

# 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

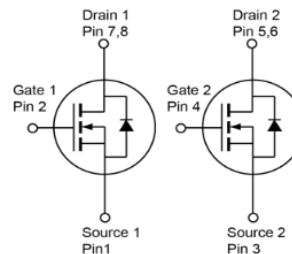
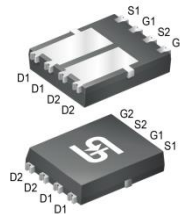
## APPLICATIONS

- Automotive applications
- Solenoid and motor drivers
- DC-DC converters

| KEY PERFORMANCE PARAMETERS |                |      |    |
|----------------------------|----------------|------|----|
| PARAMETER                  | VALUE          | UNIT |    |
| $V_{DS}$                   | 100            | V    |    |
| $R_{DS(on)}$ (max)         | $V_{GS} = 10V$ | 25   | mΩ |
|                            | $V_{GS} = 7V$  | 30   |    |
| $Q_g$                      | $V_{GS} = 10V$ | 8.4  | nC |



PDFN56U Dual



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

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |                |                           |                  |
|---|----------------|---------------------------|------------------|
| PARAMETER   | SYMBOL         | LIMIT                     | UNIT             |
| Drain-Source Voltage  | $V_{DS}$       | 100                       | V                |
| Gate-Source Voltage   | $V_{GS}$       | $\pm 20$                  | V                |
| Continuous Drain Current  | $I_D$          | $T_C = 25^\circ\text{C}$  | 31               |
|   |                | $T_C = 100^\circ\text{C}$ | 22               |
|   |                | $T_A = 25^\circ\text{C}$  | 7.4              |
| Pulsed Drain Current (Note 1)   | $I_{DM}$       | 124                       | A                |
| Single Pulse Avalanche Current (Note 2)                                     | $I_{AS}$       | 7                         | A                |
| Single Pulse Avalanche Energy (Note 2)                                      | $E_{AS}$       | 7.3                       | mJ               |
| Total Power Dissipation   | $P_D$          | $T_C = 25^\circ\text{C}$  | 54               |
|   |                | $T_C = 125^\circ\text{C}$ | 18               |
| Operating Junction and Storage Temperature Range                            | $T_J, T_{STG}$ | - 55 to +175              | $^\circ\text{C}$ |

| THERMAL PERFORMANCE                             |                 |       |                           |
|---|-----------------|-------|---------------------------|
| PARAMETER                                       | SYMBOL          | LIMIT | UNIT                      |
| Junction to Case Thermal Resistance             | $R_{\theta JC}$ | 2.8   | $^\circ\text{C}/\text{W}$ |
| Junction to Ambient Thermal Resistance (Note 3) | $R_{\theta JA}$ | 50    | $^\circ\text{C}/\text{W}$ |

### Notes:

1. Pulse Width  $\leq 100\mu\text{s}$ .
2.  $L = 0.3\text{mH}$ ,  $V_{GS} = 10V$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$ .
3. Device on a PCB FR4 with 1 in<sup>2</sup> (single layer, 2 oz thickness) copper area for drain connection.

