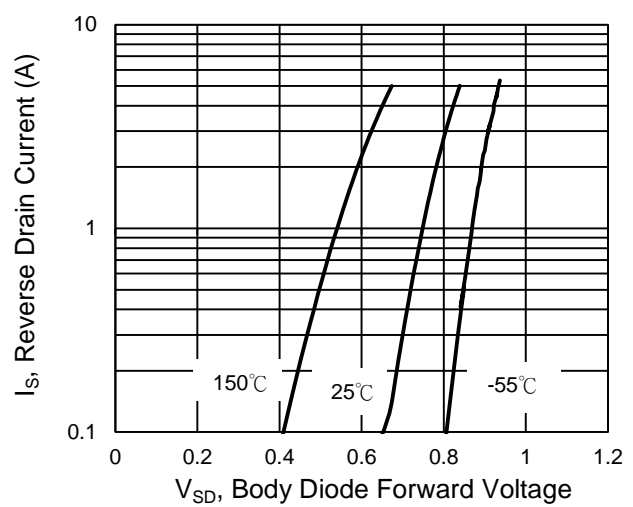
BV_{DSS} vs. Junction Temperature



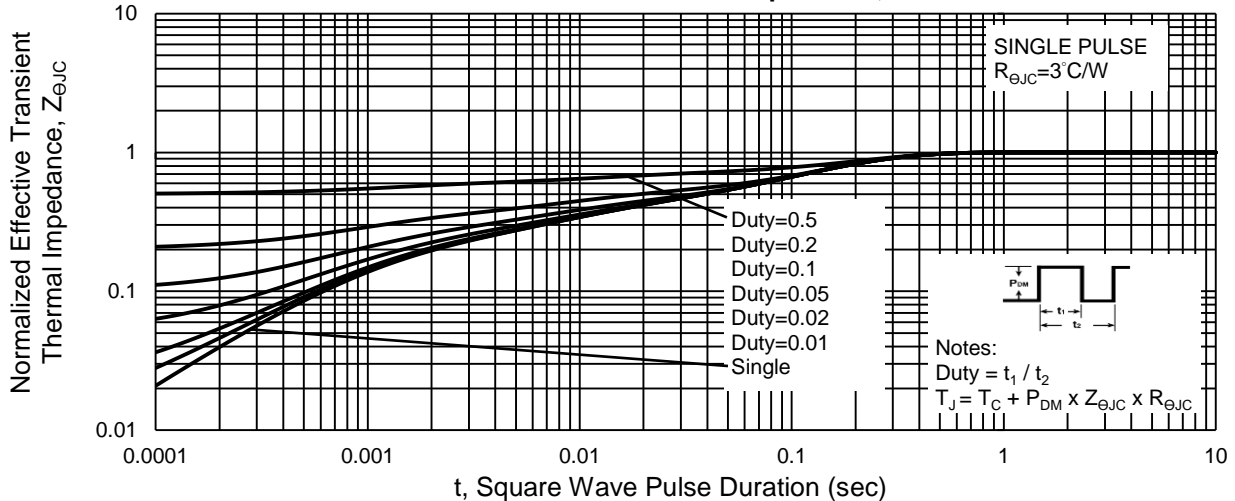
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage

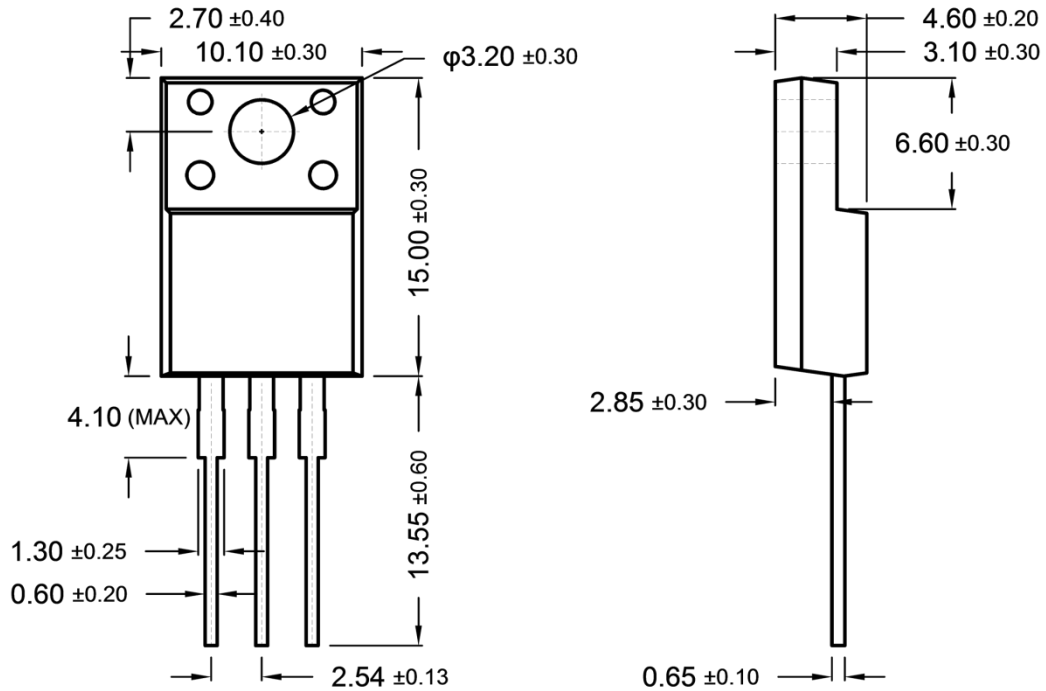


Normalized Thermal Transient Impedance, Junction-to-Case

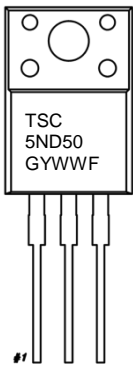


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

ITO-220



MARKING DIAGRAM



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

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