PerFET™ Power Transistor

FEATURES

- Ultra-low On-resistance
- Wettable Flank leads for Enhanced AOI
- 100% UIS and Rg tested
- 175°C Operating Junction Temperature
- RoHS Compliant
- Halogen-Free according to IEC 61249-2-21

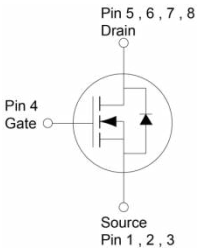
PRODUCT SUMMARY			
PARAMETER		**VALUE**	**UNIT**
V_{DS}		40	V
$R_{DS(on)}$ (max)	V_{GS} = 10V	5.6	mΩ
	V_{GS} = 7V	6.7	
Q_g	V_{GS} = 10V	27.3	nC

APPLICATIONS

- DC-DC Converters
- Solenoid and Motor Drivers
- Load Switch

Pb-Free RoHS COMPLIANT HALOGEN FREE

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}	40	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current, Silicon limited	T_C = 25°C	I_D	90	A
Continuous Drain Current (Note 1)	T_C = 25°C	I_D	54	A
	T_C = 100°C		54	
	T_A = 25°C		17	
Pulsed Drain Current		I_{DM}	216	A
Single Pulse Avalanche Current (Note 2)		I_{AS}	21.6	A
Single Pulse Avalanche Energy (Note 2)		E_{AS}	69.8	mJ
Total Power Dissipation	T_C = 25°C	P_D	78.9	W
	T_C = 125°C		26.3	
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	$R_{\Theta JC}$	1.9	°C/W
Thermal Resistance – Junction to Ambient	$R_{\Theta JA}$	50	°C/W

Note: $R_{\Theta JA}$ 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. $R_{\Theta JC}$ is guaranteed by design while $R_{\Theta CA}$ is determined by the user's board design.

ELECTRICAL CHARACTERISTICS (T_A = 25°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 = 250μA	$V_{GS(TH)}$	2.4	3	3.6	V
Gate-Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Drain-Source Leakage Current	V_{GS} = 0V, V_{DS} = 40V	I_{DSS}	--	--	1	μA
	V_{GS} = 0V, V_{DS} = 40V T_J = 125°C		--	--	100	
Drain-Source On-State Resistance (Note 3)	V_{GS} = 10V, I_D = 27A	$R_{DS(on)}$	--	4.3	5.6	mΩ
	V_{GS} = 7V, I_D = 27A		--	5	6.7	
Forward Transconductance (Note 3)	V_{DS} = 10V, I_D = 10A	g_{fs}	--	105	--	S
Dynamic						
Total Gate Charge	V_{GS} = 7V, V_{DS} = 20V, I_D = 17A	Q_g	--	19.4	--	nC
Total Gate Charge	V_{GS} = 10V, V_{DS} = 20V, I_D = 17A	Q_g	--	27.3	--	
Gate-Source Charge		Q_{gs}	--	8.4	--	
Gate-Drain Charge		Q_{gd}	--	4.8	--	
Input Capacitance	V_{GS} = 0V, V_{DS} = 25V, f = 1.0MHz	C_{iss}	--	1942	--	pF
Output Capacitance		C_{oss}	--	350	--	
Reverse Transfer Capacitance		C_{rss}	--	37	--	
Gate Resistance	f = 1.0MHz	R_g	--	1.5	--	Ω
Switching (Note 4)						
Turn-On Delay Time	V_{GS} = 10V, V_{DS} = 20V, I_D = 17A, R_G = 1.5Ω	$t_{d(on)}$	--	10.1	--	nS
Rise Time		t_r	--	55.7	--	
Turn-Off Delay Time		$t_{d(off)}$	--	20.3	--	
Fall Time		t_f	--	5.7	--	
Source-Drain Diode						
Diode Forward Voltage (Note 3)	V_{GS} = 0V, I_S = 27A	V_{SD}	--	--	1.1	V
Reverse Recovery Time	I_S = 17A, di/dt = 100A/μs	t_{rr}	--	32	--	nS
Reverse Recovery Charge		Q_{rr}	--	22	--	nC

Notes:

1. Package current limit.
2. L = 0.3mH, V_{GS} = 10V, R_G = 25Ω, Starting T_J = 25°C.
3. Pulse test: Pulse Width ≤ 300μs, duty cycle ≤ 2%.
4. Switching time is essentially independent of operating temperature.