| <b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |  |              |     |     |           |            |
|---|--|--------------|-----|-----|-----------|------------|
| PARAMETER   | CONDITIONS   | SYMBOL       | MIN | TYP | MAX       | UNIT       |
| <b>Static</b>   |  |              |     |     |           |            |
| Drain-Source Breakdown Voltage  | $V_{GS} = 0V, I_D = 1mA$                                     | $BV_{DSS}$   | 100 | --  | --        | V          |
| Gate Threshold Voltage  | $V_{DS} = V_{GS}, I_D = 250\mu A$                            | $V_{GS(TH)}$ | 2.4 | 3   | 3.6       | V          |
| Gate Body Leakage   | $V_{GS} = \pm 20V, V_{DS} = 0V$                              | $I_{GSS}$    | --  | --  | $\pm 100$ | nA         |
| Drain-Source Leakage Current  | $V_{GS} = 0V, V_{DS} = 100V$                                 | $I_{DSS}$    | --  | --  | 1         | $\mu A$    |
|   | $V_{GS} = 0V, V_{DS} = 100V$<br>$T_J = 125^\circ\text{C}$    |              | --  | --  | 100       |            |
| Drain-Source On-State Resistance<br>(Note 4)  | $V_{GS} = 10V, I_D = 15.5A$                                  | $R_{DS(on)}$ | --  | 20  | 25        | m $\Omega$ |
|   | $V_{GS} = 7V, I_D = 15.5A$                                   |              | --  | 23  | 30        |            |
| Forward Transconductance (Note 4)   | $V_{DS} = 10V, I_D = 3.9A$                                   | $g_{fs}$     | --  | 14  | --        | S          |
| <b>Dynamic</b> (Note 5)   |  |              |     |     |           |            |
| Total Gate Charge   | $V_{DS} = 50V, I_D = 7.4A,$<br>$V_{GS} = 7V$                 | $Q_g$        | --  | 6.2 | --        | nC         |
| Total Gate Charge   | $V_{DS} = 50V, I_D = 7.4A,$<br>$V_{GS} = 10V$                | $Q_g$        | --  | 8.4 | --        | nC         |
| Gate-Source Charge  |  | $Q_{gs}$     | --  | 2.8 | --        |            |
| Gate-Drain Charge   |  | $Q_{gd}$     | --  | 2.3 | --        |            |
| Input Capacitance   | $V_{DS} = 60V, V_{GS} = 0V,$<br>$f = 1.0MHz$                 | $C_{iss}$    | --  | 513 | --        | pF         |
| Output Capacitance  |  | $C_{oss}$    | --  | 115 | --        |            |
| Reverse Transfer Capacitance  |  | $C_{rss}$    | --  | 18  | --        |            |
| Gate Resistance   | $f = 1.0MHz$   | $R_g$        | --  | 1.1 | --        | $\Omega$   |
| <b>Switching</b> (Note 6)   |  |              |     |     |           |            |
| Turn-On Delay Time  | $V_{DD} = 50V, R_G = 6\Omega,$<br>$I_D = 7.4A, V_{GS} = 10V$ | $t_{d(on)}$  | --  | 6.5 | --        | ns         |
| Turn-On Rise Time   |  | $t_r$        | --  | 16  | --        |            |
| Turn-Off Delay Time   |  | $t_{d(off)}$ | --  | 10  | --        |            |
| Turn-Off Fall Time  |  | $t_f$        | --  | 5.9 | --        |            |
| <b>Source-Drain Diode</b>   |  |              |     |     |           |            |
| Forward Voltage (Note 4)  | $I_S = 15.5A, V_{GS} = 0V$                                   | $V_{SD}$     | --  | --  | 1.1       | V          |
| Reverse Recovery Time   | $I_S = 7.4A,$<br>$di/dt = 100A/\mu s$                        | $t_{rr}$     | --  | 40  | --        | ns         |
| Reverse Recovery Charge   |  | $Q_{rr}$     | --  | 47  | --        | 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.

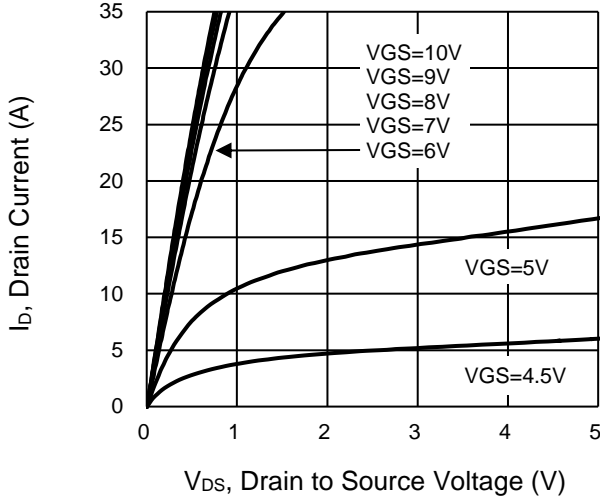
**ORDERING INFORMATION**

| ORDERING CODE     | PACKAGE      | PACKING             |
|-------------------|--------------|---------------------|
| TQM250NH10DCR RLG | PDFN56U Dual | 2,500pcs / 13" Reel |

