

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

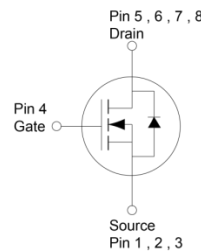
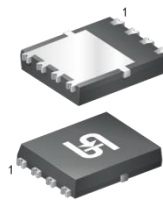
APPLICATIONS

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

KEY PERFORMANCE PARAMETERS			
PARAMETER	VALUE	UNIT	
V_{DS}	100	V	
$R_{DS(on)}$ (max)	$V_{GS} = 10V$	17	mΩ
	$V_{GS} = 4.5V$	23.8	
Q_g	$V_{GS} = 4.5V$	8.7	nC



PDFN56U



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}	± 20	V
Continuous Drain Current	I_D	$T_C = 25^\circ\text{C}$	50
		$T_C = 100^\circ\text{C}$	36
		$T_A = 25^\circ\text{C}$	9
Pulsed Drain Current (Note 1)	I_{DM}	200	A
Single Pulse Avalanche Current (Note 2)	I_{AS}	11.3	A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	19	mJ
Total Power Dissipation	P_D	$T_C = 25^\circ\text{C}$	97
		$T_C = 125^\circ\text{C}$	32
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	$R_{\theta JC}$	1.54	$^\circ\text{C/W}$
Junction to Ambient Thermal Resistance (Note 3)	$R_{\theta JA}$	50	$^\circ\text{C/W}$

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 in² (single layer, 2 oz thickness) copper area for drain connection.

ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_D = 1\text{mA}$	BV_{DSS}	100	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	$V_{GS(TH)}$	1.4	1.8	2.2	V
Gate Body Leakage	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	I_{GSS}	--	--	± 100	nA
Drain-Source Leakage Current	$V_{GS} = 0\text{V}, V_{DS} = 100\text{V}$	I_{DSS}	--	--	1	μA
	$V_{GS} = 0\text{V}, V_{DS} = 100\text{V}$ $T_J = 125^\circ\text{C}$		--	--	100	
Drain-Source On-State Resistance (Note 4)	$V_{GS} = 10\text{V}, I_D = 25\text{A}$	$R_{DS(on)}$	--	12.3	17	m Ω
	$V_{GS} = 4.5\text{V}, I_D = 25\text{A}$		--	15.8	23.8	
Forward Transconductance (Note 4)	$V_{DS} = 10\text{V}, I_D = 6.3\text{A}$	g_{fs}	--	40	--	S
Dynamic (Note 5)						
Total Gate Charge	$V_{DS} = 50\text{V}, I_D = 9\text{A},$ $V_{GS} = 4.5\text{V}$	Q_g	--	8.7	--	nC
Total Gate Charge	$V_{DS} = 50\text{V}, I_D = 9\text{A},$ $V_{GS} = 10\text{V}$	Q_g	--	17	--	nC
Gate-Source Charge		Q_{gs}	--	3.2	--	
Gate-Drain Charge		Q_{gd}	--	3.4	--	
Input Capacitance	$V_{DS} = 60\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$	C_{iss}	--	936	--	μF
Output Capacitance		C_{oss}	--	145	--	
Reverse Transfer Capacitance		C_{rss}	--	22	--	
Gate Resistance	$f = 1.0\text{MHz}$	R_g	--	2	--	Ω
Switching (Note 6)						
Turn-On Delay Time	$V_{DD} = 50\text{V}, R_G = 6\Omega,$ $I_D = 9\text{A}, V_{GS} = 10\text{V}$	$t_{d(on)}$	--	7.3	--	ns
Turn-On Rise Time		t_r	--	19	--	
Turn-Off Delay Time		$t_{d(off)}$	--	21	--	
Turn-Off Fall Time		t_f	--	28	--	
Source-Drain Diode						
Forward Voltage (Note 4)	$I_S = 25\text{A}, V_{GS} = 0\text{V}$	V_{SD}	--	--	1.1	V
Reverse Recovery Time	$I_S = 9\text{A},$ $di/dt = 100\text{A}/\mu\text{s}$	t_{rr}	--	48	--	ns
Reverse Recovery Charge		Q_{rr}	--	51	--	nC

