

AUTOMOTIVE N-Channel 60V 175°C MOSFET

FEATURES

- AEC-Q101 Qualified
- 100% UIS and R_g Tested
- 175°C Operating Junction Temperature
- Wettable Flank Package
- RoHS Compliant
- Halogen-free according to IEC 61249-2-21

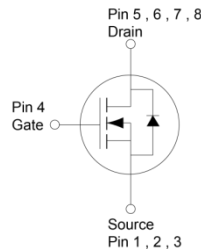
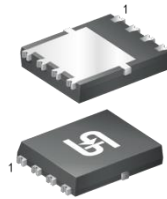
APPLICATIONS

- 12V Automotive Systems
- Solenoid and Motor Control
- Automotive Transmission Control
- DC-DC Converters

| PRODUCT SUMMARY | | |
|---------------------------|-----------------------|------|
| PARAMETER | VALUE | UNIT |
| V _{DS} | 60 | V |
| R _{DS(on)} (max) | V _{GS} = 10V | 30 |
| | V _{GS} = 7V | 42.3 |
| Q _g | 20 | nC |



PDFN56U



Note: MSL 1 (Moisture Sensitivity Level) per J-STD-020

| ABSOLUTE MAXIMUM RATINGS (T _A = 25°C unless otherwise noted) | | | |
|---|-----------------------------------|------------------------|------|
| PARAMETER | SYMBOL | LIMIT | UNIT |
| Drain-Source Voltage | V _{DS} | 60 | V |
| Gate-Source Voltage | V _{GS} | ±20 | V |
| Continuous Drain Current (Note 1) | I _D | T _C = 25°C | 27 |
| | | T _A = 25°C | 6 |
| Pulsed Drain Current | I _{DM} | 108 | A |
| Single Pulse Avalanche Current (Note 2) | I _{AS} | 12 | A |
| Single Pulse Avalanche Energy (Note 2) | E _{AS} | 21.6 | mJ |
| Total Power Dissipation | P _D | T _C = 25°C | 56 |
| | | T _C = 125°C | 19 |
| Total Power Dissipation | P _D | T _A = 25°C | 3.1 |
| | | T _A = 125°C | 1 |
| Operating Junction and Storage Temperature Range | T _J , T _{STG} | - 55 to +175 | °C |

| THERMAL RESISTANCE | | | |
|--|------------------|---------|------|
| PARAMETER | SYMBOL | MAXIMUM | UNIT |
| Thermal Resistance – Junction to Case | R _{θJC} | 2.7 | °C/W |
| Thermal Resistance – Junction to Ambient | R _{θJA} | 48 | °C/W |

Thermal Performance Note: 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_{θJC} is guaranteed by design while R_{θCA} is determined by the user's board design. The R_{θJA} limit presented here is based on mounting on a 1 in² pad of 2 oz copper.

| ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ 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} | 60 | -- | -- | V |
| Gate Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$ | $V_{GS(TH)}$ | 1.8 | 2.6 | 3.8 | V |
| Gate-Source Leakage Current | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$ | I_{GSS} | -- | -- | ± 100 | nA |
| Drain-Source Leakage Current | $V_{GS} = 0\text{V}, V_{DS} = 60\text{V}$ | I_{DSS} | -- | -- | 1 | μA |
| | $V_{GS} = 0\text{V}, V_{DS} = 60\text{V}$ $T_J = 125^\circ\text{C}$ | | -- | -- | 100 | |
| | $V_{GS} = 0\text{V}, V_{DS} = 60\text{V}$ $T_J = 175^\circ\text{C}$ | | -- | -- | 500 | |
| Drain-Source On-State Resistance (Note 3) | $V_{GS} = 10\text{V}, I_D = 6\text{A}$ | $R_{DS(on)}$ | -- | 25 | 30 | m Ω |
| | $V_{GS} = 10\text{V}, I_D = 6\text{A},$ $T_J = 125^\circ\text{C}$ | | -- | 49.3 | 59.1 | |
| | $V_{GS} = 10\text{V}, I_D = 6\text{A},$ $T_J = 175^\circ\text{C}$ | | -- | 65 | 78 | |
| | $V_{GS} = 7\text{V}, I_D = 5\text{A}$ | | -- | 26 | 42.3 | |
| Forward Transconductance (Note 3) | $V_{DS} = 10\text{V}, I_D = 6\text{A}$ | g_{fs} | -- | 30 | -- | S |
| Dynamic (Note 4) | | | | | | |
| Total Gate Charge | $V_{GS} = 10\text{V}, V_{DS} = 30\text{V},$ $I_D = 6\text{A}$ | Q_g | -- | 20 | -- | nC |
| Total Gate Charge | $V_{GS} = 7\text{V}, V_{DS} = 30\text{V},$ $I_D = 5\text{A}$ | Q_g | -- | 14 | -- | |
| Gate-Source Charge | | Q_{gs} | -- | 5 | -- | |
| Gate-Drain Charge | | Q_{gd} | -- | 6 | -- | |
| Input Capacitance | $V_{GS} = 0\text{V}, V_{DS} = 30\text{V},$ $f = 1.0\text{MHz}$ | C_{iss} | -- | 1009 | -- | pF |
| Output Capacitance | | C_{oss} | -- | 74 | -- | |
| Reverse Transfer Capacitance | | C_{rss} | -- | 23 | -- | |
| Gate Resistance | $f = 1.0\text{MHz}$ | R_g | 0.7 | 2.2 | 4.4 | Ω |
| Switching (Note 4) | | | | | | |
| Turn-On Delay Time | $V_{GS} = 10\text{V}, V_{DS} = 30\text{V},$ $I_D = 6\text{A}, R_G = 2\Omega$ | $t_{d(on)}$ | -- | 3 | -- | ns |
| Rise Time | | t_r | -- | 21 | -- | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 10 | -- | |
| Fall Time | | t_f | -- | 15 | -- | |
| Source-Drain Diode | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{GS} = 0\text{V}, I_S = 6\text{A}$ | V_{SD} | -- | -- | 1.2 | V |
| Reverse Recovery Time | $I_S = 6\text{A},$ $di/dt = 100\text{A}/\mu\text{s}$ | t_{rr} | -- | 17 | -- | ns |
| Reverse Recovery Charge | | Q_{rr} | -- | 13 | -- | nC |

Notes:

1. Silicon limited current only.
2. $L = 0.3\text{mH}, V_{GS} = 10\text{V}, V_{DD} = 30\text{V}, R_G = 50\Omega, I_{AS} = 12\text{A},$ Starting $T_J = 25^\circ\text{C}$
3. Pulse test: Pulse Width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
4. Switching time is essentially independent of operating temperature.

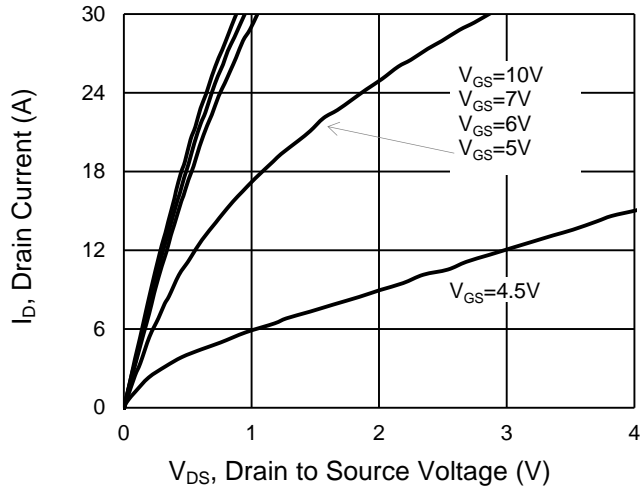
ORDERING INFORMATION

| ORDERING CODE | PACKAGE | PACKING |
|----------------------|----------------|---------------------|
| TQM300NB06CR RLG | PDFN56U | 2,500pcs / 13" Reel |