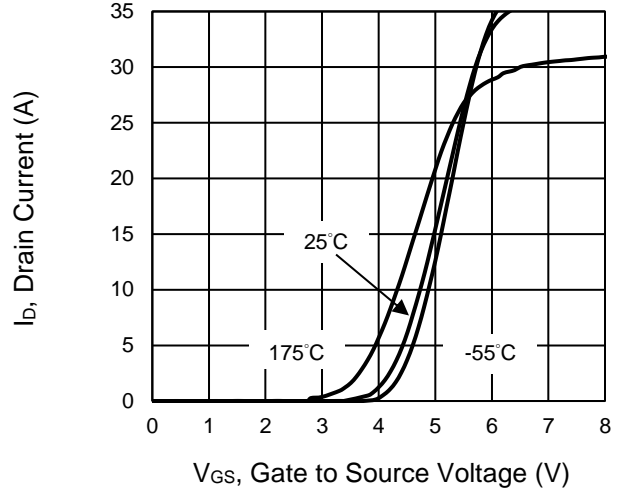
**CHARACTERISTICS CURVES**

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

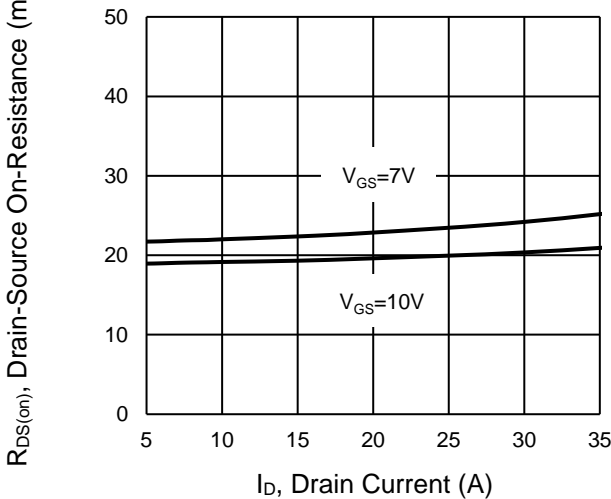
**Output Characteristics**



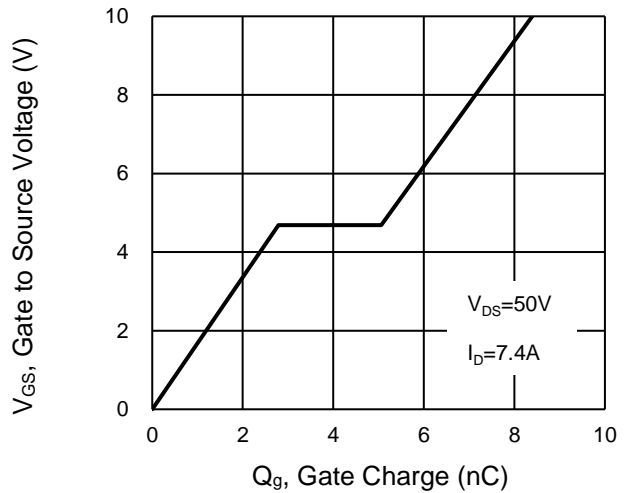
**Transfer Characteristics**



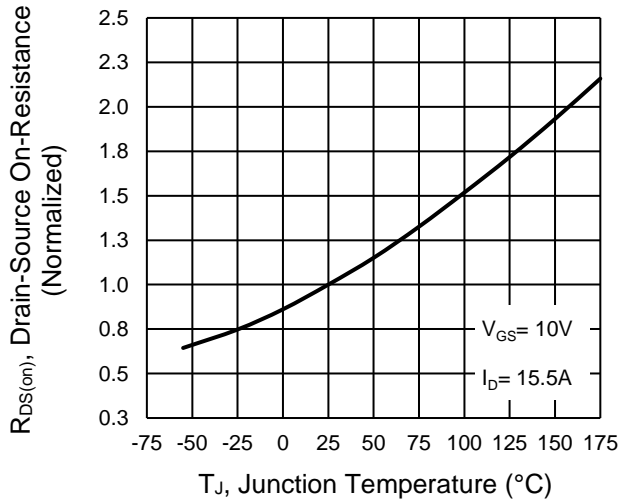
**On-Resistance vs. Drain Current**



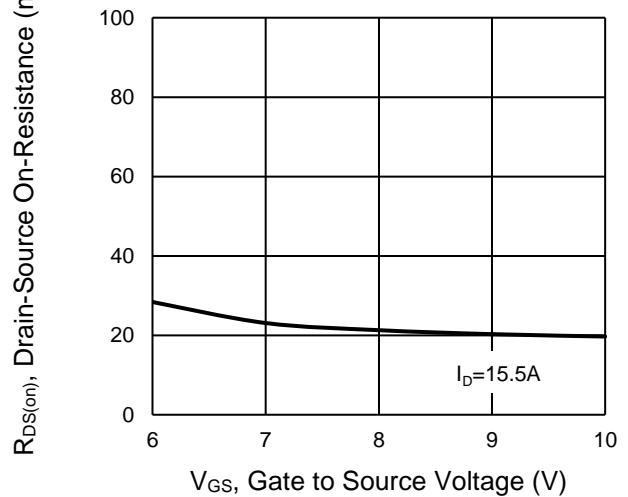
