

PerFET™ Power Transistor

FEATURES

- Excellent FOM
- AEC-Q101 Qualified
- Wettable Flank leads for Enhanced AOI
- 100% UIS and Rg tested
- 175°C Operating Junction Temperature
- RoHS Compliant
- Halogen-Free

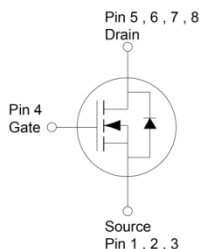
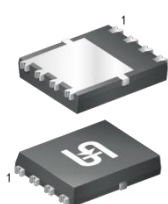
APPLICATIONS

- Automotive Applications
- Solenoid and Motor Drivers
- DC-DC Converters

| PRODUCT SUMMARY | | | |
|--------------------|-----------------|------|----|
| PARAMETER | VALUE | UNIT | |
| V_{DS} | 40 | V | |
| $R_{DS(on)}$ (max) | $V_{GS} = 10V$ | 4.3 | mΩ |
| | $V_{GS} = 4.5V$ | 6 | |
| Q_g | $V_{GS} = 4.5V$ | 20 | nC |



PDFN56U



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

| ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ C$ unless otherwise noted) | | | | |
|---|---------------------|--------------|------------|---|
| PARAMETER | SYMBOL | LIMIT | UNIT | |
| Drain-Source Voltage | V_{DS} | 40 | V | |
| Gate-Source Voltage | V_{GS} | ± 16 | V | |
| Continuous Drain Current, Silicon limited | $T_C = 25^\circ C$ | I_D | 113 | A |
| Continuous Drain Current (Note 1) | $T_C = 25^\circ C$ | I_D | 54 | A |
| | $T_C = 100^\circ C$ | | 54 | |
| | $T_A = 25^\circ C$ | | 20 | |
| Pulsed Drain Current (Note 2) | I_{DM} | 216 | A | |
| Single Pulse Avalanche Current (Note 3) | I_{AS} | 25.6 | A | |
| Single Pulse Avalanche Energy (Note 3) | E_{AS} | 98.3 | mJ | |
| Total Power Dissipation | $T_C = 25^\circ C$ | P_D | 100 | W |
| | $T_C = 125^\circ C$ | | 33 | |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | - 55 to +175 | $^\circ C$ | |

| THERMAL RESISTANCE | | | |
|---|-----------------|---------|--------------|
| PARAMETER | SYMBOL | MAXIMUM | UNIT |
| Thermal Resistance – Junction to Case | $R_{\theta JC}$ | 1.5 | $^\circ C/W$ |
| Thermal Resistance – Junction to Ambient (Note 4) | $R_{\theta JA}$ | 50 | $^\circ C/W$ |

NOTE:

1. Package current limit.
2. Pulse Width $\leq 100\mu s$.
3. $L = 0.3mH$, $V_{GS} = 10V$, $R_G = 25\Omega$, Starting $T_J = 25^\circ C$.
4. Device on a PCB FR4 with 1 in² (single layer, 2 oz thick) copper area for drain connection.

