

N-Channel Power MOSFET

600V, 38A, 99mΩ

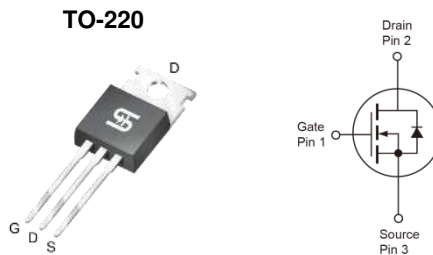
FEATURES

- Super-Junction technology
- High performance, small $R_{DS(on)} * Q_g$ figure of merit (FOM)
- High ruggedness performance
- 100% UIS and R_g tested
- 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} | 600 | V |
| $R_{DS(on)}$ (max) | 99 | mΩ |
| Q_g | 62 | nC |

APPLICATIONS

- PFC stage
- Server/Telecom Power
- Charging Station
- Inverter
- Power Supply



| ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted) | | | |
|---|----------------|---------------------------|------------------|
| PARAMETER | SYMBOL | LIMIT | UNIT |
| Drain-Source Voltage | V_{DS} | 600 | V |
| Gate-Source Voltage | V_{GS} | ± 30 | V |
| Continuous Drain Current (Note 1) | I_D | $T_C = 25^\circ\text{C}$ | 38 |
| | | $T_C = 100^\circ\text{C}$ | 24 |
| Pulsed Drain Current (Note 2) | I_{DM} | 114 | A |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | P_D | 298 | W |
| Single Pulse Avalanche Energy (Note 3) | E_{AS} | 784 | mJ |
| Single Pulse Avalanche Current (Note 3) | I_{AS} | 5.6 | A |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | - 55 to +150 | $^\circ\text{C}$ |

| THERMAL PERFORMANCE | | | |
|--|-----------------|-------|--------------------|
| PARAMETER | SYMBOL | LIMIT | UNIT |
| Junction to Case Thermal Resistance | $R_{\theta JC}$ | 0.42 | $^\circ\text{C/W}$ |
| Junction to Ambient Thermal Resistance | $R_{\theta JA}$ | 62 | $^\circ\text{C/W}$ |

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.

| 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} | 600 | -- | -- | V |
| Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ | $V_{GS(TH)}$ | 2 | 3 | 4 | V |
| Gate Body Leakage | $V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$ | I_{GSS} | -- | -- | ± 100 | nA |
| Zero Gate Voltage Drain Current | $V_{DS} = 600\text{V}, V_{GS} = 0\text{V}$ | I_{DSS} | -- | -- | 1 | μA |
| Drain-Source On-State Resistance (Note 4) | $V_{GS} = 10\text{V}, I_D = 11.3\text{A}$ | $R_{DS(on)}$ | -- | 86 | 99 | m Ω |
| Dynamic (Note 5) | | | | | | |
| Total Gate Charge | $V_{DS} = 480\text{V}, I_D = 34\text{A},$ $V_{GS} = 10\text{V}$ | Q_g | -- | 62 | -- | nC |
| Gate-Source Charge | | Q_{gs} | -- | 17 | -- | |
| Gate-Drain Charge | | Q_{gd} | -- | 25 | -- | |
| Input Capacitance | $V_{DS} = 100\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$ | C_{iss} | -- | 2587 | -- | pF |
| Output Capacitance | | C_{oss} | -- | 123 | -- | |
| Reverse Transfer Capacitance | | C_{rss} | -- | 20 | -- | |
| Gate Resistance | $f = 1.0\text{MHz}$ | R_g | -- | 3.3 | 6.6 | Ω |
| Switching (Note 6) | | | | | | |
| Turn-On Delay Time | $V_{DD} = 300\text{V},$ $R_{GEN} = 5\Omega,$ $I_D = 17\text{A}, V_{GS} = 10\text{V},$ | $t_{d(on)}$ | -- | 18 | -- | ns |
| Turn-On Rise Time | | t_r | -- | 24 | -- | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 87 | -- | |
| Turn-Off Fall Time | | t_f | -- | 25 | -- | |
| Source-Drain Diode | | | | | | |
| Body-Diode Continuous Forward Current | | I_S | -- | -- | 38 | A |
| Body-Diode Pulsed Current | | I_{SM} | -- | -- | 114 | A |
| Forward Voltage (Note 4) | $I_S = 34\text{A}, V_{GS} = 0\text{V}$ | V_{SD} | -- | -- | 1.4 | V |
| Reverse Recovery Time | $I_S = 17\text{A}$ $di_f/dt = 100\text{A}/\mu\text{s}$ | t_{rr} | -- | 342 | -- | ns |
| Reverse Recovery Charge | | Q_{rr} | -- | 5.3 | -- | μC |

