

# PerFET™ Power Transistor

## FEATURES

- Excellent FOM
- Reliability meets AEC-Q101 requirements
- Wettable flank leads for enhanced AOI
- 100% UIS and Rg tested
- 175°C operating junction temperature
- RoHS Compliant
- Halogen-free

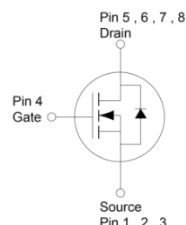
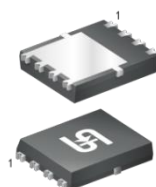
## APPLICATIONS

- Solenoid and motor drivers
- DC-DC converters
- Load Switch
- SMPS

KEY PERFORMANCE PARAMETERS			
PARAMETER		VALUE	UNIT
$V_{DS}$		100	V
$R_{DS(on)}$ (max)	$V_{GS} = 10V$	7.5	mΩ
	$V_{GS} = 4.5V$	10.5	
$Q_g$	$V_{GS} = 4.5V$	18	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		$V_{GS}$	$\pm 20$	V
Continuous Drain Current, Silicon limited	$T_C = 25^\circ\text{C}$	$I_D$	113	A
Continuous Drain Current (Note 1)	$T_C = 25^\circ\text{C}$	$I_D$	100	A
	$T_C = 100^\circ\text{C}$		80	
	$T_A = 25^\circ\text{C}$		13	
Pulsed Drain Current (Note 2)		$I_{DM}$	400	A
Single Pulse Avalanche Current (Note 3)		$I_{AS}$	19.8	A
Single Pulse Avalanche Energy (Note 3)		$E_{AS}$	59	mJ
Total Power Dissipation	$T_C = 25^\circ\text{C}$	$P_D$	214	W
	$T_C = 125^\circ\text{C}$		71	
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	$R_{\theta JC}$	0.7	$^\circ\text{C/W}$
Junction to Ambient Thermal Resistance (Note 4)	$R_{\theta JA}$	50	$^\circ\text{C/W}$

### Notes:

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

ELECTRICAL SPECIFICATIONS (T <sub>A</sub> = 25°C unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static						
Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA	BV <sub>DSS</sub>	100	--	--	V
Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	V <sub>GS(TH)</sub>	1.4	1.8	2.2	V
Gate Body Leakage	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V	I <sub>GSS</sub>	--	--	±100	nA
Drain-Source Leakage Current	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 100V	I <sub>DSS</sub>	--	--	1	μA
	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 100V T <sub>J</sub> = 125°C		--	--	100	
Drain-Source On-State Resistance (Note 5)	V <sub>GS</sub> = 10V, I <sub>D</sub> = 50A	R <sub>DS(on)</sub>	--	5.4	7.5	mΩ
	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 50A		--	6.9	10.5	
Forward Transconductance (Note 5)	V <sub>DS</sub> = 10V, I <sub>D</sub> = 12.5A	g <sub>fs</sub>	--	70	--	S
Dynamic (Note 6)						
Total Gate Charge	V <sub>DS</sub> = 50V, I <sub>D</sub> = 13A, V <sub>GS</sub> = 4.5V	Q <sub>g</sub>	--	18	--	nC
Total Gate Charge	V <sub>DS</sub> = 50V, I <sub>D</sub> = 13A, V <sub>GS</sub> = 10V	Q <sub>g</sub>	--	36	--	nC
Gate-Source Charge		Q <sub>gs</sub>	--	6.7	--	
Gate-Drain Charge		Q <sub>gd</sub>	--	6.8	--	
Input Capacitance	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V, f = 1.0MHz	C <sub>iss</sub>	--	2110	--	pF
Output Capacitance		C <sub>oss</sub>	--	327	--	
Reverse Transfer Capacitance		C <sub>rss</sub>	--	31	--	
Gate Resistance	f = 1.0MHz	R <sub>g</sub>	--	0.5	--	Ω
Switching (Note 7)						
Turn-On Delay Time	V <sub>DD</sub> = 50V, R <sub>G</sub> = 6Ω, I <sub>D</sub> = 13A, V <sub>GS</sub> = 10V	t <sub>d(on)</sub>	--	11	--	ns
Turn-On Rise Time		t <sub>r</sub>	--	25	--	
Turn-Off Delay Time		t <sub>d(off)</sub>	--	37	--	
Turn-Off Fall Time		t <sub>f</sub>	--	53	--	
Source-Drain Diode						
Forward Voltage (Note 5)	I <sub>S</sub> = 50A, V <sub>GS</sub> = 0V	V <sub>SD</sub>	--	--	1.1	V
Reverse Recovery Time	I <sub>S</sub> = 13A,	t <sub>rr</sub>	--	67	--	ns
Reverse Recovery Charge	di/dt = 100A/μs	Q <sub>rr</sub>	--	102	--	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.