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

| PARAMETER | CONDITIONS | SYMBOL | MIN | TYP | MAX | UNIT |
|--|---|--------------|-----|------|-----------|------------|
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS} = 0V, I_D = 1mA$ | BV_{DSS} | 40 | -- | -- | V |
| Gate Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250\mu A$ | $V_{GS(TH)}$ | 1.4 | 1.8 | 2.2 | V |
| Gate-Source Leakage Current | $V_{GS} = \pm 16V, V_{DS} = 0V$ | I_{GSS} | -- | -- | ± 100 | nA |
| Drain-Source Leakage Current | $V_{GS} = 0V, V_{DS} = 40V$ | I_{DSS} | -- | -- | 1 | μA |
| Drain-Source On-State Resistance (Note 5) | $V_{GS} = 10V, I_D = 27A$ | $R_{DS(on)}$ | -- | 2.9 | 4.3 | m Ω |
| | $V_{GS} = 4.5V, I_D = 27A$ | | -- | 3.7 | 6 | |
| Forward Transconductance (Note 5) | $V_{DS} = 10V, I_D = 7A$ | g_{fs} | -- | 65 | -- | S |
| Dynamic (Note 6) | | | | | | |
| Total Gate Charge | $V_{GS} = 4.5V, V_{DS} = 25V,$ $I_D = 20A$ | Q_g | -- | 20 | 30 | nC |
| Total Gate Charge | $V_{GS} = 10V, V_{DS} = 25V,$ $I_D = 20A$ | Q_g | -- | 42 | 63 | |
| Gate-Source Charge | | Q_{gs} | -- | 8 | 16 | |
| Gate-Drain Charge | | Q_{gd} | -- | 6 | 12 | |
| Input Capacitance | $V_{GS} = 0V, V_{DS} = 25V,$ $f = 1.0MHz$ | C_{iss} | -- | 2559 | 3839 | pF |
| Output Capacitance | | C_{oss} | -- | 461 | 922 | |
| Reverse Transfer Capacitance | | C_{rss} | -- | 37 | 74 | |
| Gate Resistance | $f = 1.0MHz$ | R_g | -- | 0.7 | -- | Ω |
| Switching (Note 7) | | | | | | |
| Turn-On Delay Time | $V_{GS} = 10V, V_{DS} = 25V,$ $I_D = 20A, R_G = 0.7\Omega$ | $t_{d(on)}$ | -- | 10 | -- | ns |
| Rise Time | | t_r | -- | 59 | -- | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 27 | -- | |
| Fall Time | | t_f | -- | 13 | -- | |
| Source-Drain Diode | | | | | | |
| Diode Forward Voltage (Note 5) | $V_{GS} = 0V, I_S = 27A$ | V_{SD} | -- | -- | 1.1 | V |
| Reverse Recovery Time | $I_S = 20A,$ $di/dt = 100A/\mu s$ | t_{rr} | -- | 37 | -- | ns |
| Reverse Recovery Charge | | Q_{rr} | -- | 31 | -- | nC |

Notes:

- Pulse test: Pulse Width $\leq 300\mu s$, duty cycle $\leq 2\%$.
- Defined by design. Not subject to production test.
- Switching time is essentially independent of operating temperature.

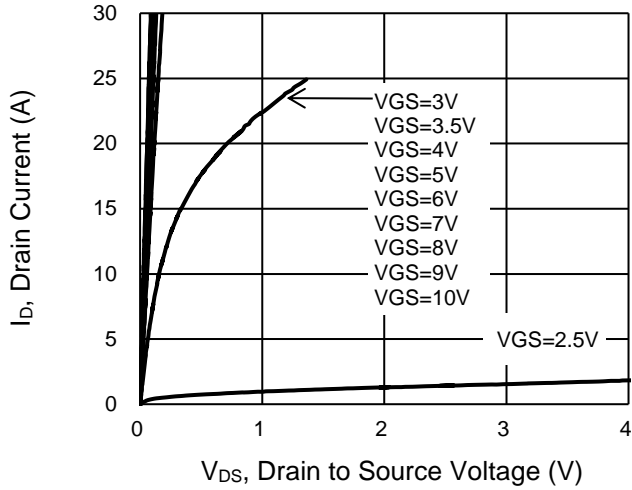
ORDERING INFORMATION

| ORDERING CODE | PACKAGE | PACKING |
|-------------------|---------|---------------------|
| TQM043NH04LCR RLG | PDFN56U | 2,500pcs / 13" Reel |

