

N-Channel Power MOSFET

500V, 5A, 1.38Ω

FEATURES

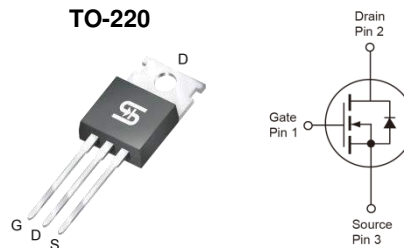
- 100% UIS and R_g tested
- Advanced planar process
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

KEY PERFORMANCE PARAMETERS

| PARAMETER | VALUE | UNIT |
|--------------------|-------|------|
| V_{DS} | 500 | V |
| $R_{DS(on)}$ (max) | 1.38 | Ω |
| Q_g | 15 | nC |

APPLICATIONS

- Power Supply
- Ballast
- UPS
- HV BLDC



ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ 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) | I_D | $T_C = 25^\circ\text{C}$ | 5 |
| | | $T_C = 100^\circ\text{C}$ | 3.2 |
| Pulsed Drain Current (Note 2) | I_{DM} | 20 | A |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | P_{DTOT} | 89 | W |
| Single Pulse Avalanche Energy (Note 3) | E_{AS} | 122.5 | mJ |
| Single Pulse Avalanche Current (Note 3) | I_{AS} | 3.5 | 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 | $R_{\theta JC}$ | 1.4 | °C/W |
| Junction to Ambient Thermal Resistance | $R_{\theta JA}$ | 62 | °C/W |

Thermal Performance Note: $R_{\theta JA}$ 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 | | | | | | |
| 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 | 4.5 | 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 (Note 4) | $V_{GS} = 10\text{V}, I_D = 2.5\text{A}$ | $R_{DS(on)}$ | -- | 1.2 | 1.38 | Ω |
| Dynamic (Note 5) | | | | | | |
| Total Gate Charge | $V_{DS} = 400\text{V}, I_D = 5\text{A},$ $V_{GS} = 10\text{V}$ | Q_g | -- | 15 | -- | nC |
| Gate-Source Charge | | Q_{gs} | -- | 4 | -- | |
| Gate-Drain Charge | | Q_{gd} | -- | 7 | -- | |
| Input Capacitance | $V_{DS} = 50\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$ | C_{iss} | -- | 586 | -- | pF |
| Output Capacitance | | C_{oss} | -- | 45 | -- | |
| Reverse Transfer Capacitance | | C_{rss} | -- | 1 | -- | |
| Gate Resistance | $f = 1.0\text{MHz}$ | R_g | -- | 2.9 | 5.8 | Ω |
| Switching (Note 6) | | | | | | |
| Turn-On Delay Time | $V_{DD} = 250\text{V}, R_G = 5\Omega,$ $I_D = 5\text{A}, V_{GS} = 10\text{V}$ | $t_{d(on)}$ | -- | 9 | -- | ns |
| Turn-On Rise Time | | t_r | -- | 22 | -- | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 14 | -- | |
| Turn-Off Fall Time | | t_f | -- | 20 | -- | |
| Source-Drain Diode | | | | | | |
| Forward Voltage (Note 4) | $I_S = 5\text{A}, V_{GS} = 0\text{V}$ | V_{SD} | -- | -- | 1.3 | V |
| Reverse Recovery Time | $I_S = 5\text{A}$ | t_{rr} | -- | 213 | -- | ns |
| Reverse Recovery Charge | $di_f/dt = 100\text{A}/\mu\text{s}$ | Q_{rr} | -- | 1.6 | -- | μC |

Notes:

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. $L = 20\text{mH}, I_{AS} = 3.5\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
4. Pulse test: $PW \leq 300\mu\text{s}$, duty cycle $\leq 2\%$
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