Notes:

- Current limited by package.
- Pulse width limited by the maximum junction temperature.
- $L = 50\text{mH}, I_{AS} = 5.6\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega,$ 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.

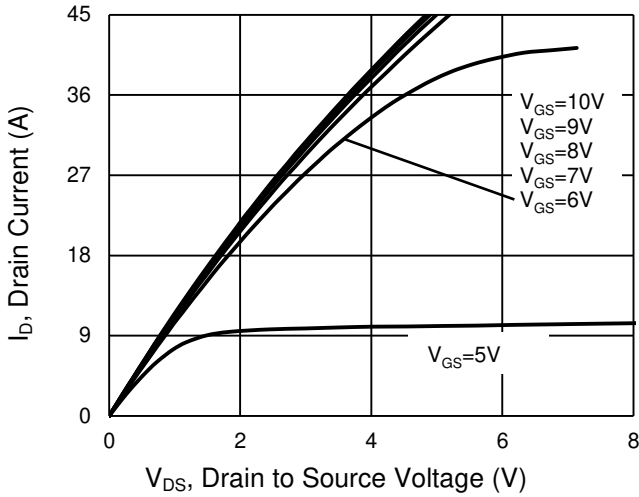
ORDERING INFORMATION

| PART NO. | PACKAGE | PACKING |
|------------------|---------|--------------|
| TSM60NB099CZ C0G | TO-220 | 50pcs / Tube |