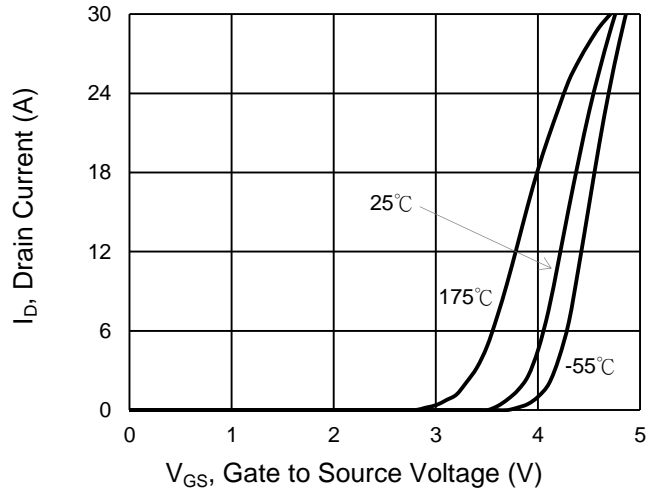
CHARACTERISTICS CURVES

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

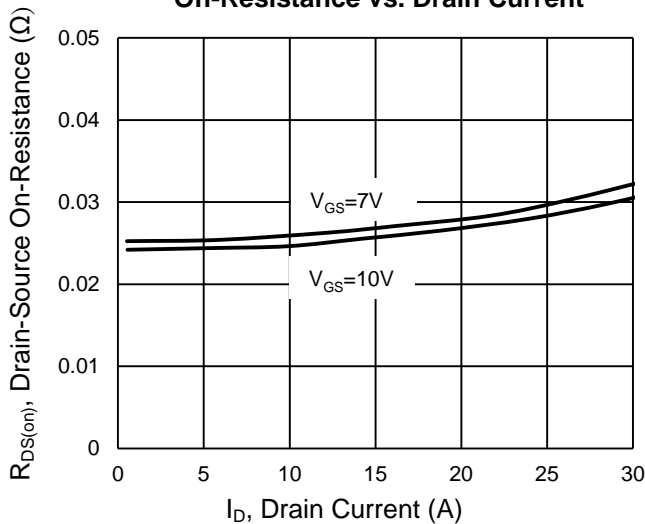
Output Characteristics



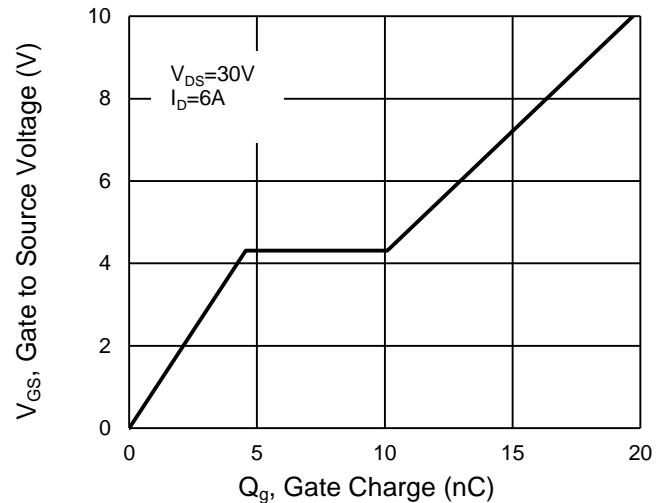
Transfer Characteristics