**Gate-Source Voltage vs. Gate Charge**



**On-Resistance vs. Junction Temperature**



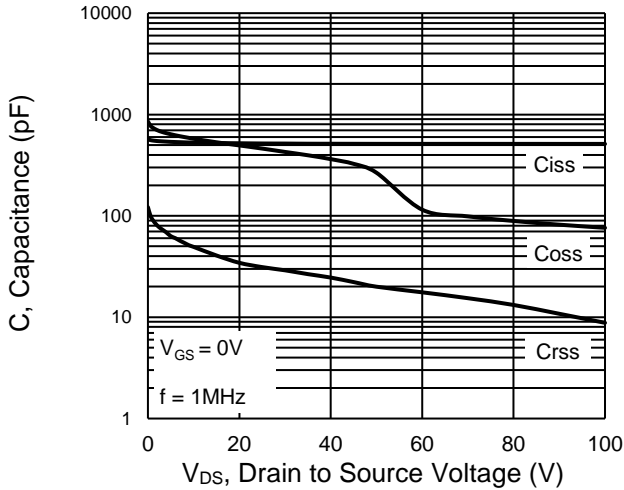
**On-Resistance vs. Gate-Source Voltage**



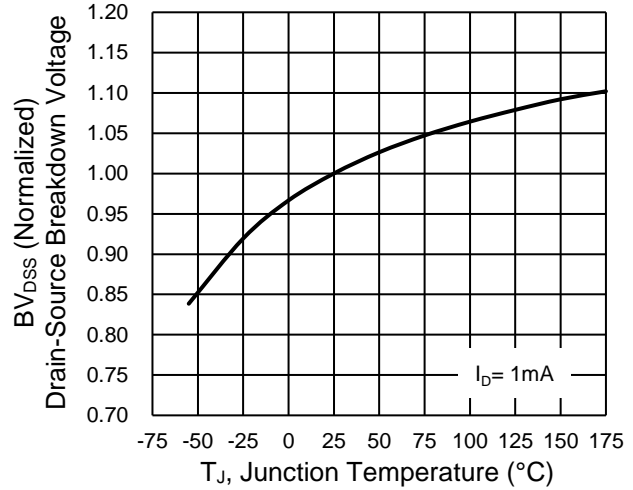
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( $T_A = 25^\circ\text{C}$  unless otherwise noted)