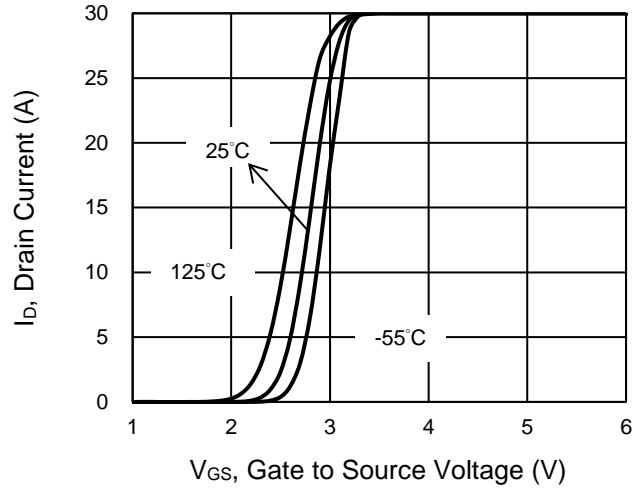
CHARACTERISTICS CURVES

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

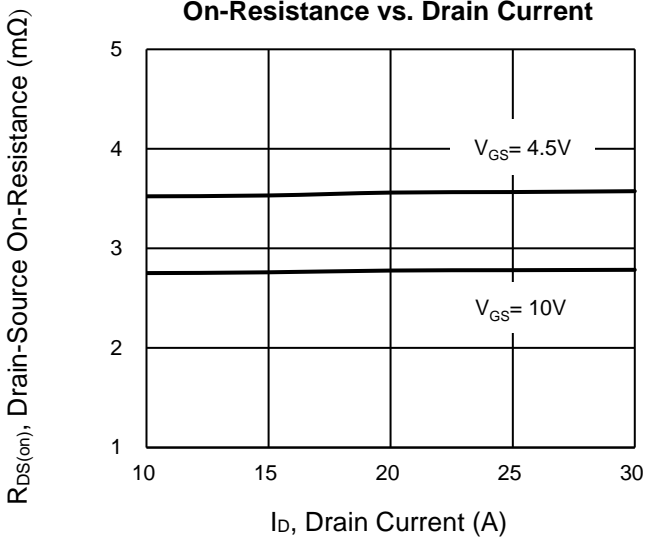
Output Characteristics



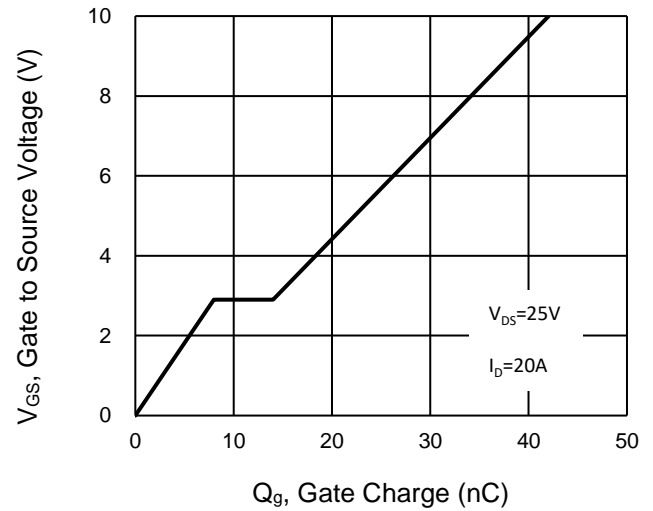
Transfer Characteristics



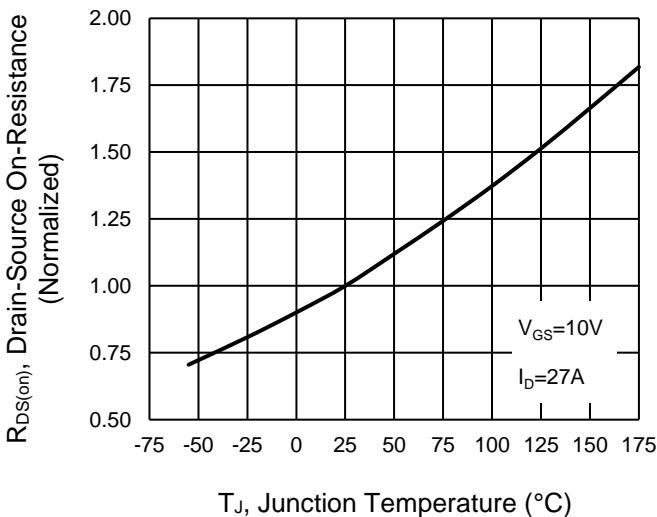
On-Resistance vs. Drain Current



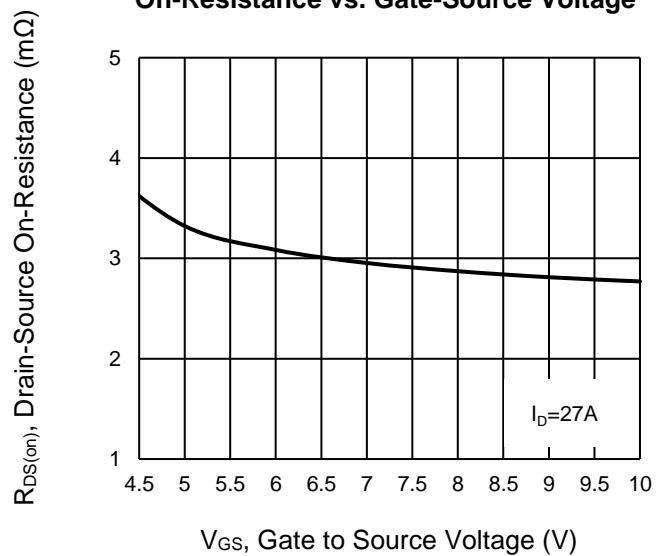
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