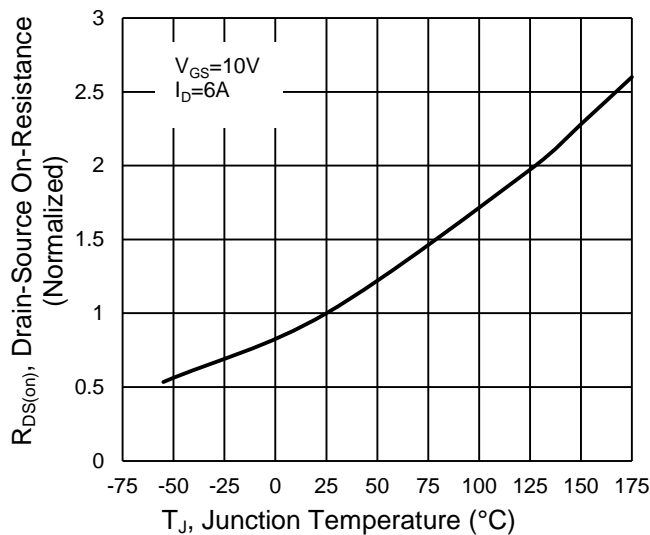
On-Resistance vs. Drain Current



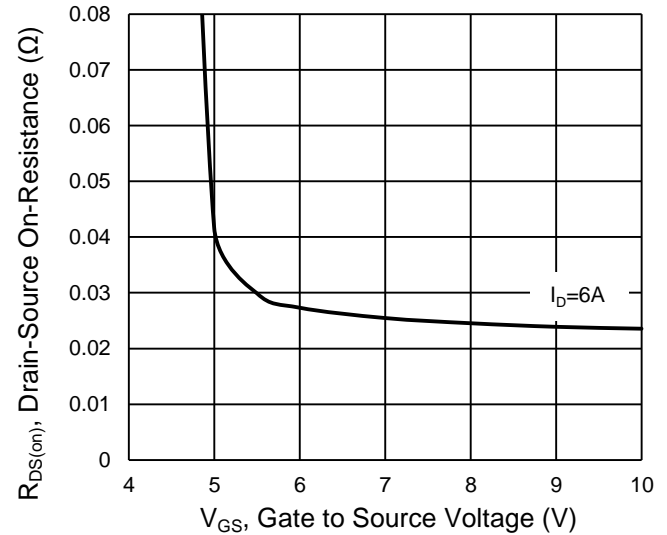
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature

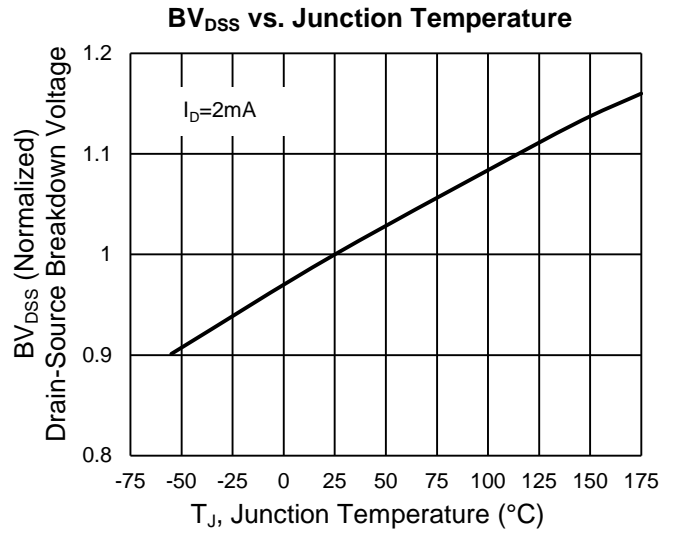
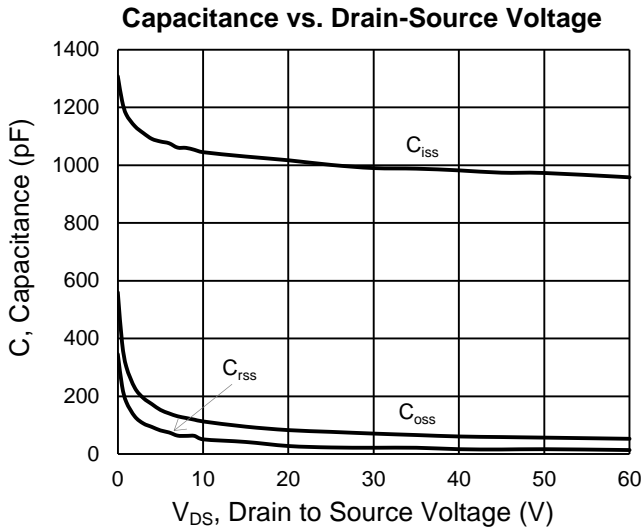