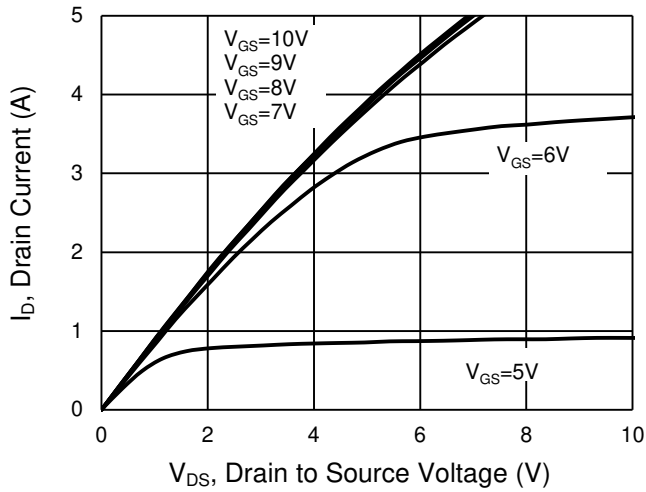
ORDERING INFORMATION

| PART NO. | PACKAGE | PACKING |
|----------------|---------|--------------|
| TSM5NC50CZ C0G | TO-220 | 50pcs / Tube |

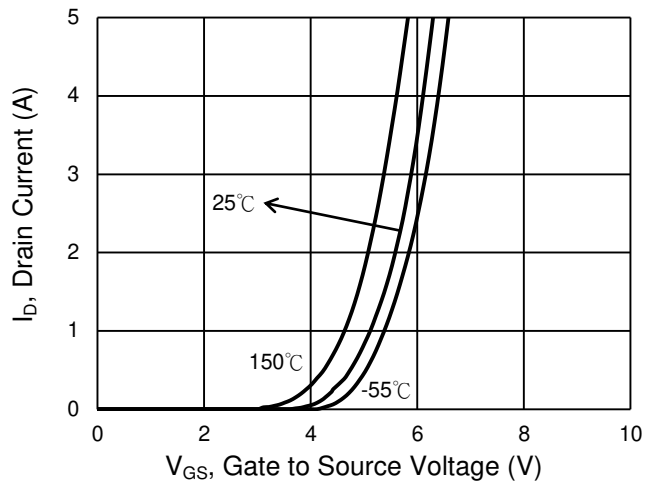
CHARACTERISTICS CURVES

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