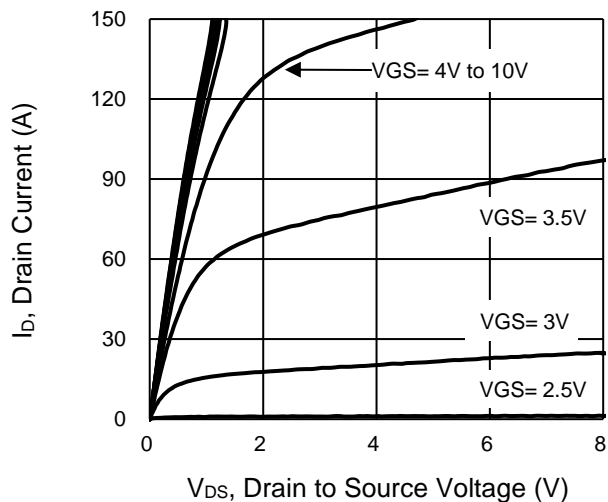
**ORDERING INFORMATION**

ORDERING CODE	PACKAGE	PACKING
TSM075NH10LCR RLG	PDFN56U	2,500pcs / 13" Reel

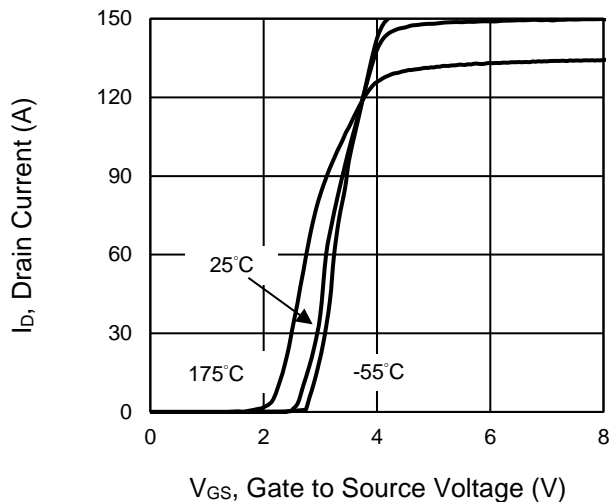
## CHARACTERISTICS CURVES

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

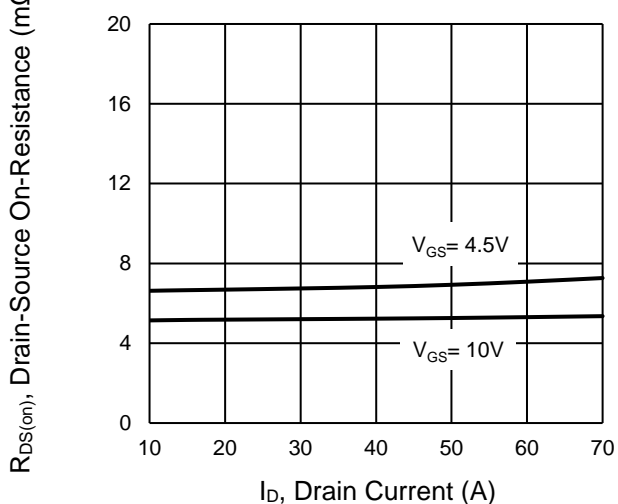
**Output Characteristics**



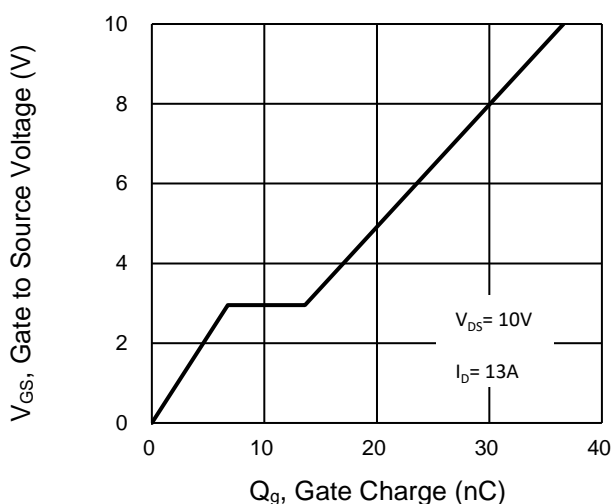