Notes:

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

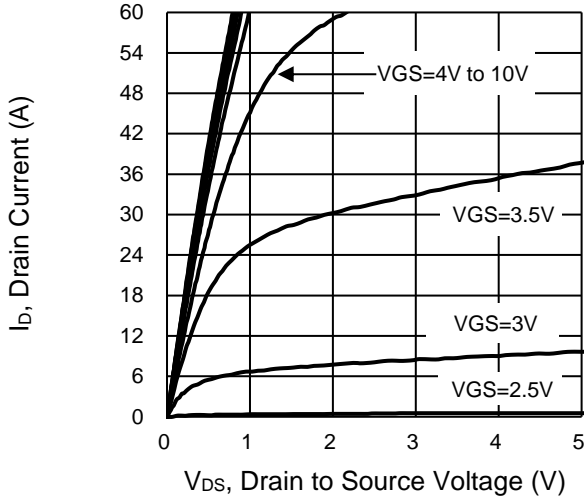
ORDERING INFORMATION

ORDERING CODE	PACKAGE	PACKING
TQM170NH10LCR RLG	PDFN56U	2,500pcs / 13" Reel

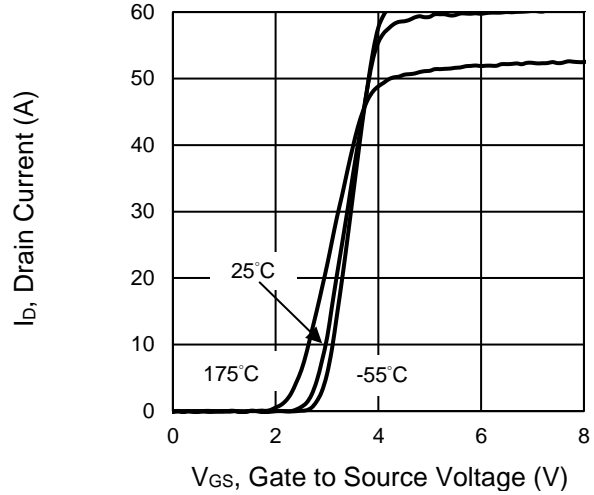
CHARACTERISTICS CURVES

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

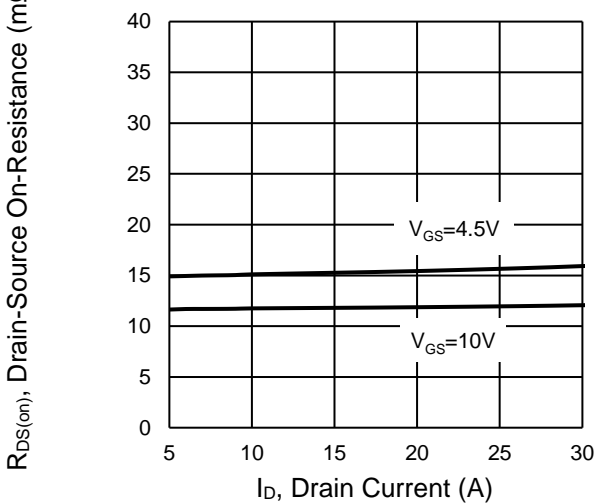
Output Characteristics



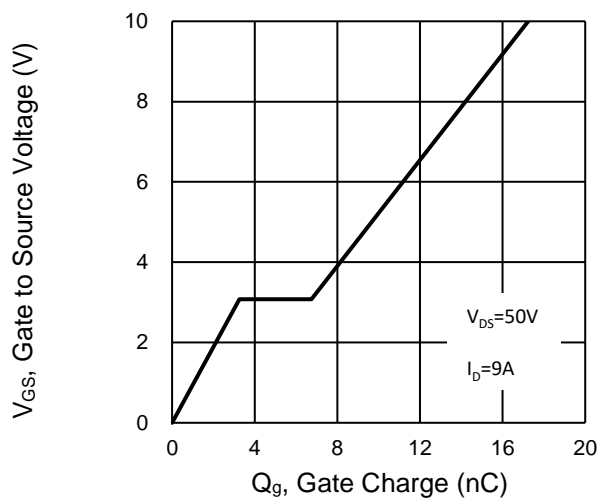
Transfer Characteristics



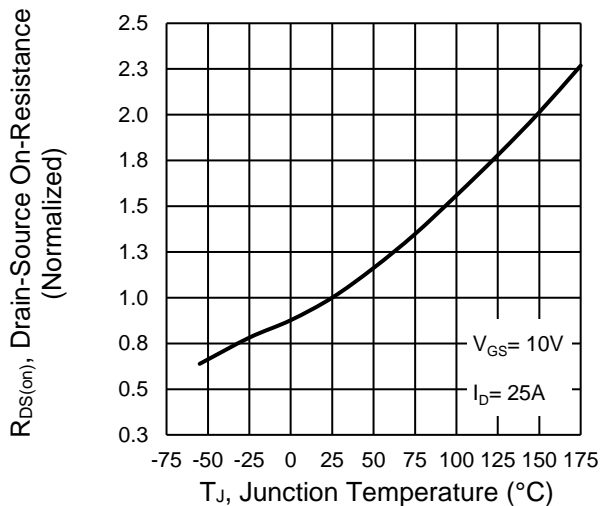
On-Resistance vs. Drain Current



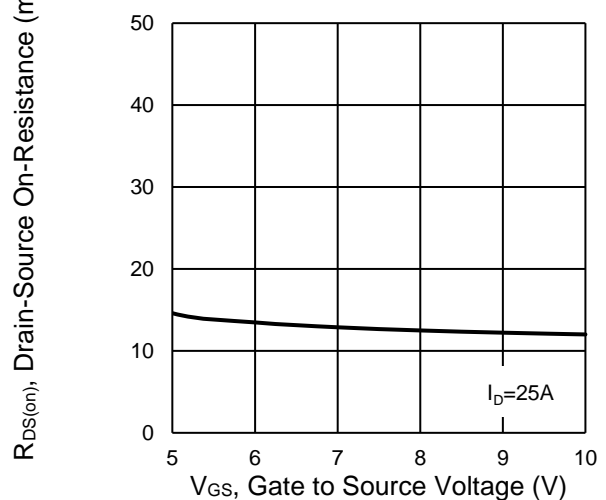
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