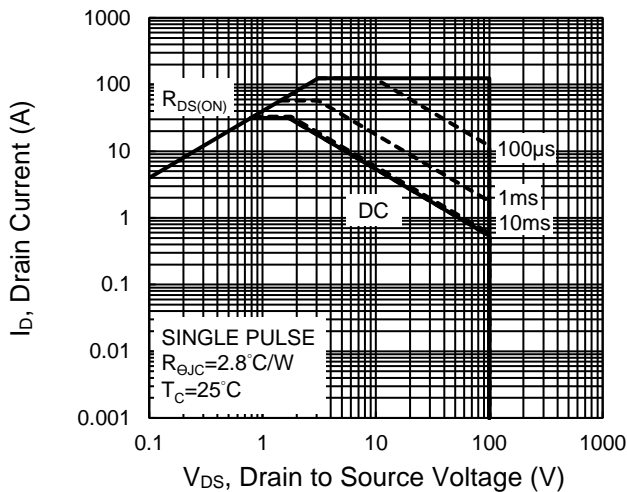
**Capacitance vs. Drain-Source Voltage**



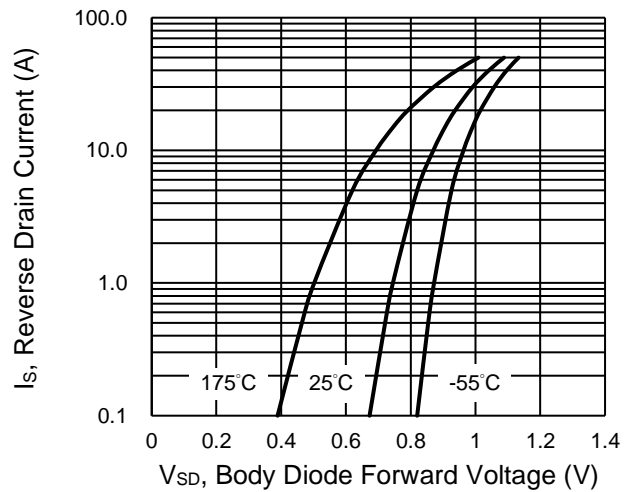
**$BV_{DSS}$  vs. Junction Temperature**



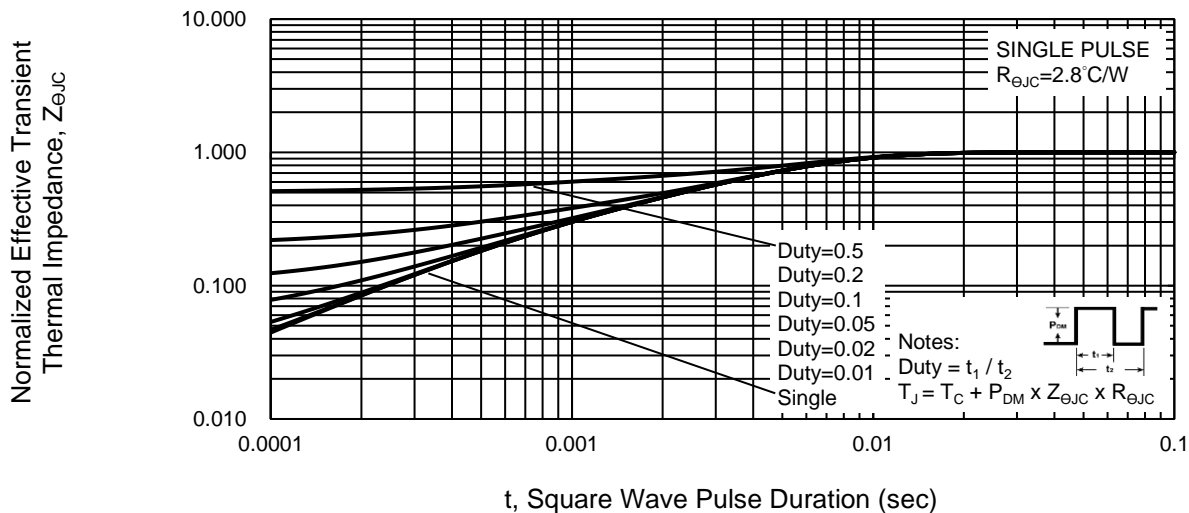
**Maximum Safe Operating Area, Junction-to-Case**