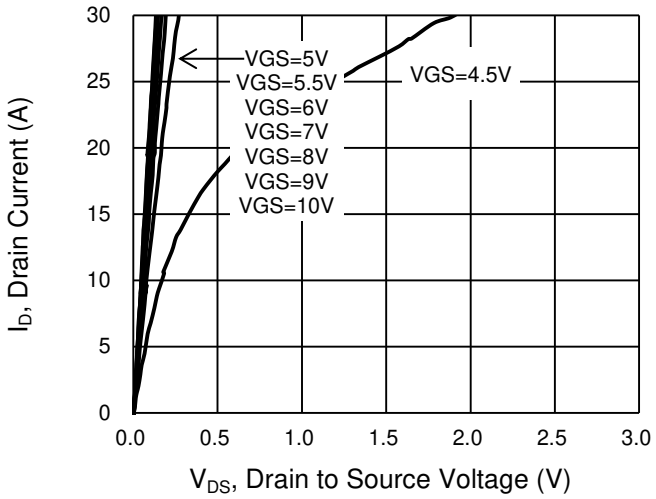
ORDERING INFORMATION

ORDERING CODE	PACKAGE	PACKING
TSM056NH04CR RLG	PDFN56U	2,500pcs / 13” Reel

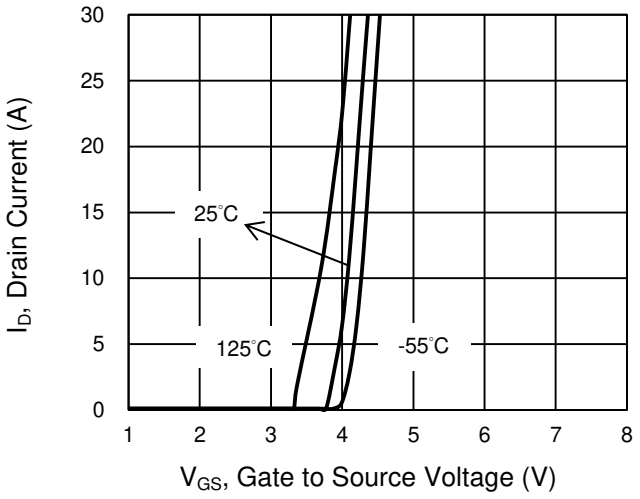
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