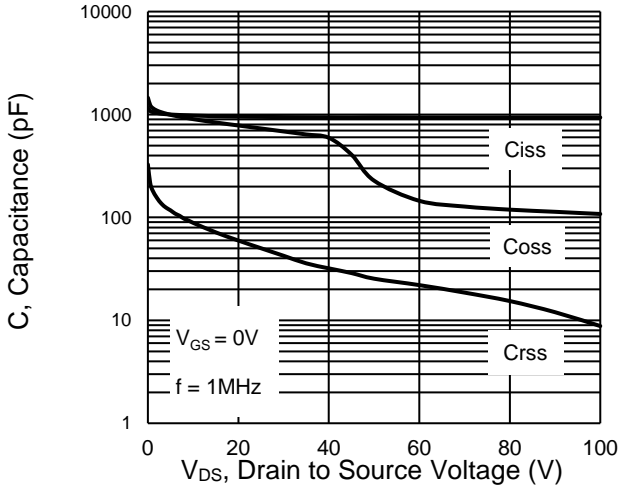
On-Resistance vs. Gate-Source Voltage



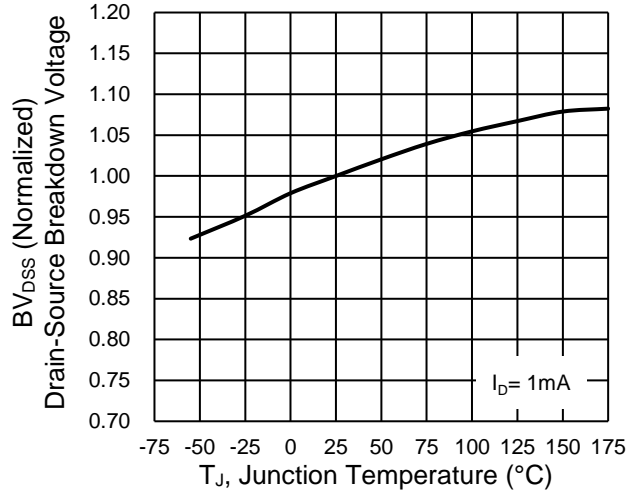
CHARACTERISTICS CURVES

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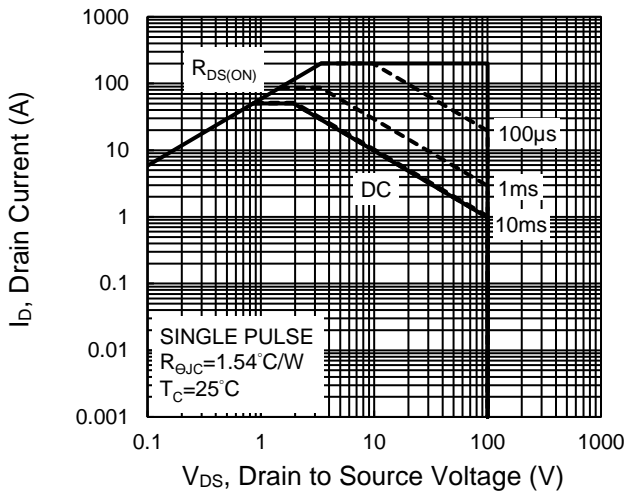