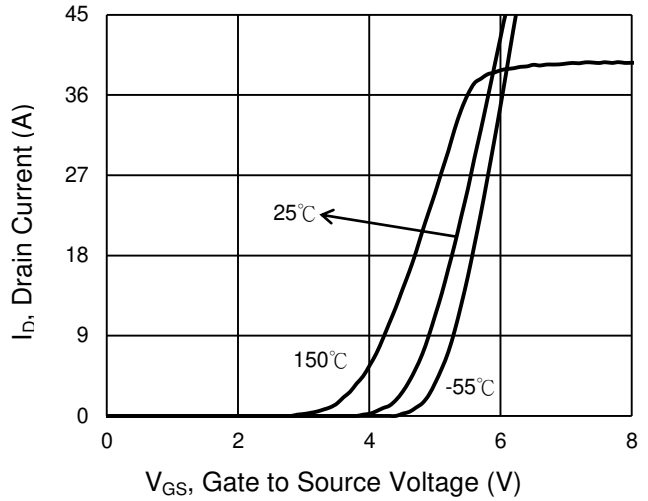
CHARACTERISTICS CURVES

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

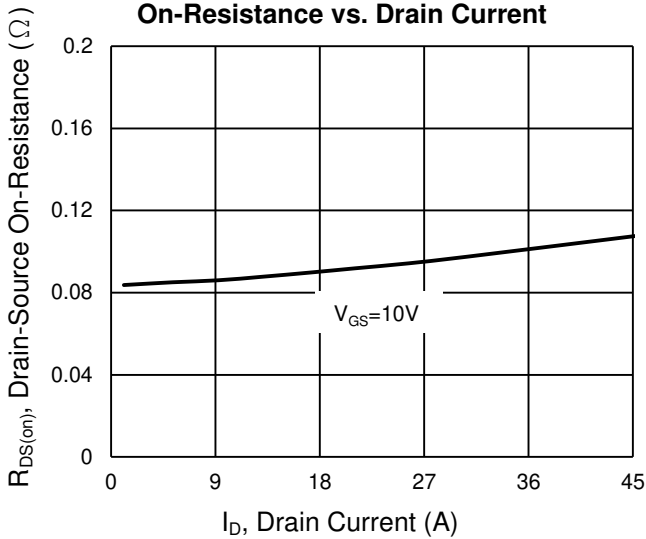
Output Characteristics



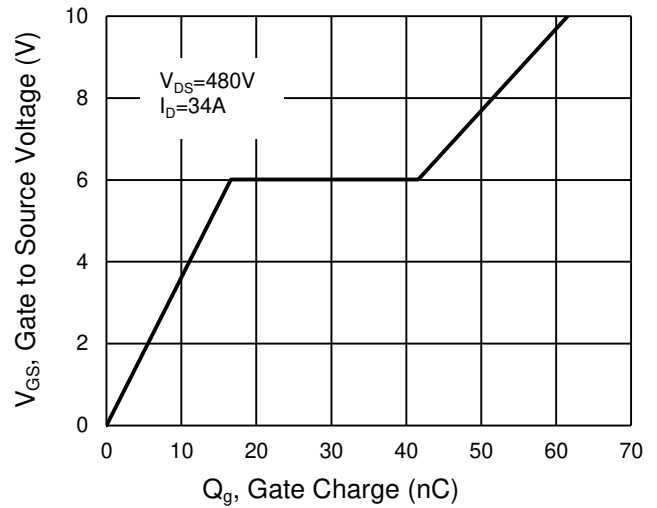
Transfer Characteristics



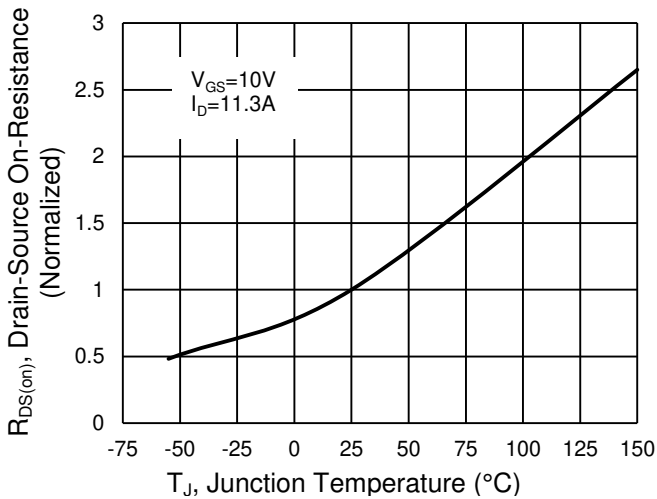
On-Resistance vs. Drain Current



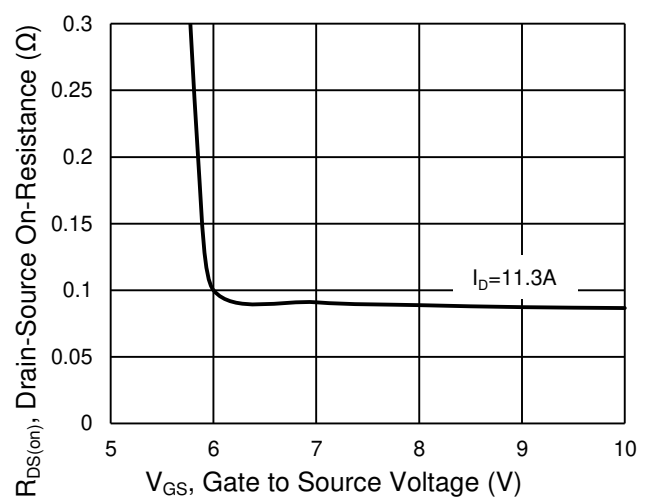
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