On-Resistance vs. Gate-Source Voltage

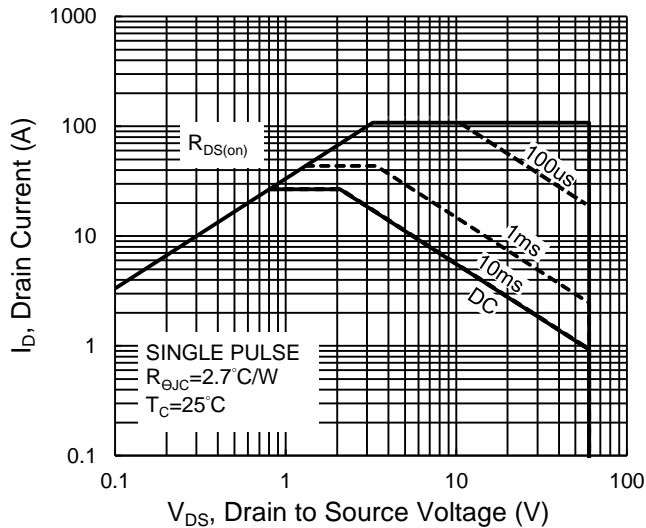


CHARACTERISTICS CURVES

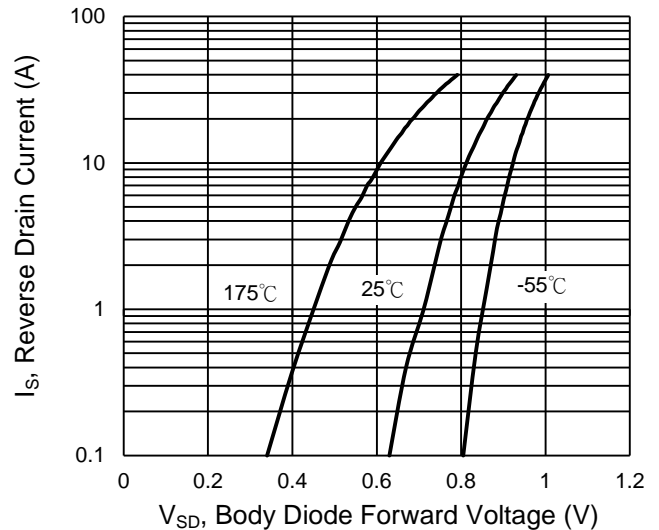
($T_A = 25^\circ\text{C}$ unless otherwise noted)



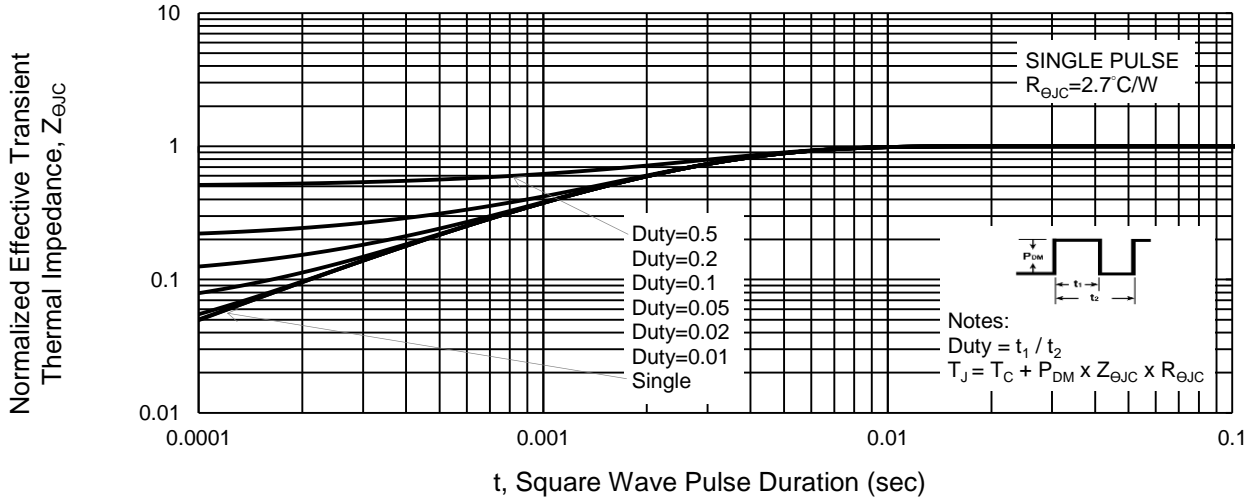
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage

