

PerFET™ Power Transistor

FEATURES

- Ultra-low On-resistance
- 100% UIS and Rg tested
- RoHS Compliant
- Halogen-Free according to IEC 61249-2-21

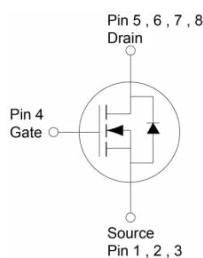
APPLICATIONS

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

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	$V_{GS} = 10V$	29	nC



PDFN33



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}	40	V
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current, Silicon limited	$T_C = 25^\circ\text{C}$	I_D	61	A
Continuous Drain Current ^(Note 1)	$T_C = 25^\circ\text{C}$	I_D	54	A
	$T_C = 100^\circ\text{C}$		39	
	$T_A = 25^\circ\text{C}$		16	
Pulsed Drain Current		I_{DM}	216	A
Single Pulse Avalanche Current ^(Note 2)		I_{AS}	21.3	A
Single Pulse Avalanche Energy ^(Note 2)		E_{AS}	68	mJ
Total Power Dissipation	$T_C = 25^\circ\text{C}$	P_D	34	W
	$T_C = 125^\circ\text{C}$		6.8	
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

THERMAL RESISTANCE			
PARAMETER	SYMBOL	MAXIMUM	UNIT
Thermal Resistance – Junction to Case	$R_{\theta JC}$	3.7	$^\circ\text{C/W}$
Thermal Resistance – Junction to Ambient	$R_{\theta JA}$	53	$^\circ\text{C/W}$

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 ($T_A = 25^\circ\text{C}$ 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}	40	--	--	V
Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	$V_{GS(TH)}$	2.4	3	3.6	V
Gate-Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	I_{GSS}	--	--	± 100	nA
Drain-Source Leakage Current	$V_{GS} = 0\text{V}, V_{DS} = 40\text{V}$	I_{DSS}	--	--	1	μA
	$V_{GS} = 0\text{V}, V_{DS} = 40\text{V}$ $T_J = 125^\circ\text{C}$		--	--	100	
Drain-Source On-State Resistance (Note 3)	$V_{GS} = 10\text{V}, I_D = 27\text{A}$	$R_{DS(on)}$	--	4.7	5.6	m Ω
	$V_{GS} = 7\text{V}, I_D = 27\text{A}$		--	5.3	6.7	
Forward Transconductance (Note 3)	$V_{DS} = 10\text{V}, I_D = 10\text{A}$	g_{fs}	--	42	--	S
Dynamic						
Total Gate Charge	$V_{GS} = 7\text{V}, V_{DS} = 20\text{V},$ $I_D = 16\text{A}$	Q_g	--	21	--	nC
Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 20\text{V},$ $I_D = 16\text{A}$	Q_g	--	29	--	
Gate-Source Charge		Q_{gs}	--	8.8	--	
Gate-Drain Charge		Q_{gd}	--	5.6	--	
Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 25\text{V},$ $f = 1.0\text{MHz}$	C_{iss}	--	1828	--	pF
Output Capacitance		C_{oss}	--	366	--	
Reverse Transfer Capacitance		C_{rss}	--	35	--	
Gate Resistance	$f = 1.0\text{MHz}$	R_g	--	1.7	--	Ω
Switching (Note 4)						
Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 20\text{V},$ $I_D = 16\text{A}, R_G = 1.7\Omega$	$t_{d(on)}$	--	12	--	nS
Rise Time		t_r	--	49	--	
Turn-Off Delay Time		$t_{d(off)}$	--	25	--	
Fall Time		t_f	--	8.9	--	
Source-Drain Diode						
Diode Forward Voltage (Note 3)	$V_{GS} = 0\text{V}, I_S = 27\text{A}$	V_{SD}	--	--	1.1	V
Reverse Recovery Time	$I_S = 16\text{A},$	t_{rr}	--	34	--	nS
Reverse Recovery Charge	$di/dt = 100\text{A}/\mu\text{s}$	Q_{rr}	--	31	--	nC

Notes:

- Package current limit.
- $L = 0.3\text{mH}, V_{GS} = 10\text{V}, R_G = 25\Omega,$ Starting $T_J = 25^\circ\text{C}.$
- Pulse test: Pulse Width $\leq 300\mu\text{s},$ duty cycle $\leq 2\%.$
- Switching time is essentially independent of operating temperature.