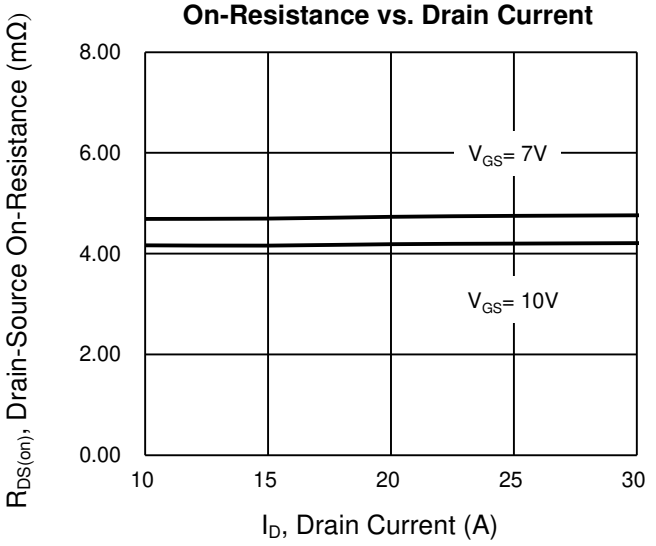
Output Characteristics



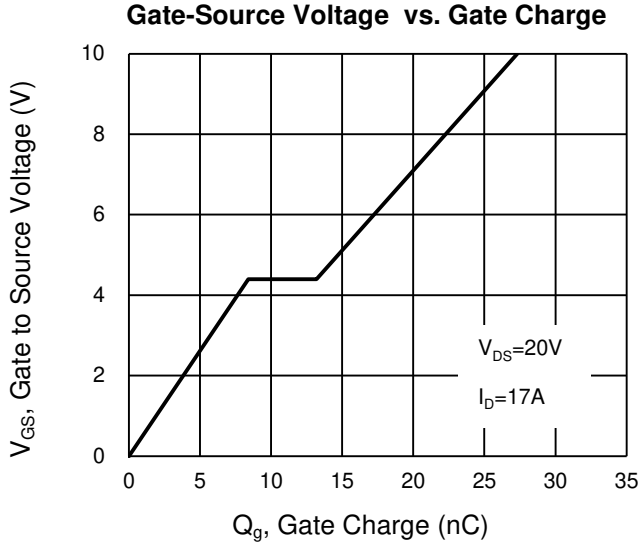
Transfer Characteristics



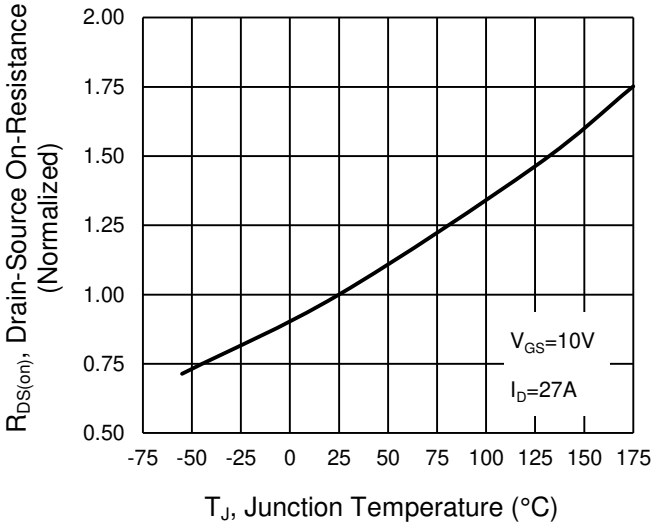
On-Resistance vs. Drain Current



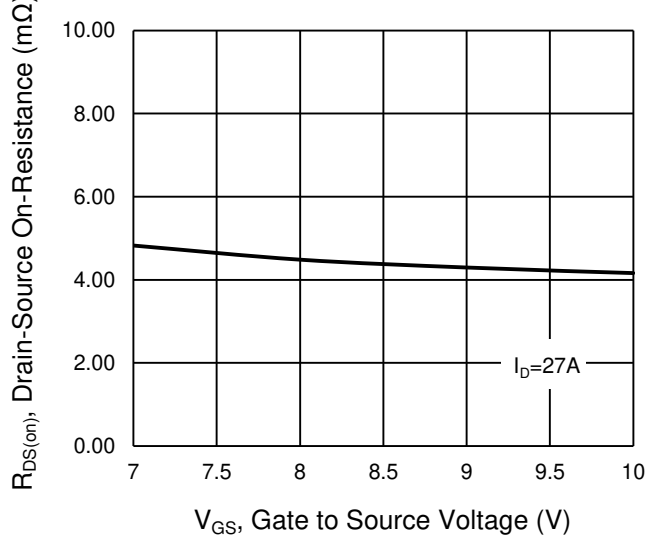
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