Capacitance vs. Drain-Source Voltage



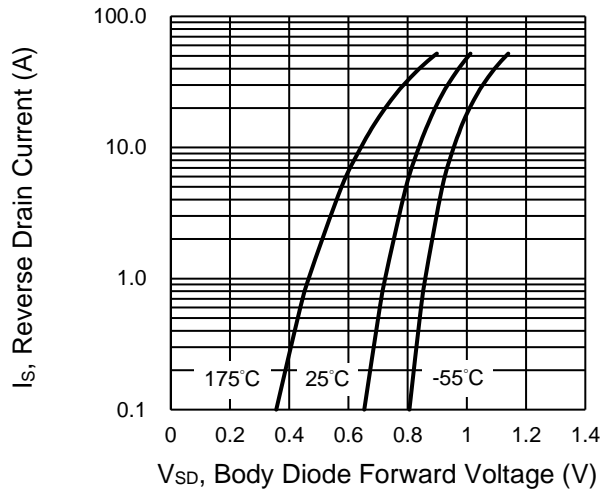
BV_{DSS} vs. Junction Temperature



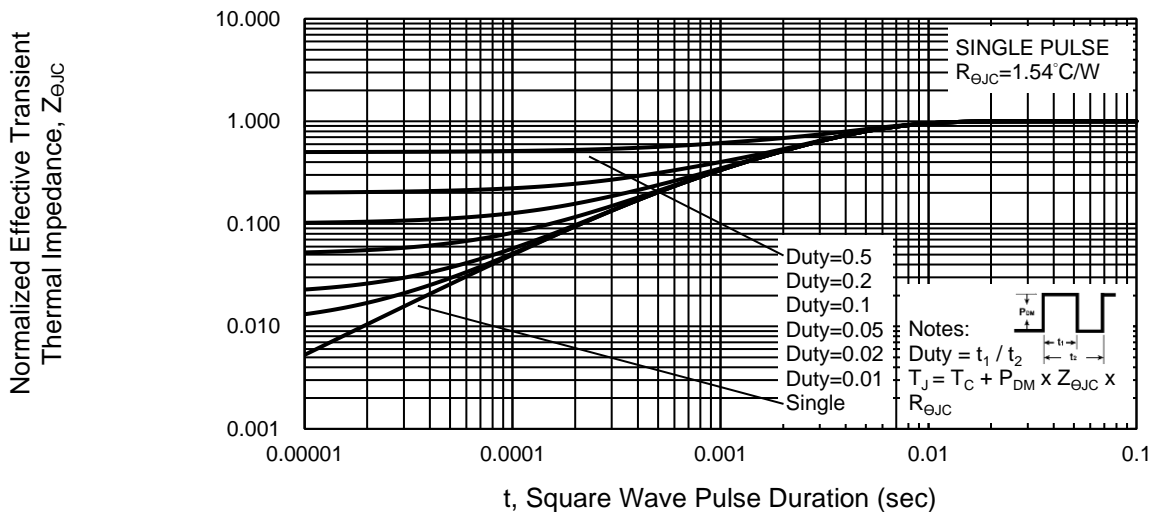
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage