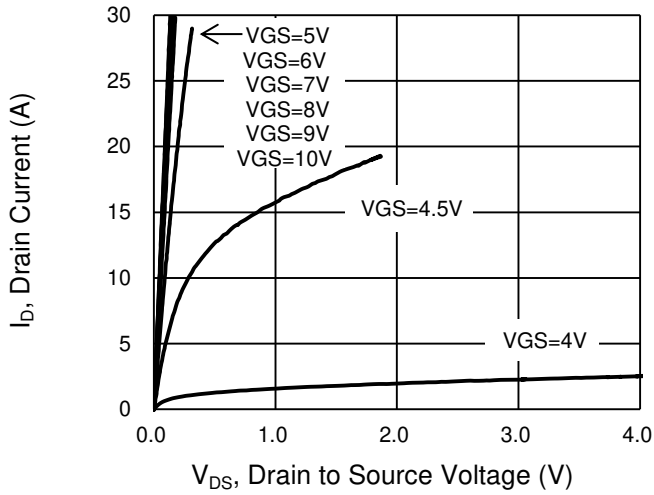
ORDERING INFORMATION

ORDERING CODE	PACKAGE	PACKING
TSM056NH04CV RGG	PDFN33	5,000pcs / 13" Reel

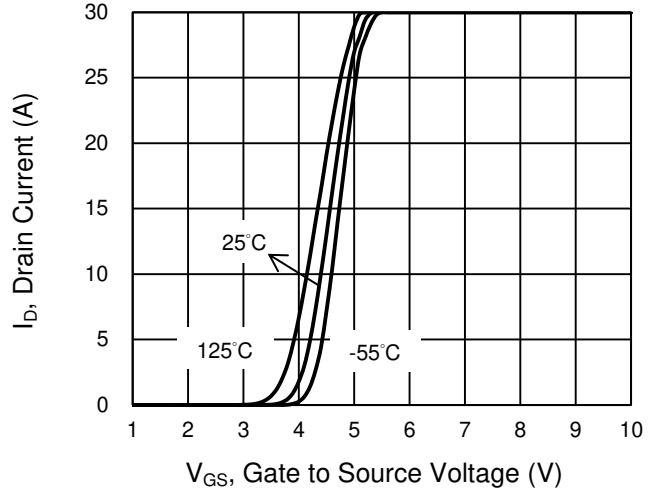
CHARACTERISTICS CURVES

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

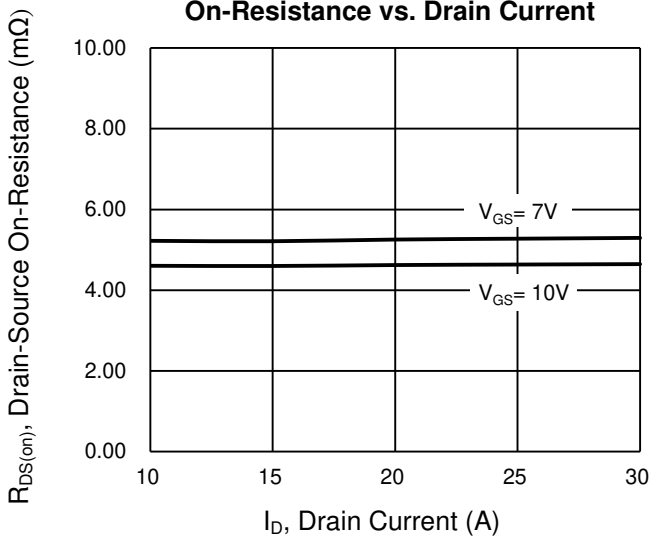