**Transfer Characteristics**



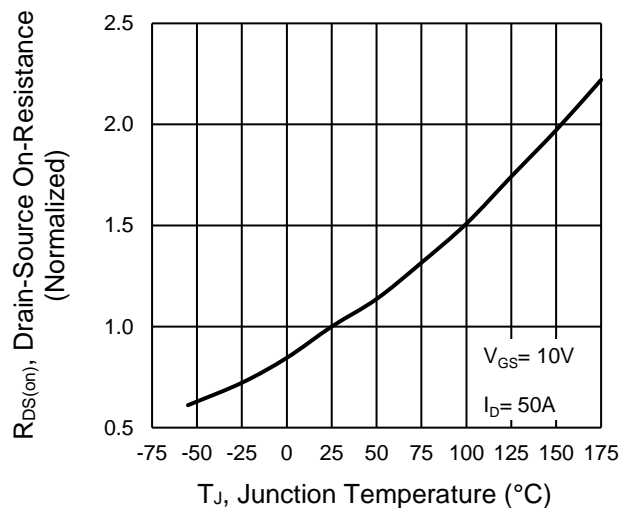
**On-Resistance vs. Drain Current**



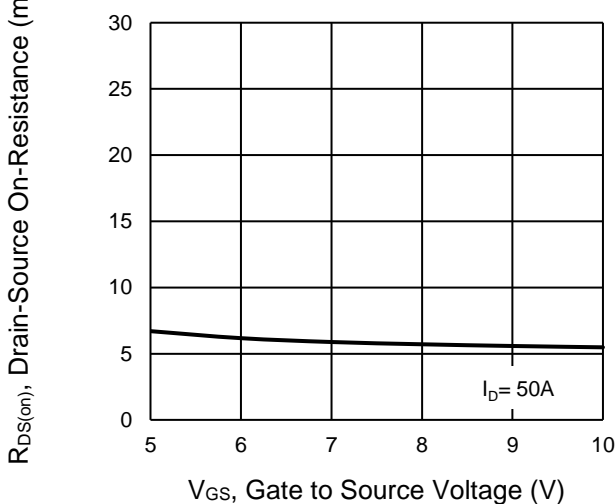
**Gate-Source Voltage vs. Gate Charge**



**On-Resistance vs. Junction Temperature**



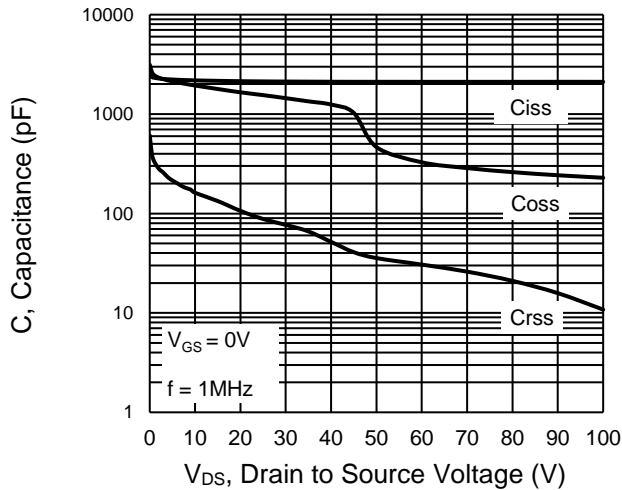
**On-Resistance vs. Gate-Source Voltage**