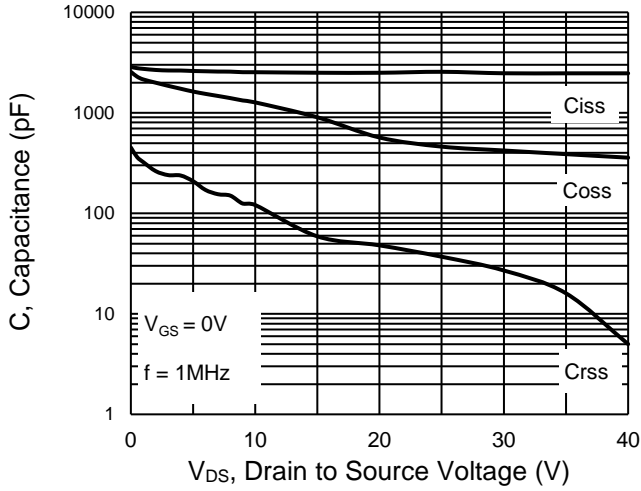
On-Resistance vs. Gate-Source Voltage



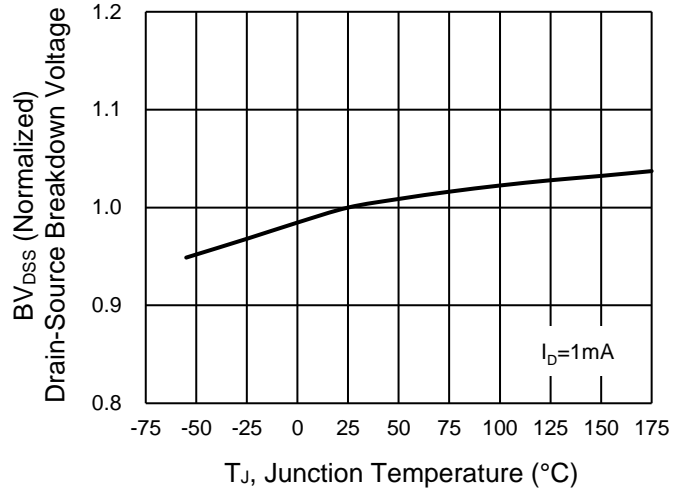
CHARACTERISTICS CURVES

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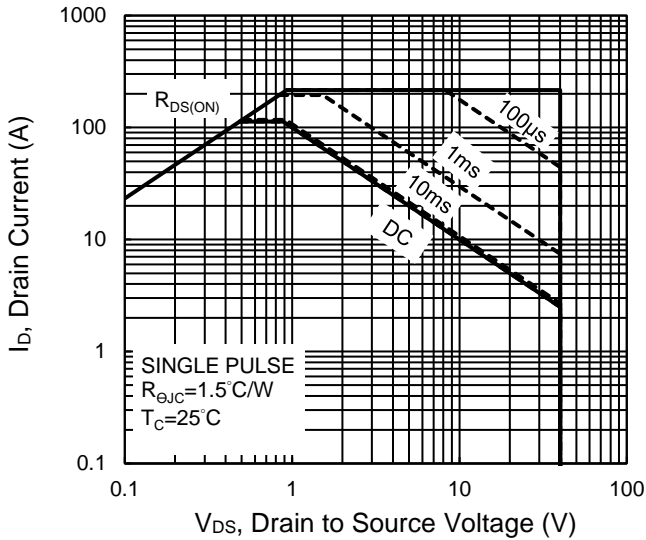