Output Characteristics



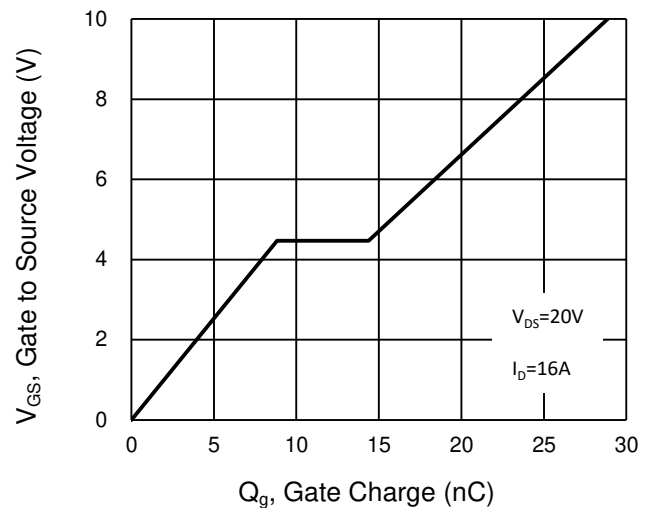
Transfer Characteristics



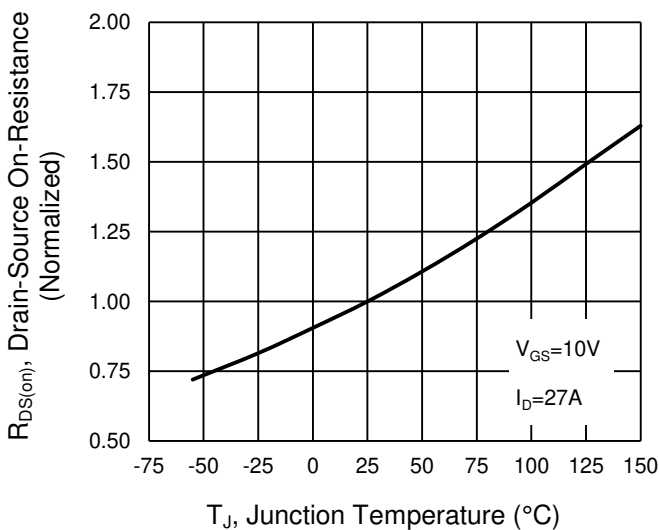
On-Resistance vs. Drain Current



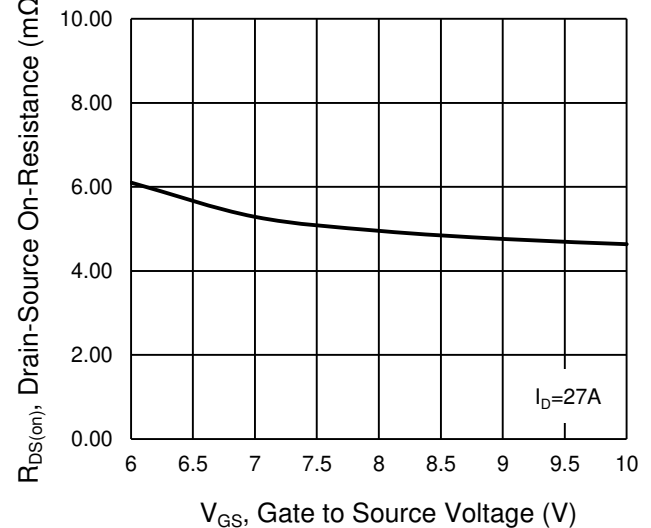
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature