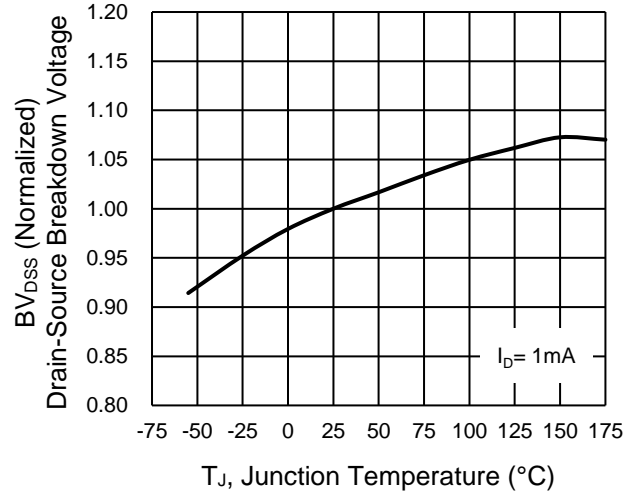
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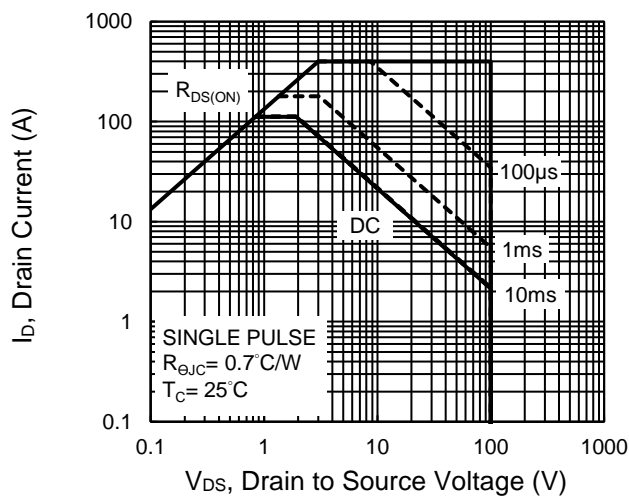
**Capacitance vs. Drain-Source Voltage**



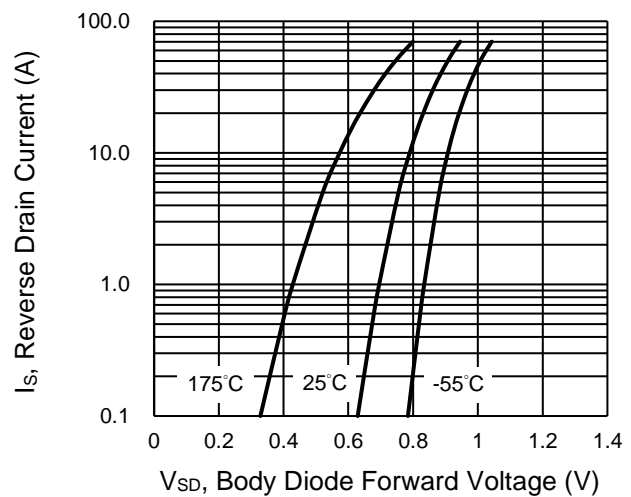
**$BV_{DSS}$  vs. Junction Temperature**



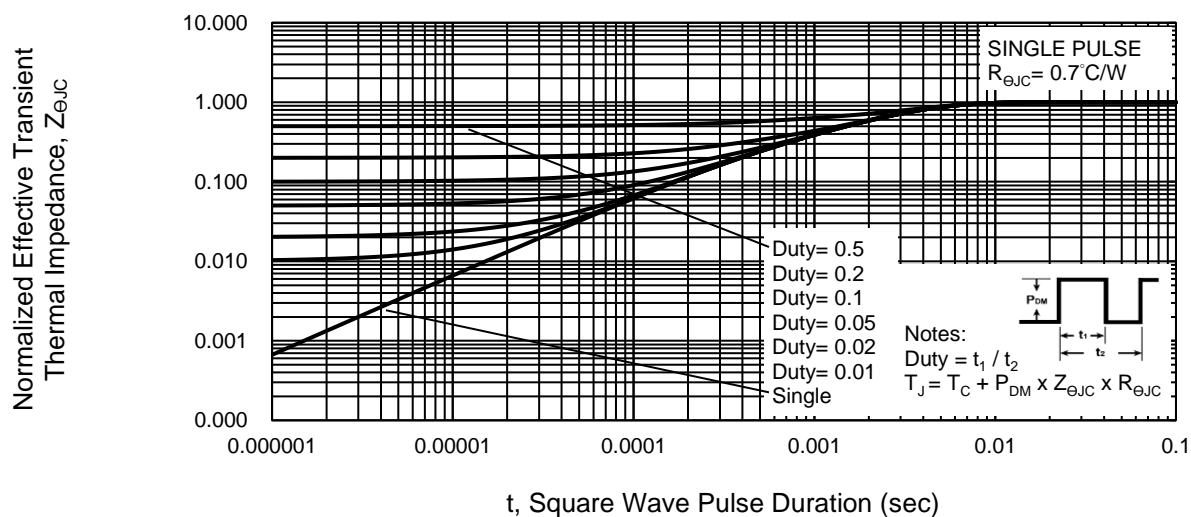
**Maximum Safe Operating Area, Junction-to-Case**