Capacitance vs. Drain-Source Voltage



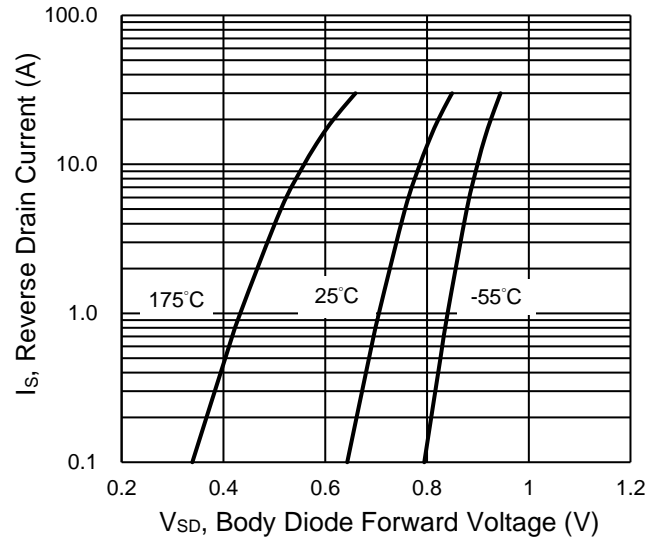
BV_{DSS} vs. Junction Temperature



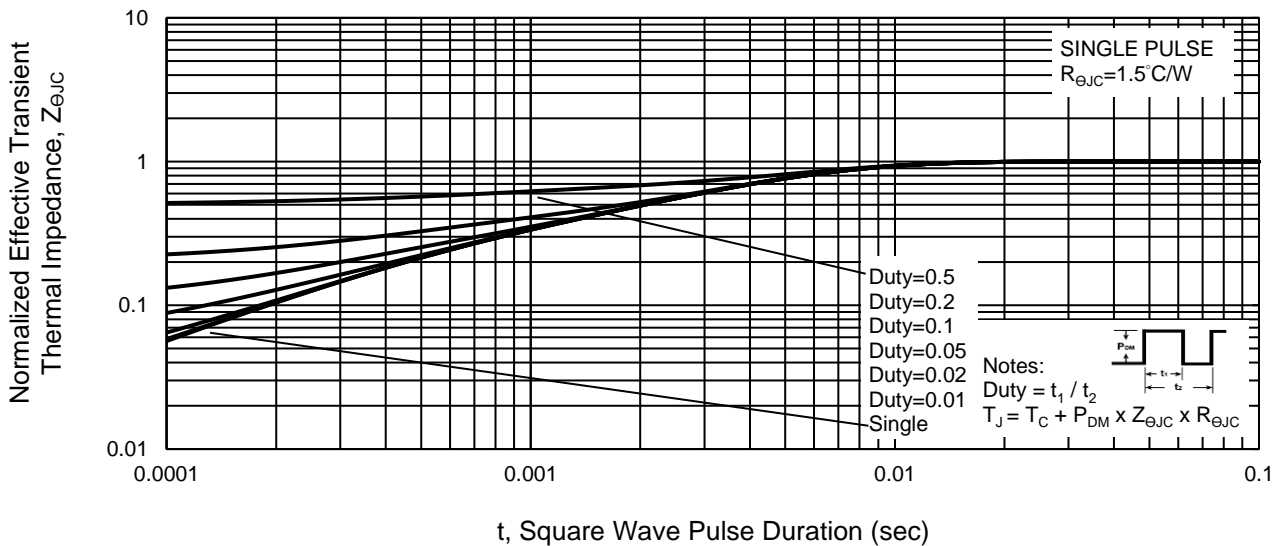
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage