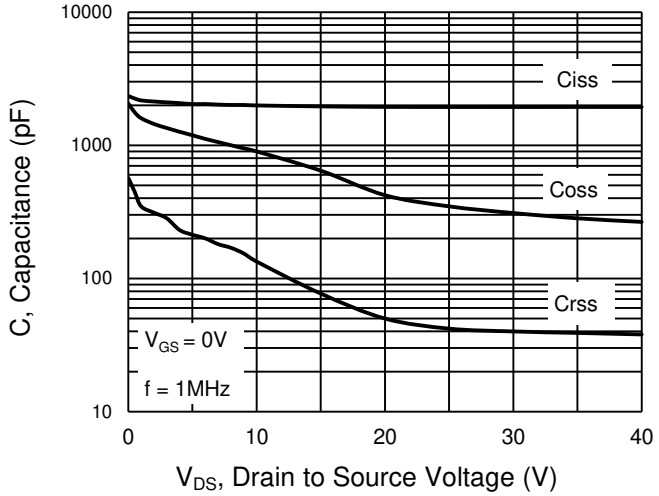
On-Resistance vs. Gate-Source Voltage



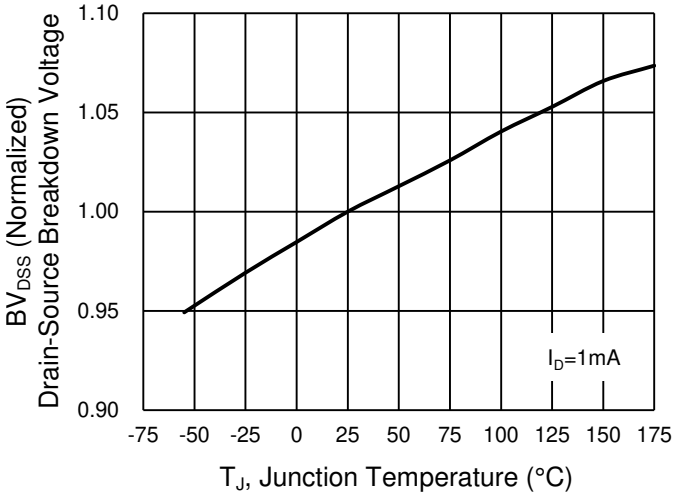
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