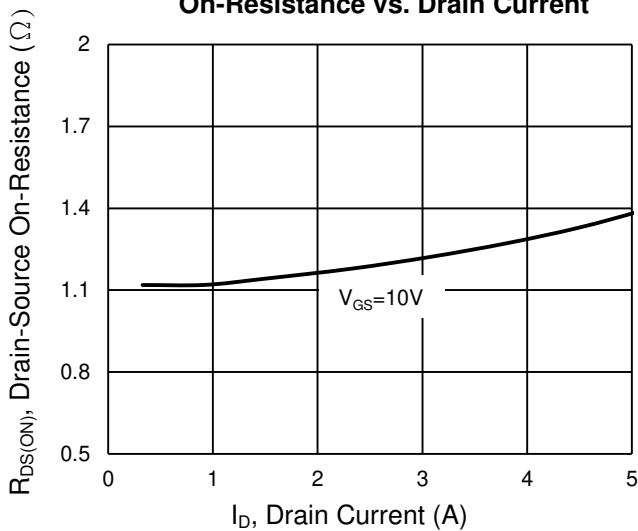
Output Characteristics



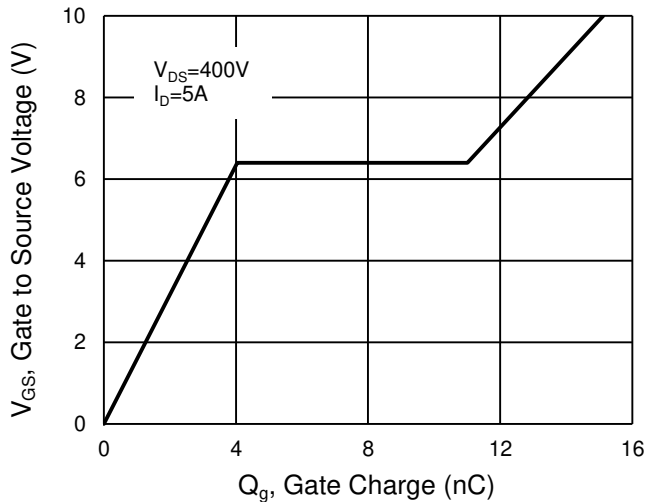
Transfer Characteristics



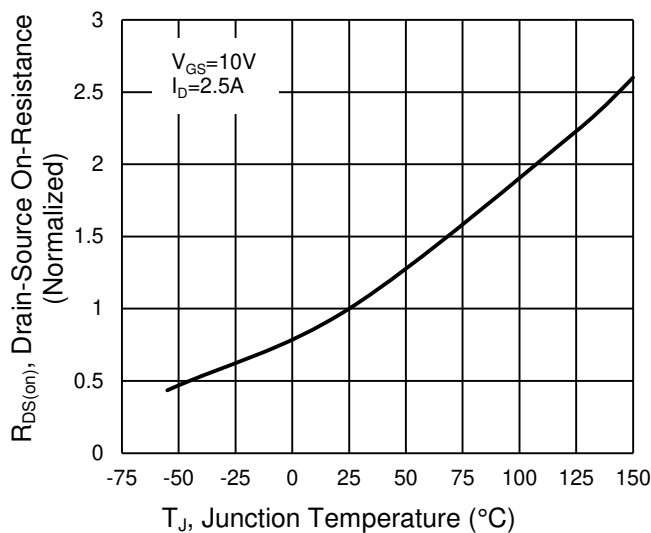
On-Resistance vs. Drain Current



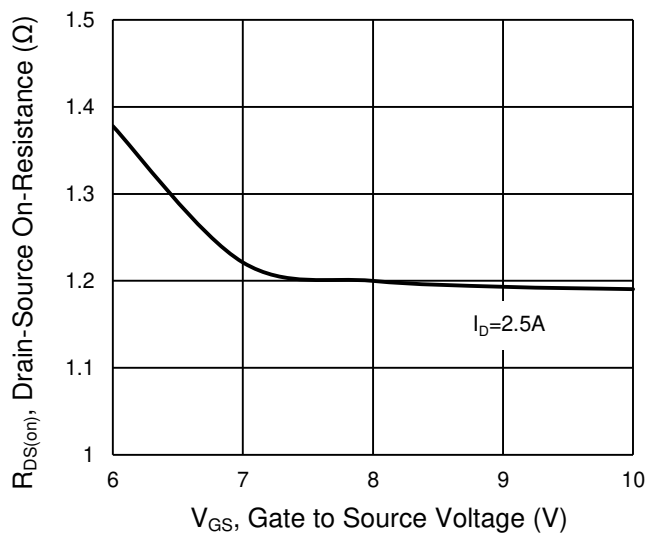
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