**Source-Drain Diode Forward Current vs. Voltage**



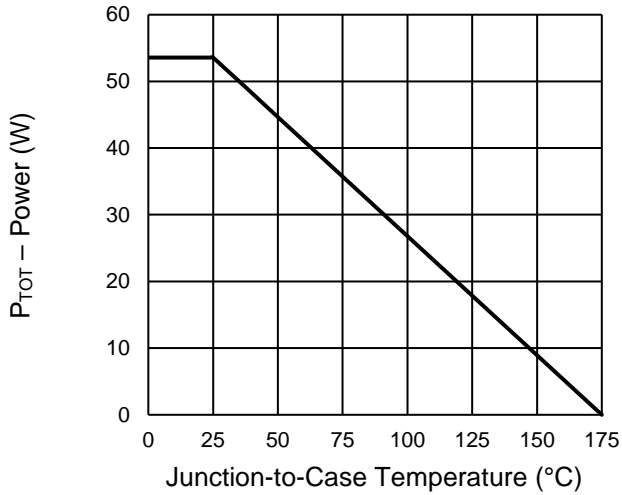
**Normalized Thermal Transient Impedance, Junction-to-Case**



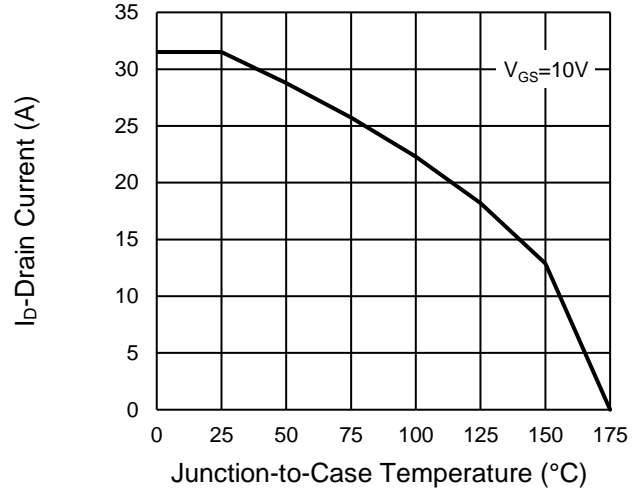
**CHARACTERISTICS CURVES**

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

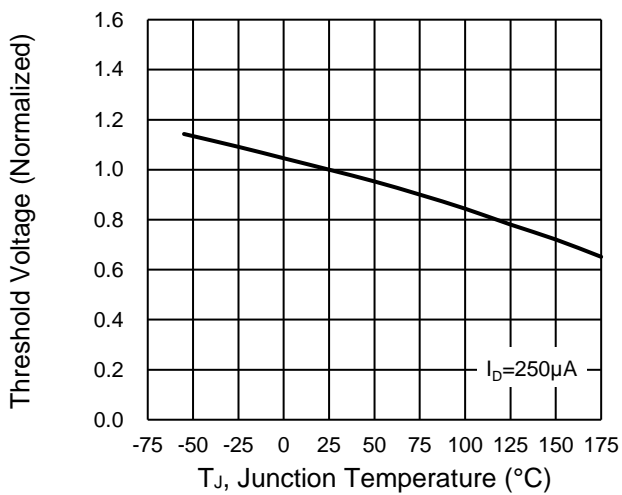
**Power Dissipation**



**Drain Current**

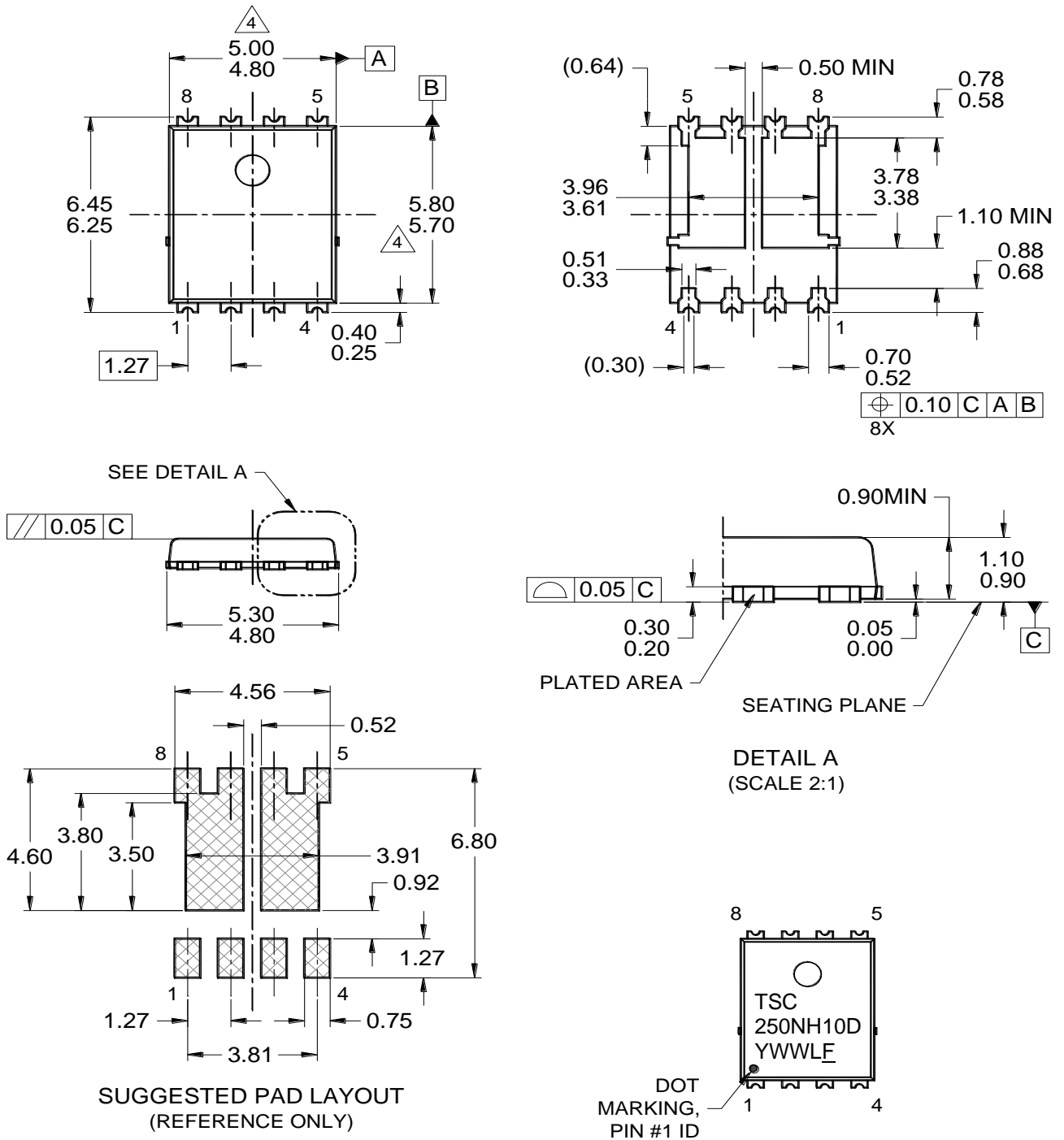


**Normalized gate threshold voltage vs Temperature**



**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**PDFN56U Dual**



**NOTES: UNLESS OTHERWISE SPECIFIED**

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. PACKAGE OUTLINE REFERENCE: JEITA ED-7500B, EIAJ SC-111CB.
4. MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
5. DWG NO. REF: HQ2SD07-PDFN56UD-032 REV B.

**MARKING DIAGRAM**

- 250NH10D = Device marking  
 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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