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

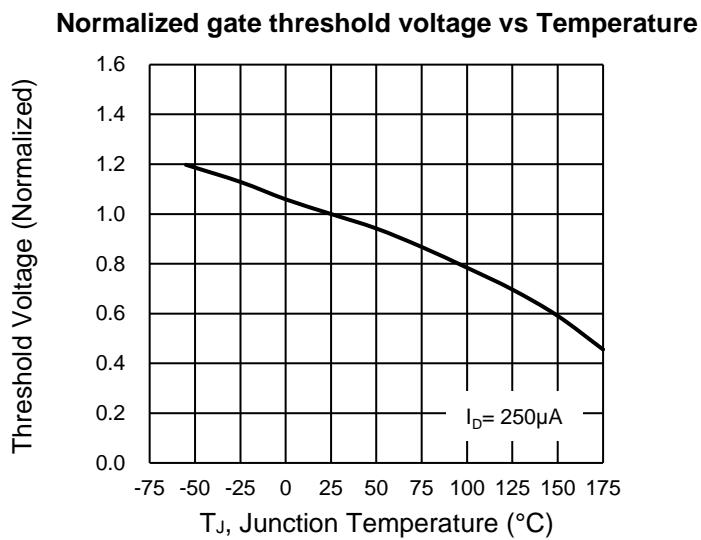
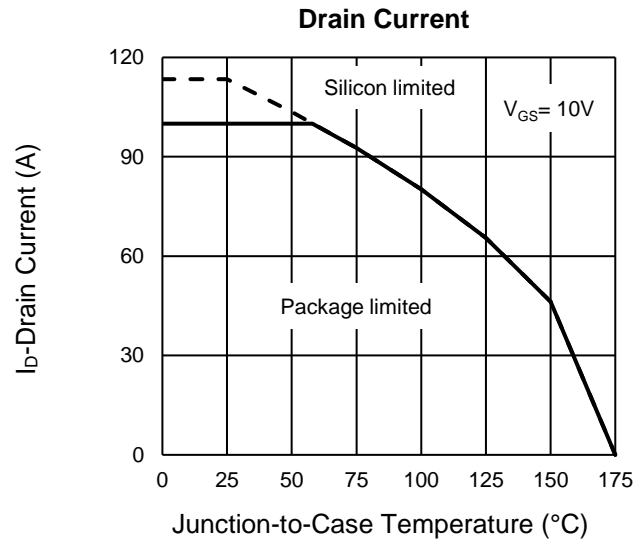
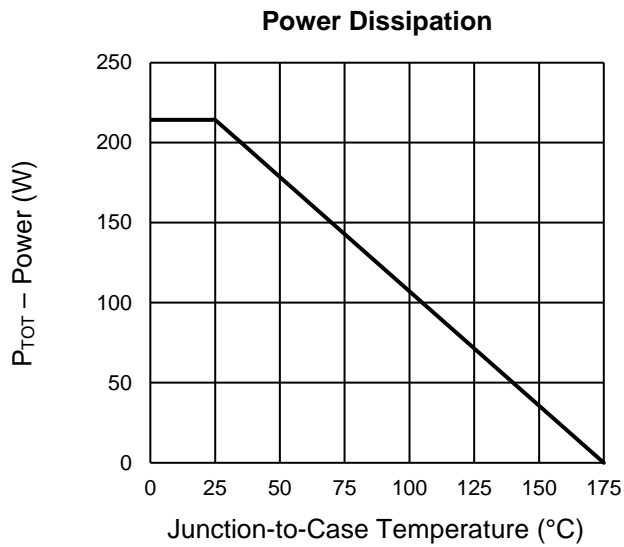