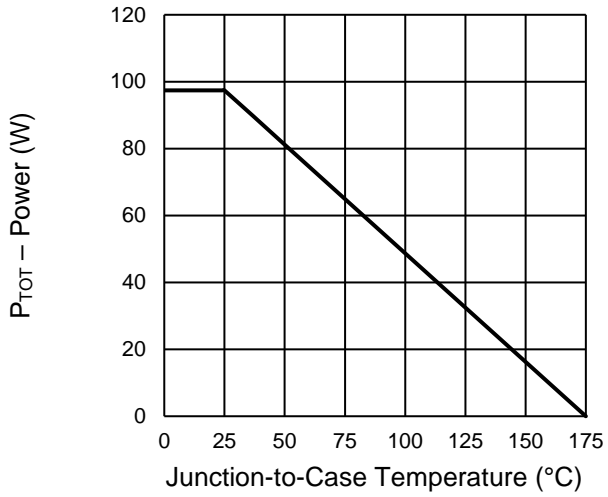
Normalized Thermal Transient Impedance, Junction-to-Case



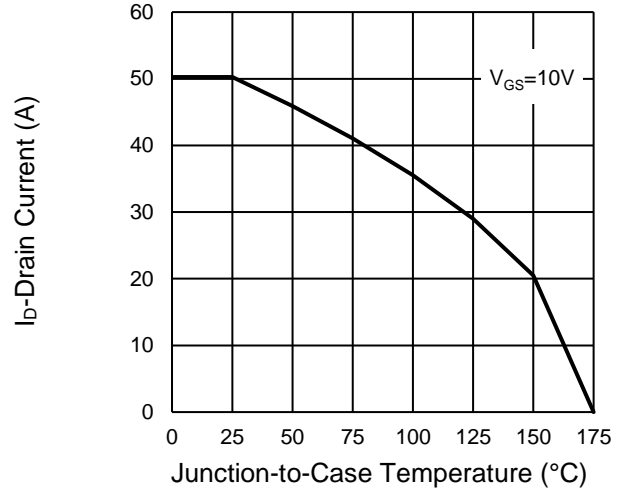
CHARACTERISTICS CURVES

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

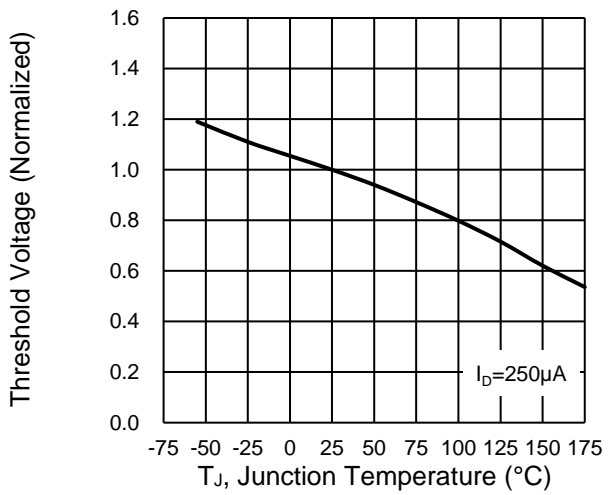
Power Dissipation



Drain Current

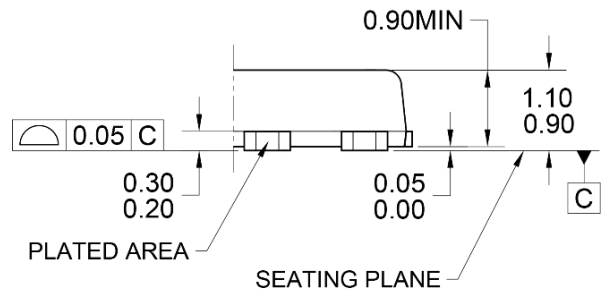
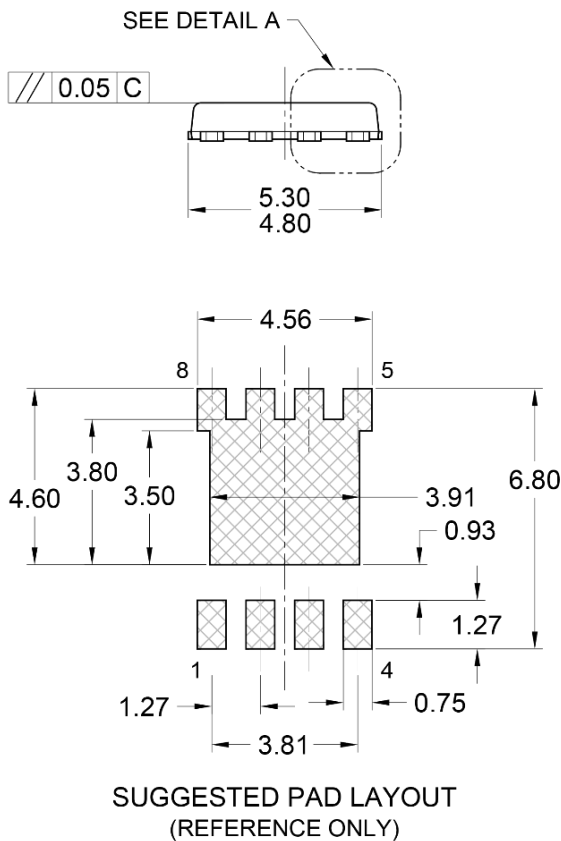
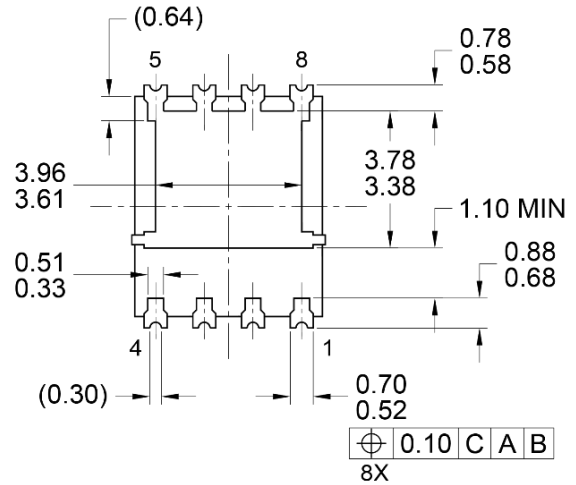
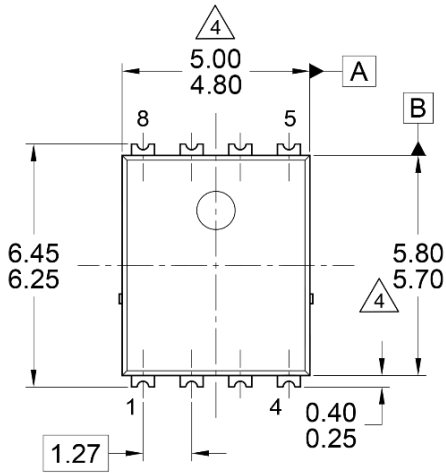


Normalized gate threshold voltage vs Temperature

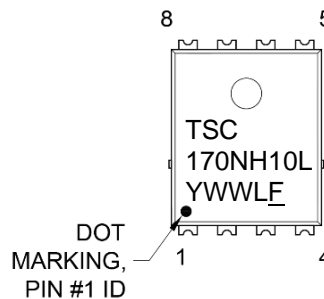


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

PDFN56U



DETAIL A
(SCALE 2:1)



MARKING DIAGRAM

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-111BB.
4. MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
5. DWG NO. REF: HQ2SD07-PDFN56U-023 REV B.

- 170NH10L = 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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