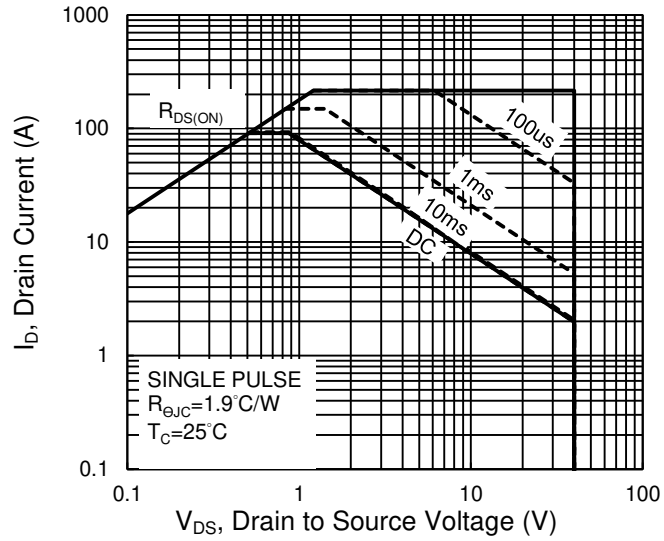
Capacitance vs. Drain-Source Voltage



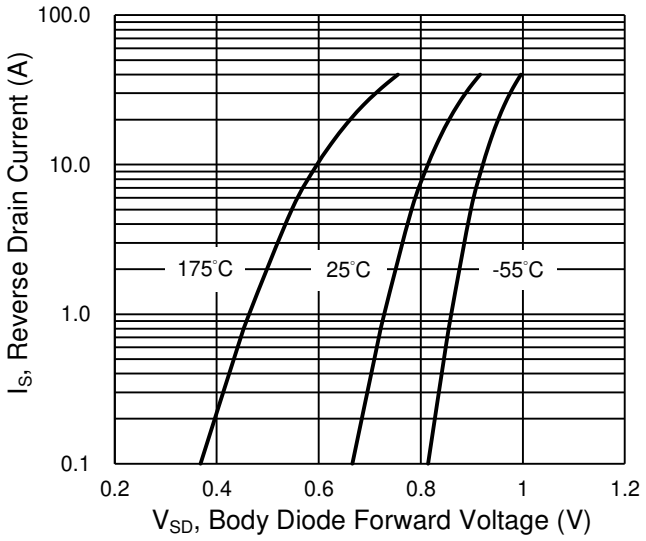
BV_{DSS} vs. Junction Temperature



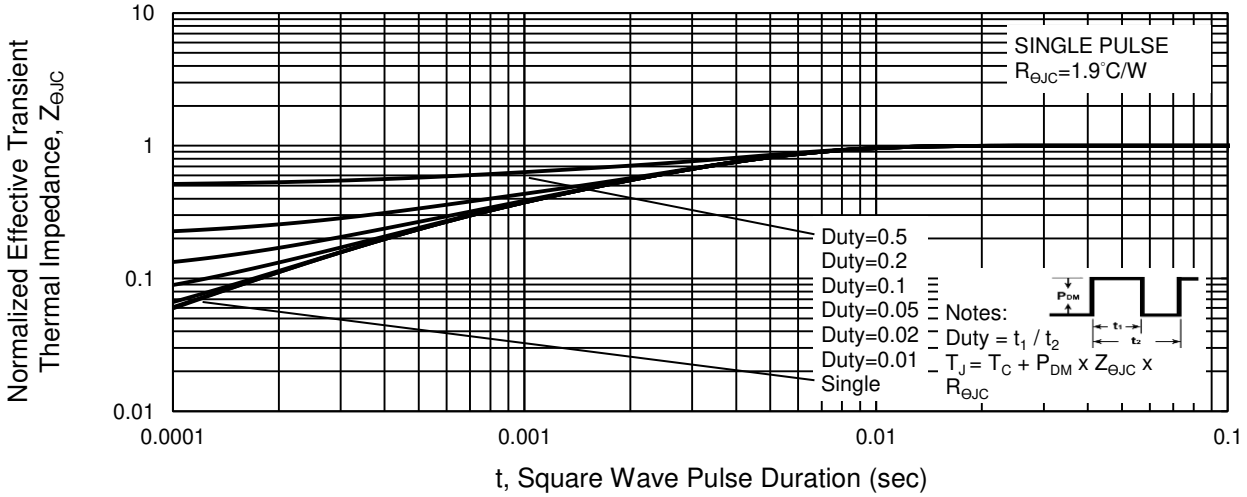
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage



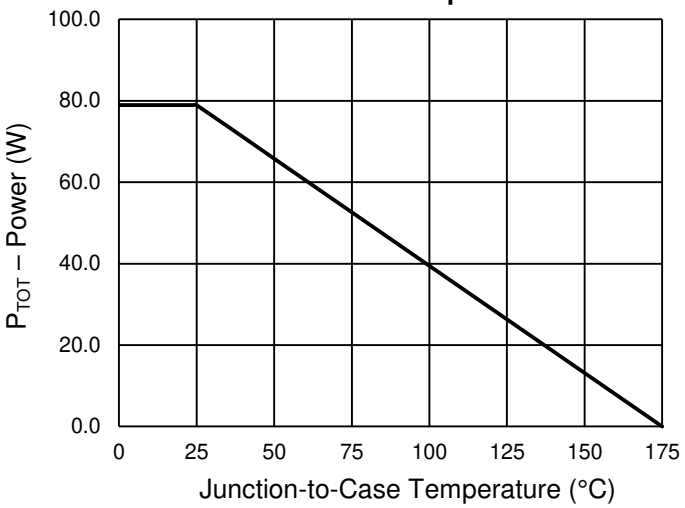
Normalized Thermal Transient Impedance, Junction-to-Case



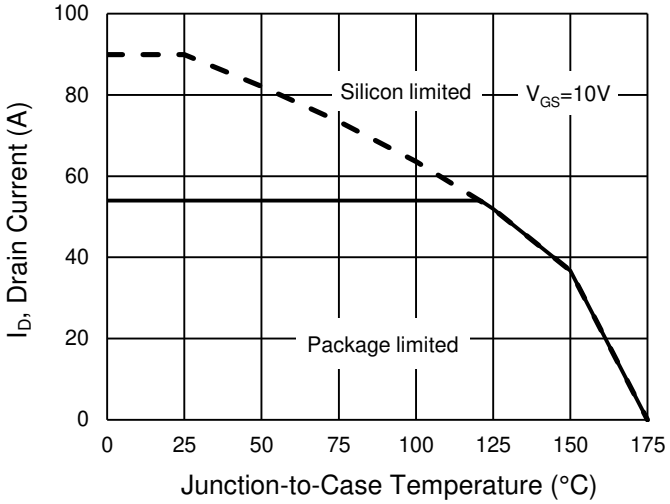
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