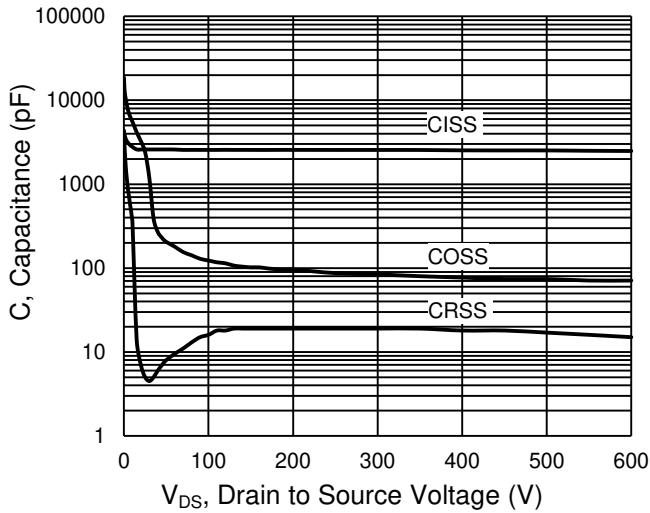
On-Resistance vs. Gate-Source Voltage



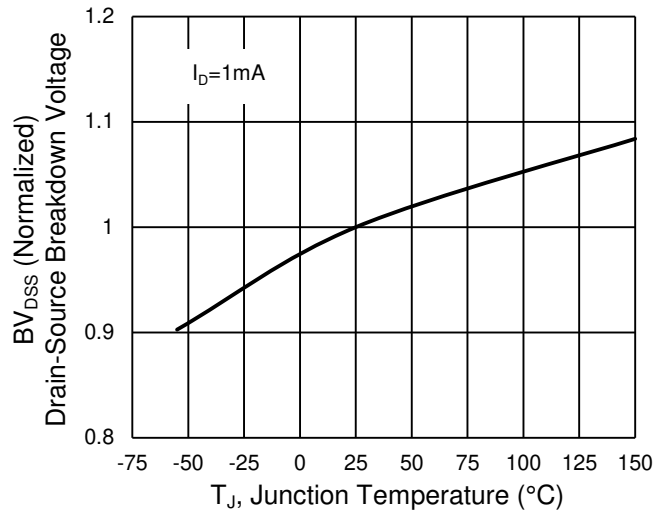
CHARACTERISTICS CURVES

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

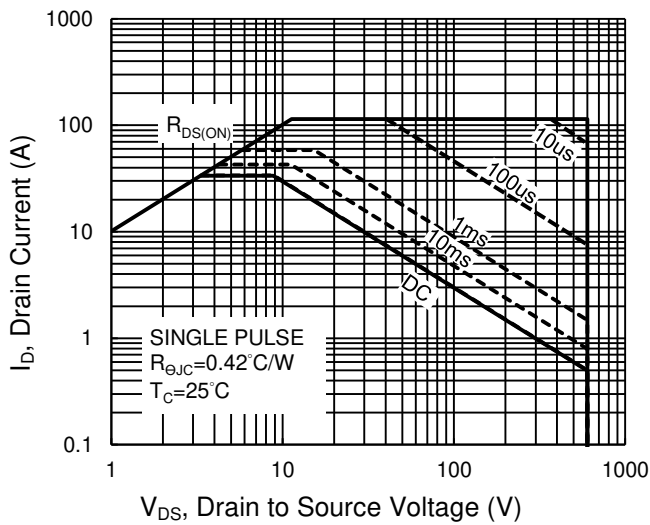
Capacitance vs. Drain-Source Voltage



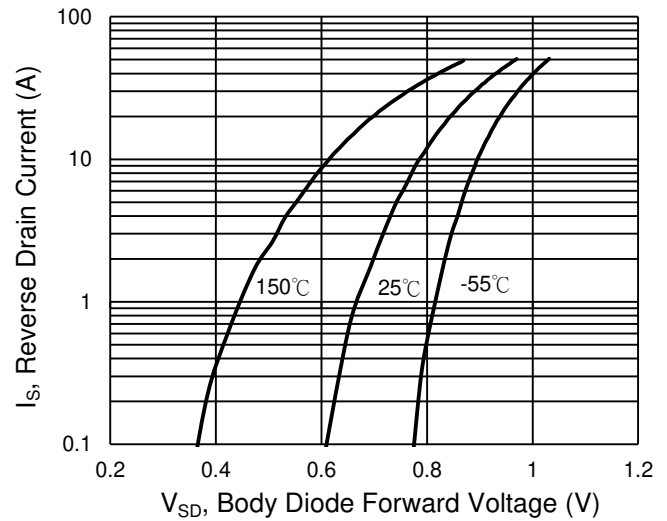
BV_{DSS} vs. Junction Temperature



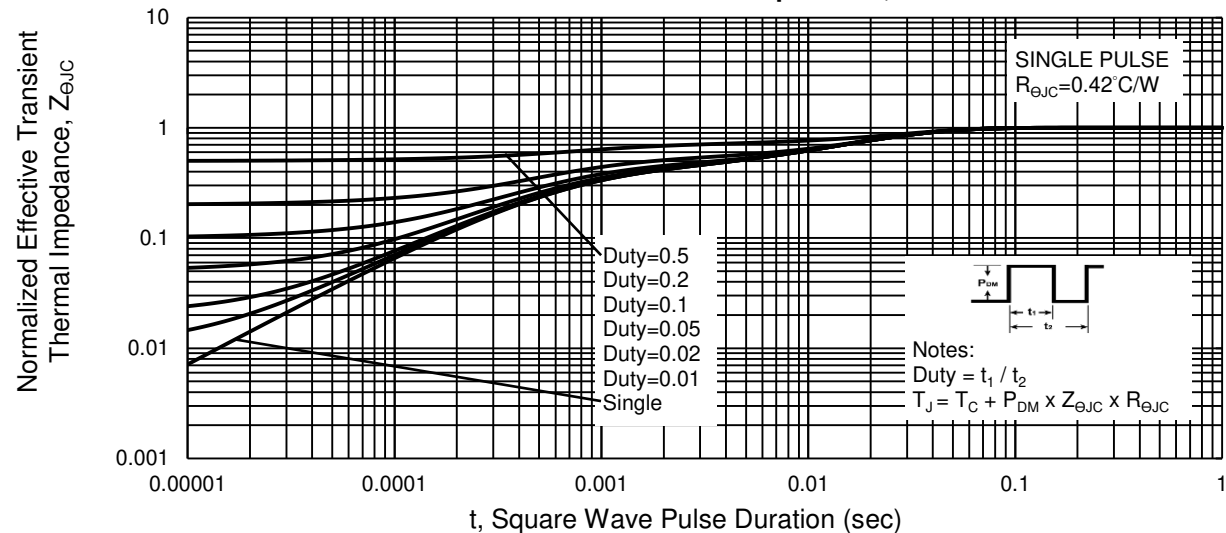