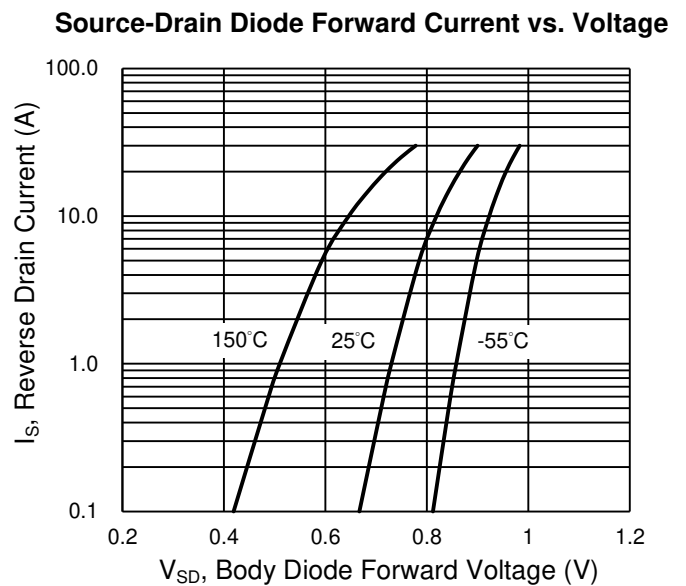
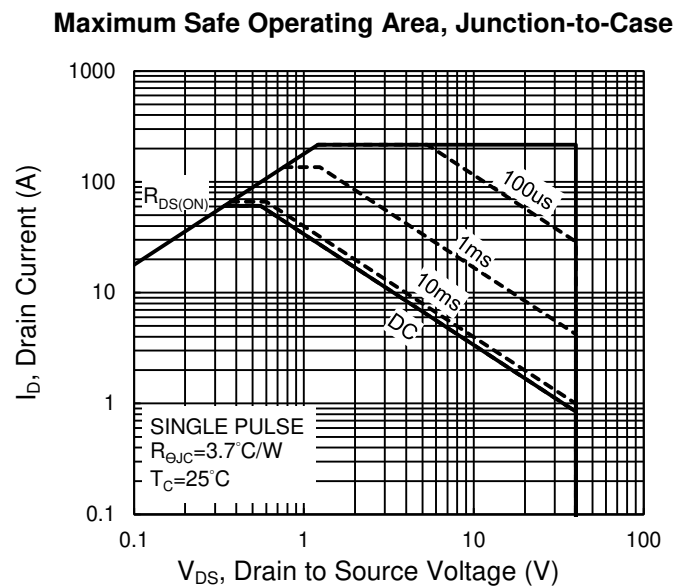
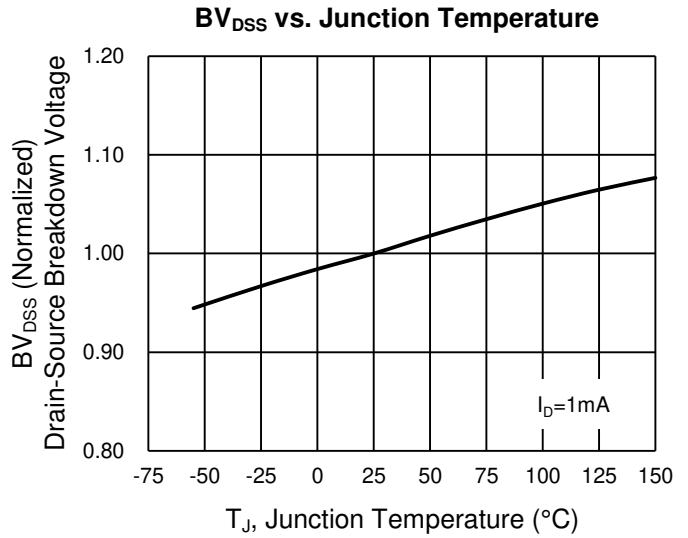
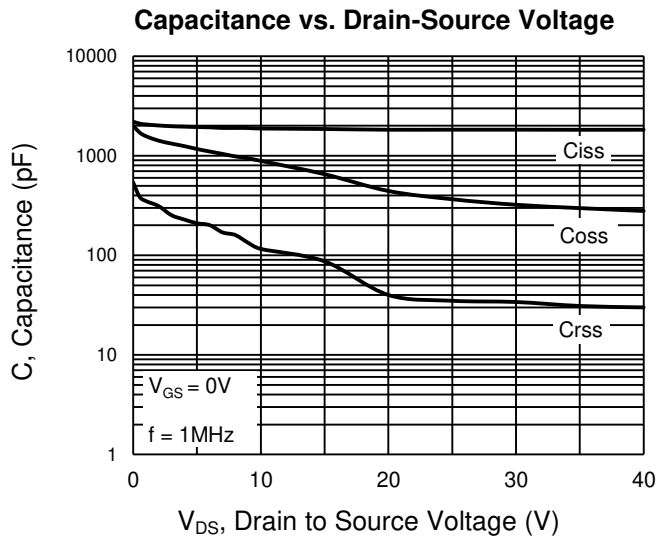