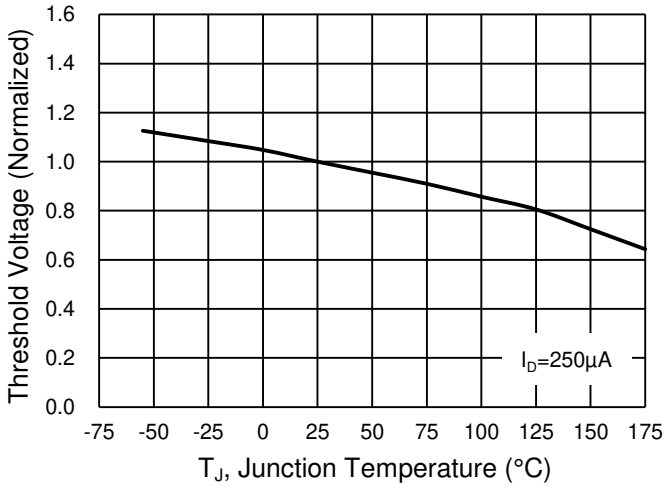
Power Dissipation



Drain Current

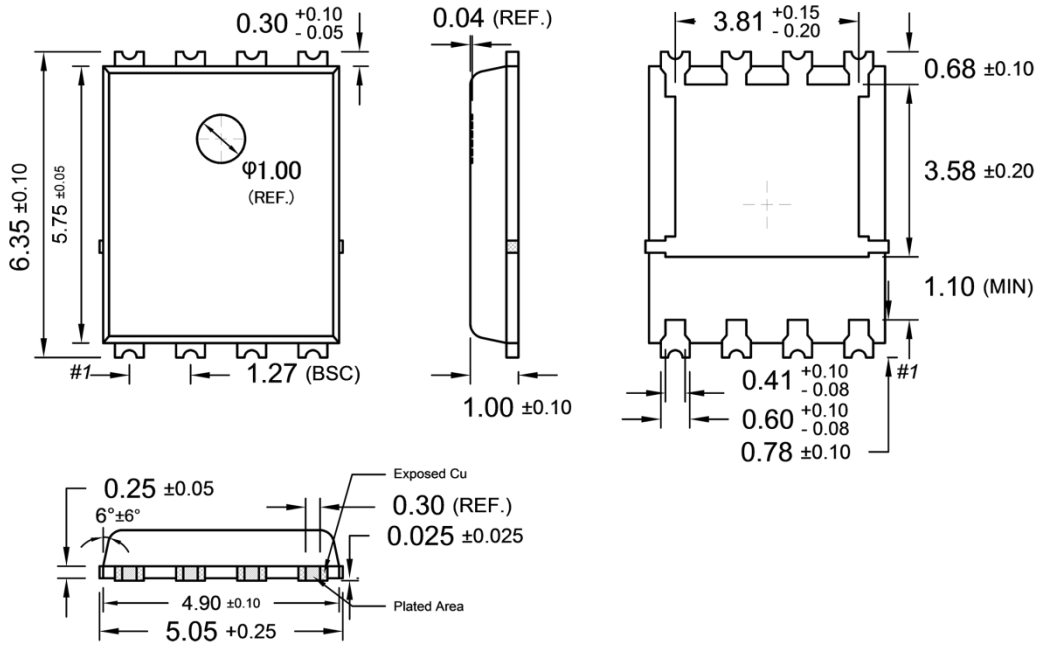


Normalized gate threshold voltage vs Temperature

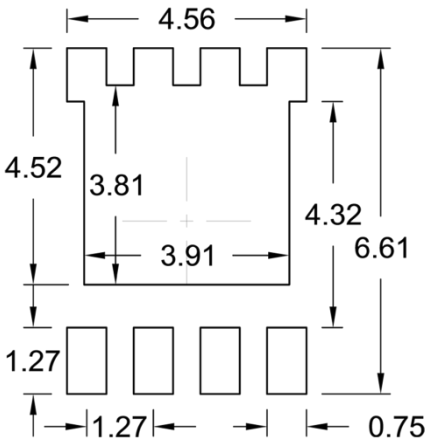


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

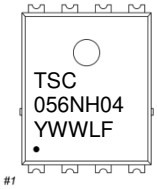
PDFN56U



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

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