Maximum Safe Operating Area, Junction-to-Case



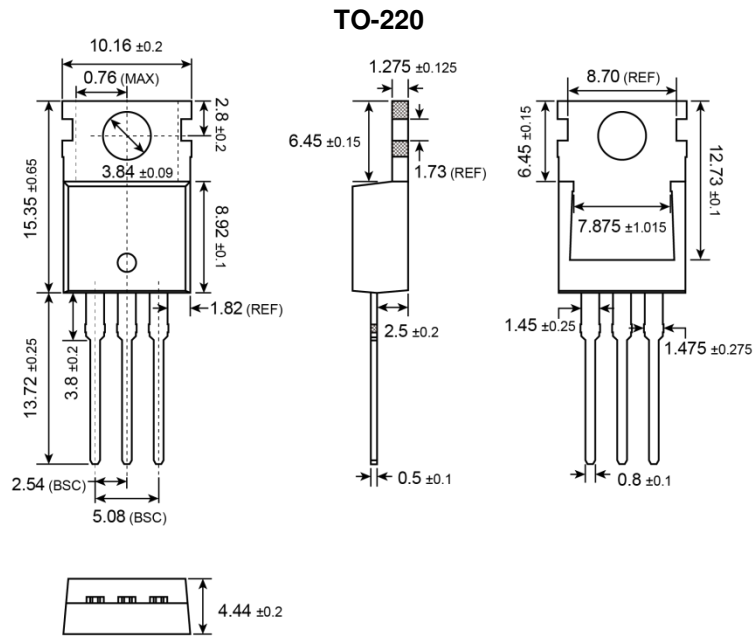
Source-Drain Diode Forward Current vs. Voltage



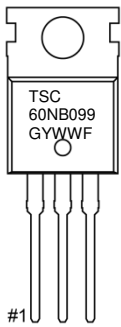
Normalized Thermal Transient Impedance, Junction-to-Case



PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)



MARKING DIAGRAM



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

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