On-Resistance vs. Gate-Source Voltage

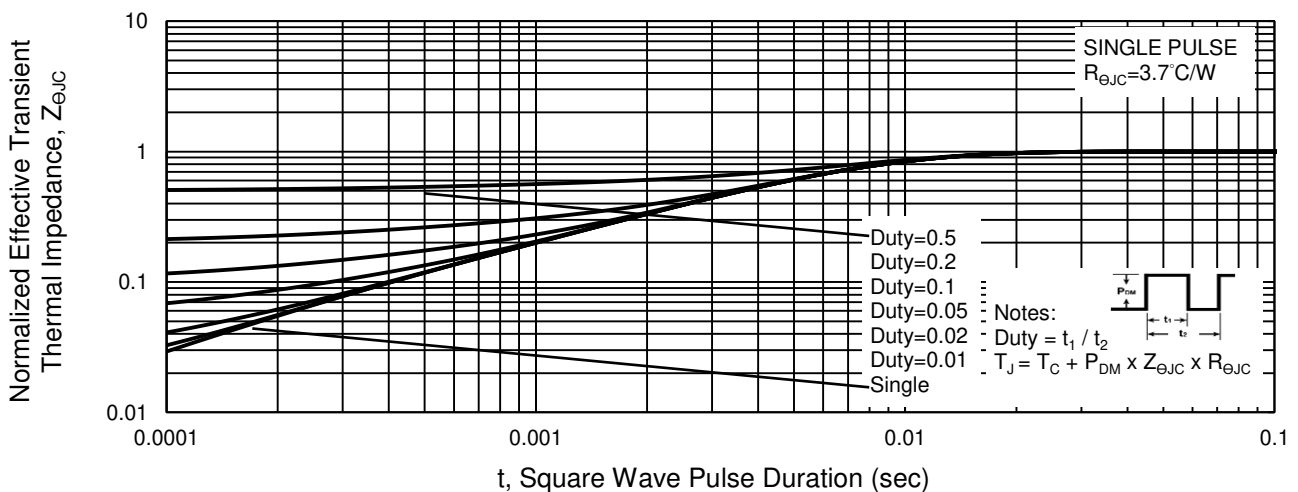


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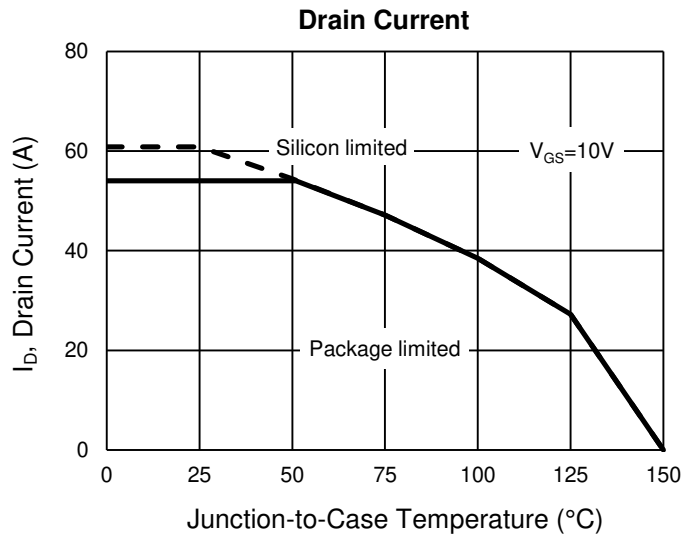
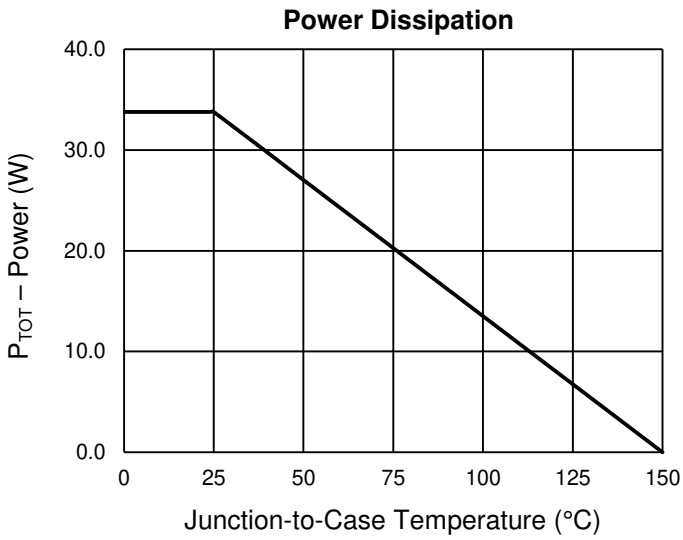