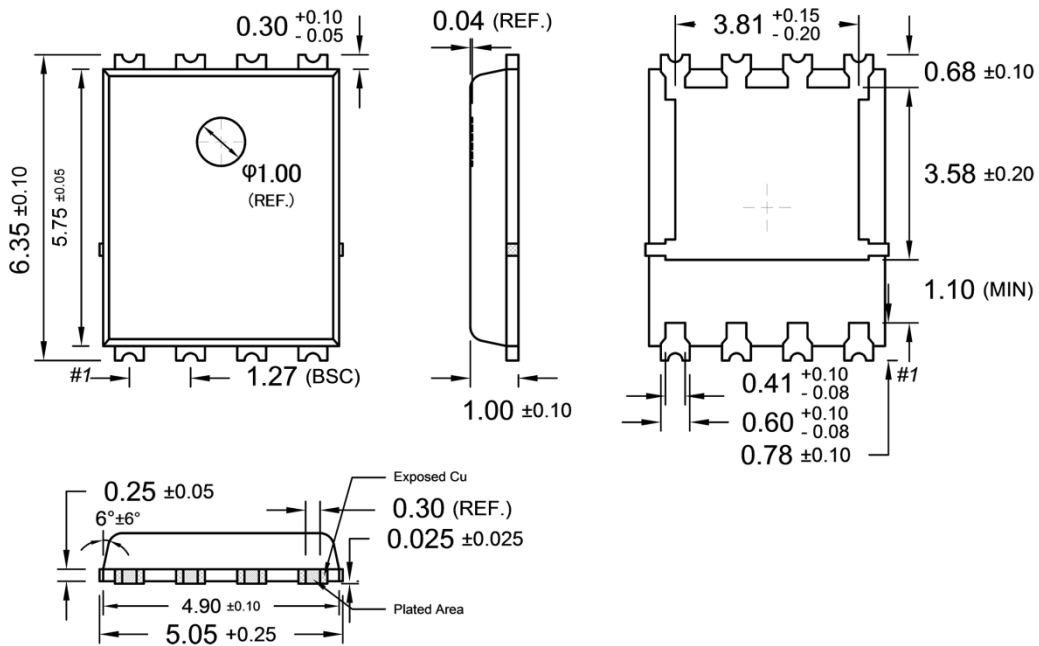


Normalized Thermal Transient Impedance, Junction-to-Case

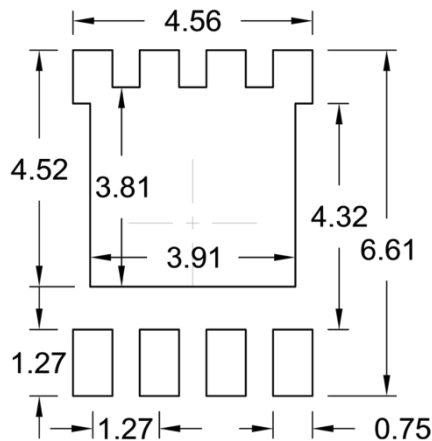


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

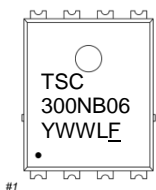
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SUGGESTED PAD LAYOUT (Unit: Millimeters)



MARKING DIAGRAM



- Y** = Year Code
- WW** = Week Code (01~52)
- L** = Lot Code (1~9, A~Z)
- F** = Factory Code
- = AEC-Q101 Qualified

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