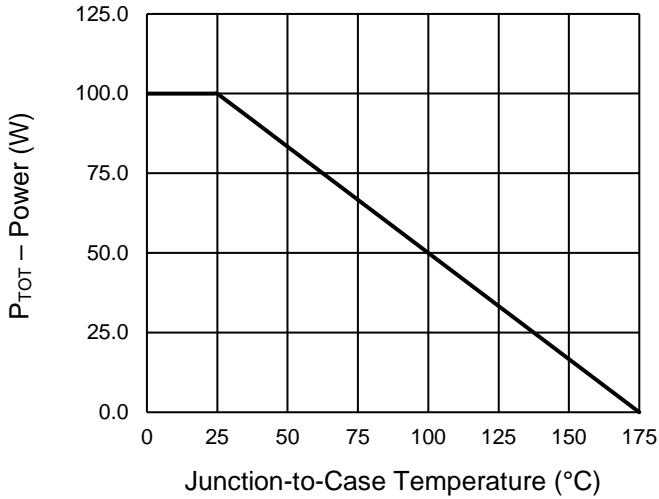
Normalized Thermal Transient Impedance, Junction-to-Case



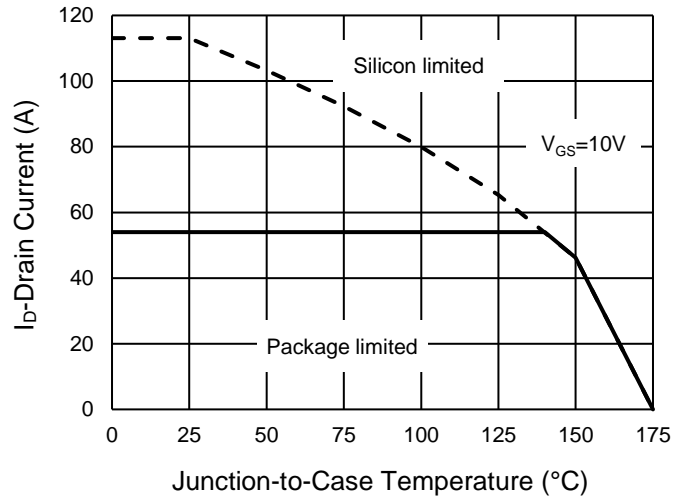
CHARACTERISTICS CURVES

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

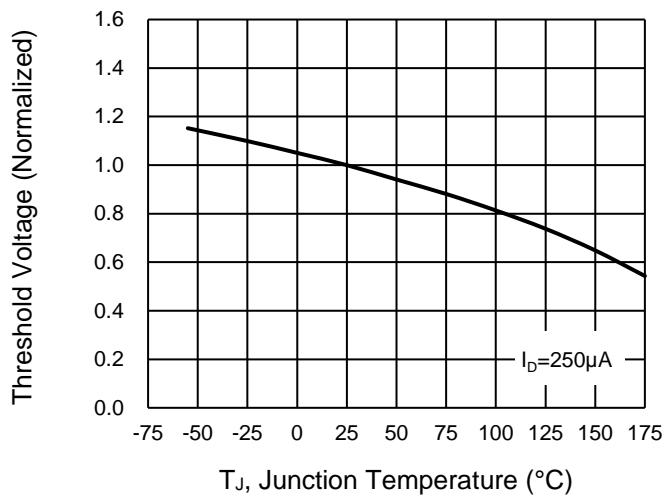
Power Dissipation



Drain Current



Normalized gate threshold voltage vs Temperature



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