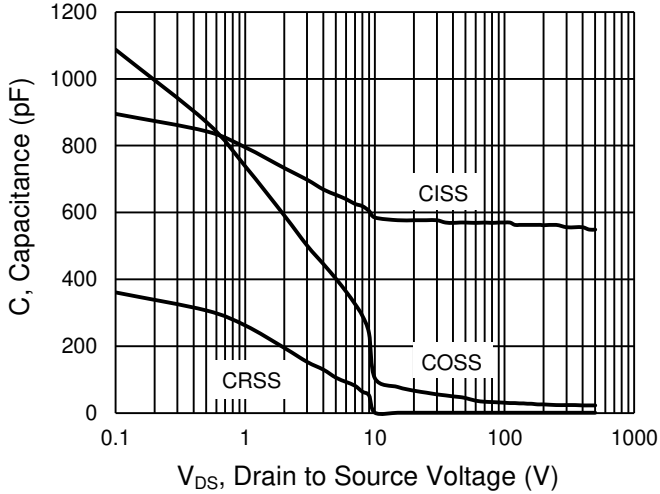
On-Resistance vs. Gate-Source Voltage



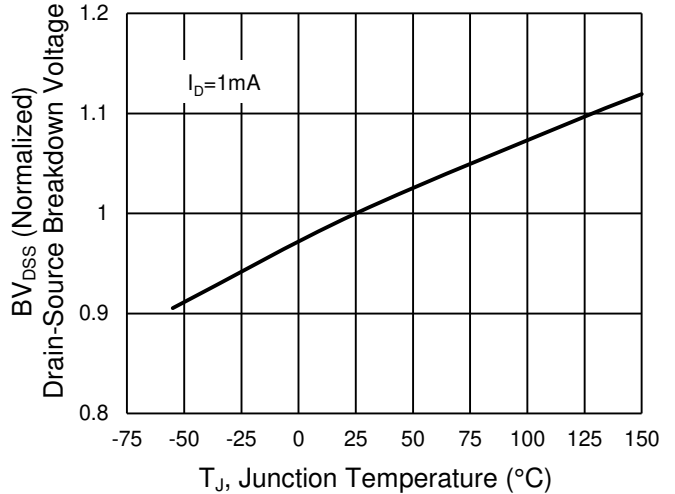
CHARACTERISTICS CURVES

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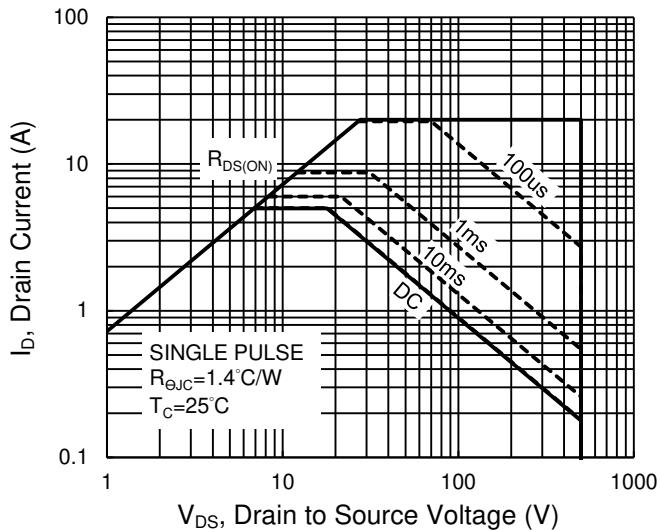
Capacitance vs. Drain-Source Voltage