Normalized Thermal Transient Impedance, Junction-to-Case

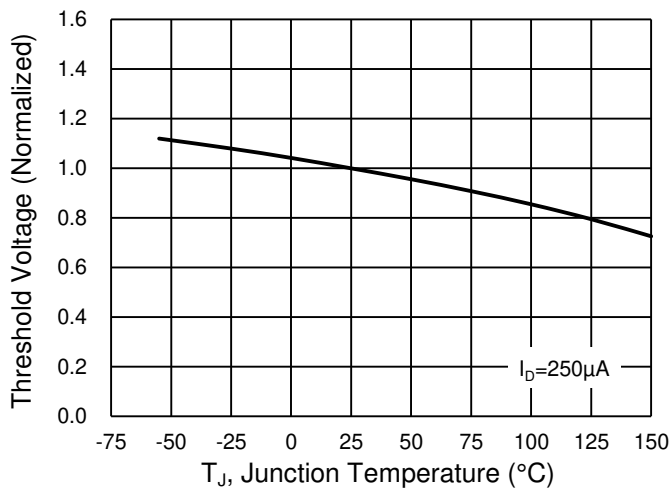


CHARACTERISTICS CURVES

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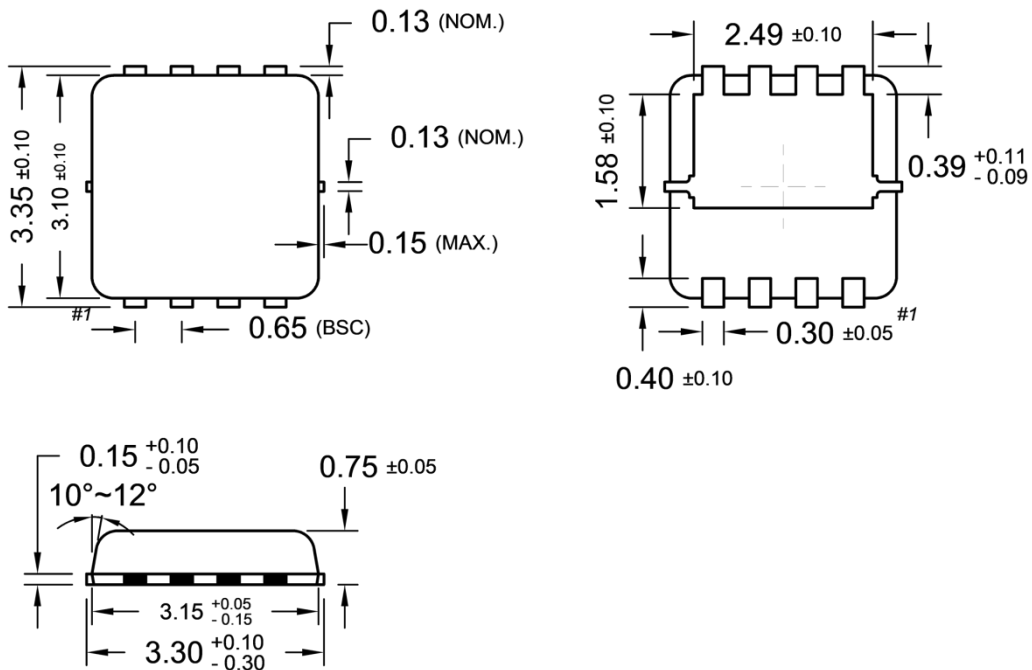


Normalized gate threshold voltage vs Temperature

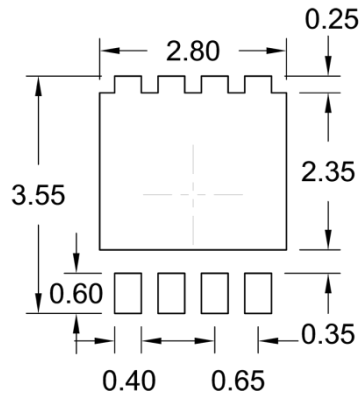


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

PDFN33



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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