**Normalized Thermal Transient Impedance, Junction-to-Case**



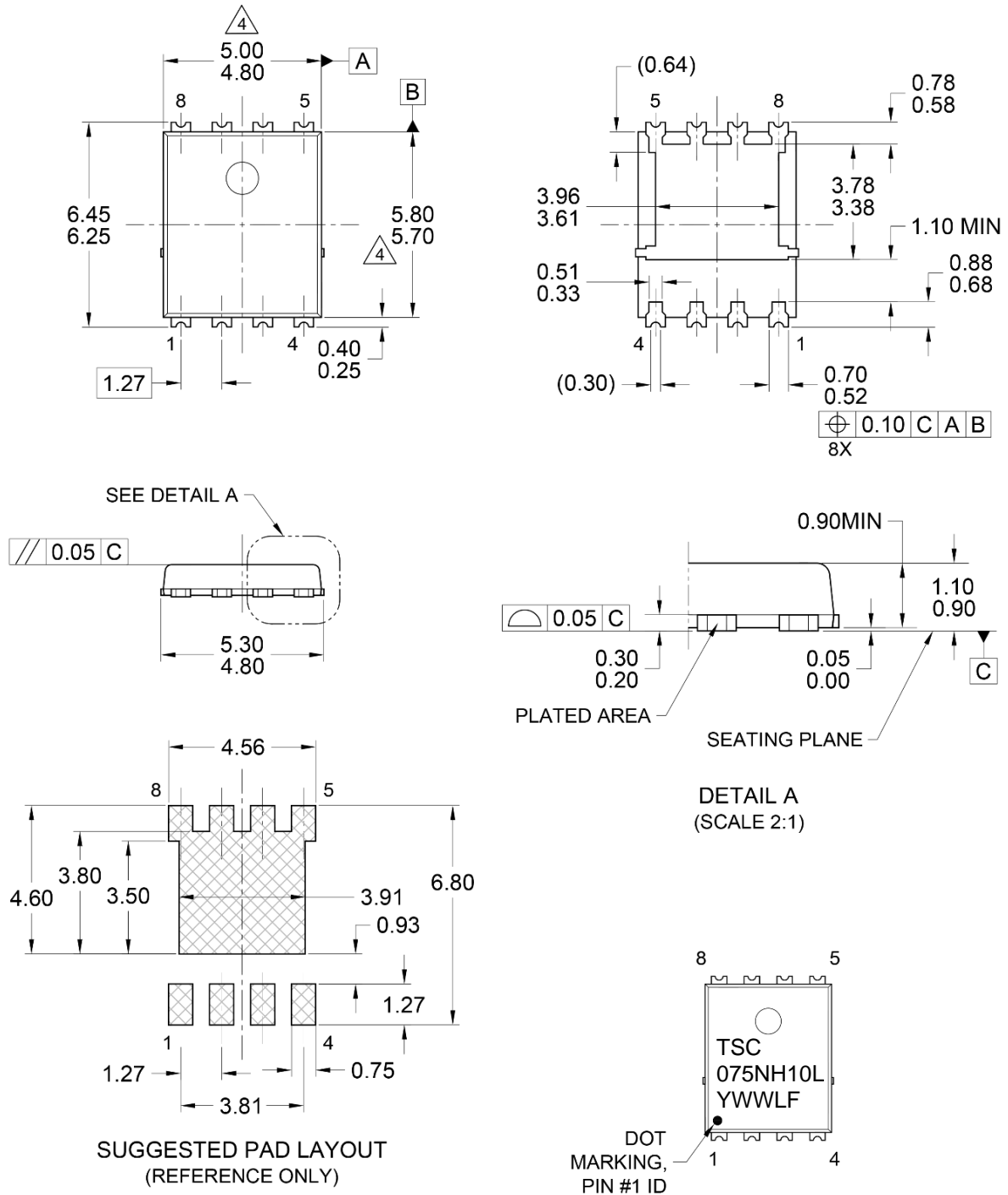
## CHARACTERISTICS CURVES

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



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

PDFN56U



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.

MARKING DIAGRAM

075NH10L = Device marking  
Y = Year code  
WW = Week code (01~52)  
L = Lot code (1~9,A~Z)  
F = Factory code

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