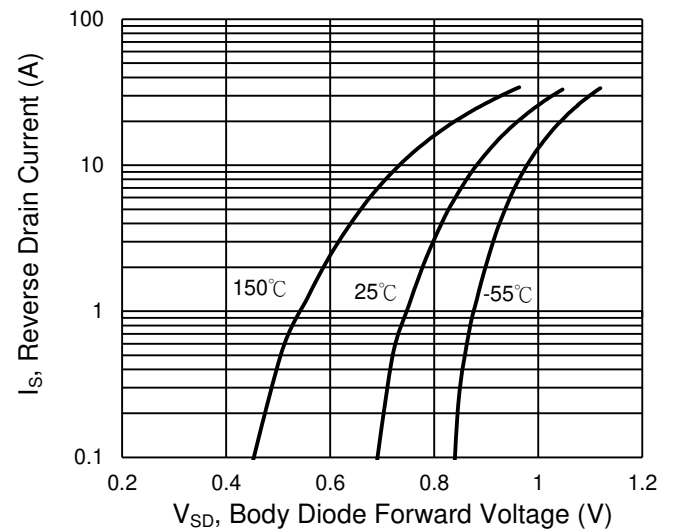
BV_{DSS} vs. Junction Temperature



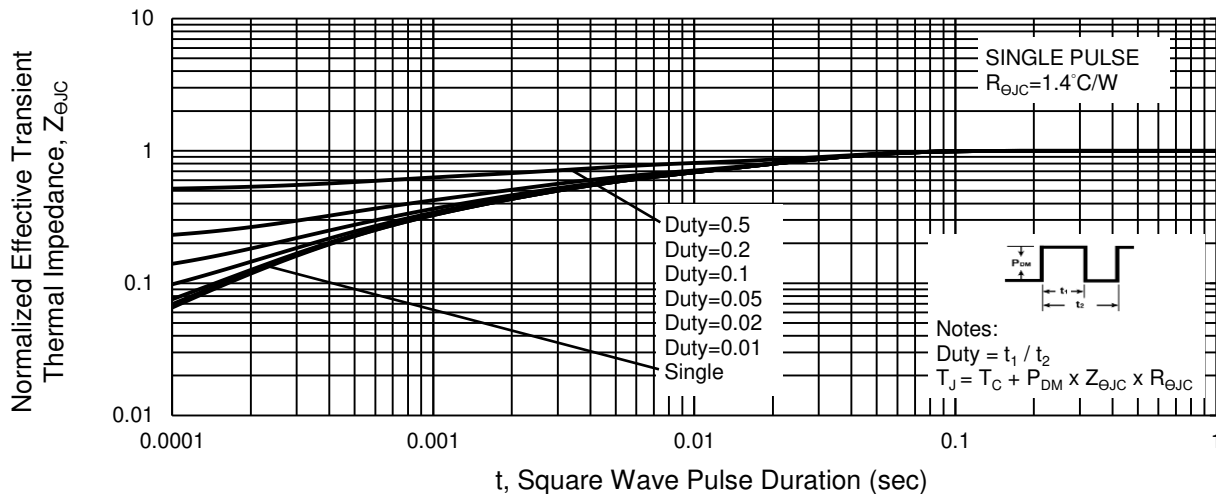
Maximum Safe Operating Area, Junction-to-Case



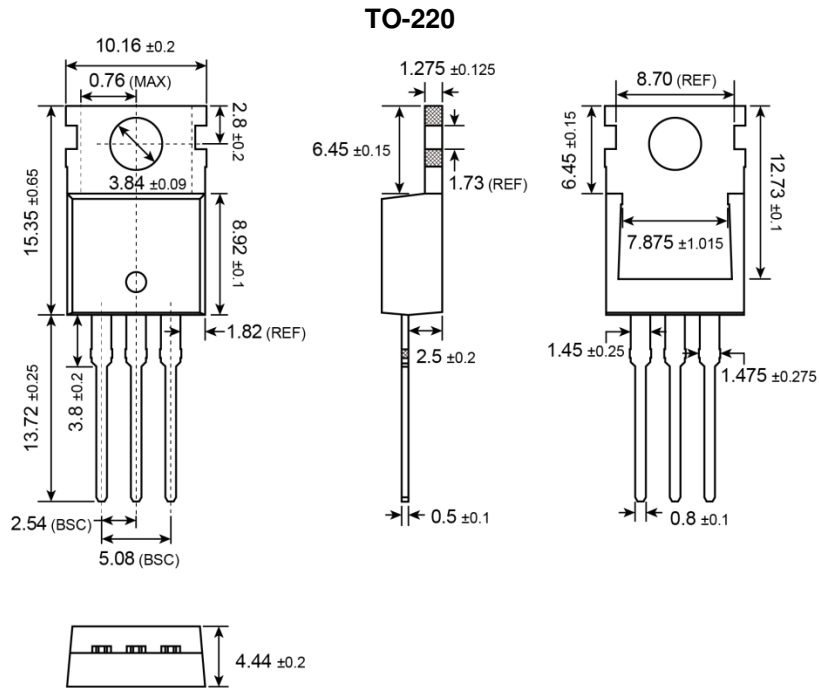
Source-Drain Diode Forward Current vs. Voltage



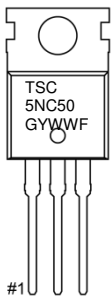
Normalized Thermal Transient Impedance, Junction-to-Case



PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)



MARKING DIAGRAM



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

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