

N-Channel Power MOSFET

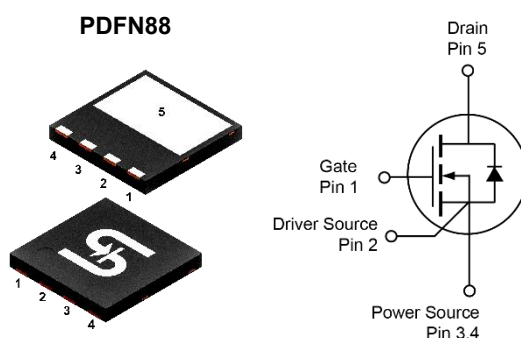
FEATURES

- Latest super-junction technology
- Low gate charge capacitance
- The driver source pin (Kelvin-source) helps reduce switching losses
- High gate noise immunity
- RoHS compliant
- Halogen-free

APPLICATIONS

- Switching power supply
- HV motor driver

KEY PERFORMANCE PARAMETERS		
PARAMETER	VALUE	UNIT
$V_{DS} @ T_{j,max}$	650	V
$R_{DS(on)} (max)$	180	mΩ
$Q_{g,typ}$	36	nC



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}	600	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current	I_D	20	A
Pulsed Drain Current (Note 1)	I_{DM}	60	A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_D	169	W
Single Pulse Avalanche Energy (Note 2)	E_{AS}	93	mJ
Single Pulse Avalanche Current (Note 2)	I_{AS}	1.9	A
Operating Junction and Storage Temperature Range	T_J, T_{STG}	- 55 to +150	$^\circ\text{C}$

THERMAL PERFORMANCE			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction to Case Thermal Resistance	$R_{\theta JC}$	0.74	$^\circ\text{C/W}$
Junction to Ambient Thermal Resistance (Note 3)	$R_{\theta JA}$	48	$^\circ\text{C/W}$

Notes:

1. Pulse Width $\leq 100\mu\text{s}$.
2. $L \approx 50\text{mH}$, $R_G = 25\Omega$, 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°C unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static (Note 4)						
Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 1mA	BV _{DSS}	600	--	--	V
Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 1.8mA	V _{GS(TH)}	4	4.9	6	V
Gate Body Leakage	V _{GS} = ±30V, V _{DS} = 0V	I _{GSS}	--	--	±100	nA
Zero Gate Voltage Drain Current	V _{DS} = 600V, V _{GS} = 0V	I _{DSS}	--	--	100	μA
Drain-Source On-State Resistance	V _{GS} = 10V, I _D = 6.6A	R _{DS(on)}	--	154	180	mΩ
	V _{GS} = 12V, I _D = 6.6A		--	149	175	
Dynamic (Note 5)						
Total Gate Charge	V _{DS} = 480V, I _D = 20A, V _{GS} = 10V	Q _g	--	36	--	nC
Gate-Source Charge		Q _{gs}	--	12	--	
Gate-Drain Charge		Q _{gd}	--	20	--	
Input Capacitance	V _{DS} = 300V, V _{GS} = 0V, f = 100kHz	C _{iss}	--	1405	--	pF
Output Capacitance		C _{oss}	--	43	--	
Reverse Transfer Capacitance		C _{rss}	--	8	--	
Effective output capacitance energy related	V _{GS} = 0V	C _{o(er)}	--	99	--	
Effective output capacitance time related	V _{DS} = 0V to 480V	C _{o(tr)}	--	379	--	
Gate Resistance	f = 1.0MHz	R _g	--	1.7	--	Ω
Switching (Note 6)						
Turn-On Delay Time	V _{DD} = 300V, R _G = 6Ω, I _D = 20A, V _{GS} = 10V	t _{d(on)}	--	27	--	ns
Turn-On Rise Time		t _r	--	68	--	
Turn-Off Delay Time		t _{d(off)}	--	42	--	
Turn-Off Fall Time		t _f	--	17	--	
Source-Drain Diode						
Forward Voltage (Note 4)	I _S = 6.6A, V _{GS} = 0V	V _{SD}	--	0.8	1.5	V
Reverse Recovery Time	I _S = 10A	t _{rr}	--	301	--	ns
Reverse Recovery Charge	dI _F /dt = 100A/μs	Q _{rr}	--	4.4	--	μC

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.

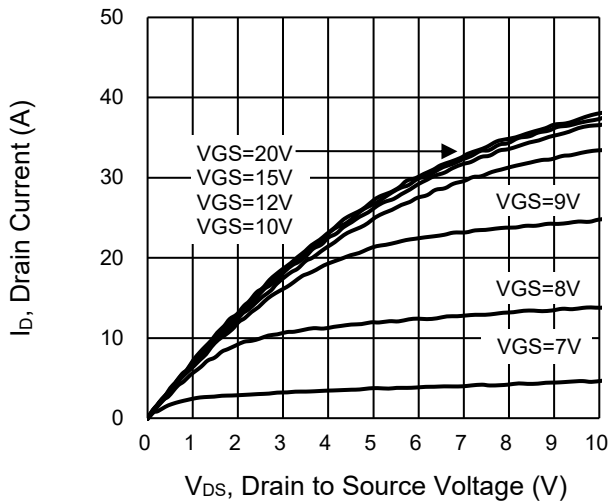
ORDERING INFORMATION

ORDERING CODE	PACKAGE	PACKING
TSM60NE180CE RVG	PDFN88	3,000pcs / 13" Reel

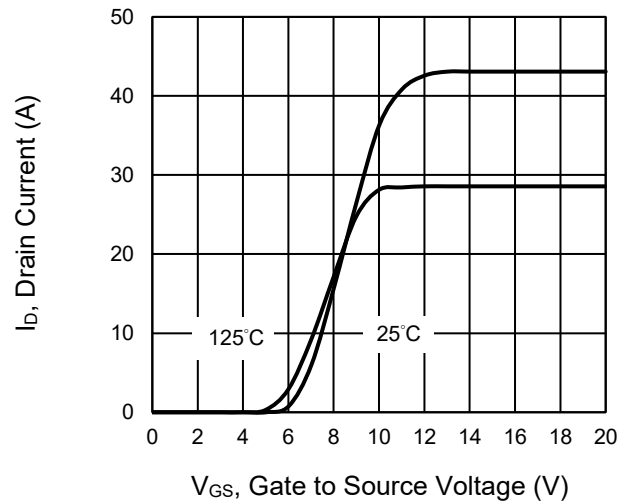
CHARACTERISTICS CURVES

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

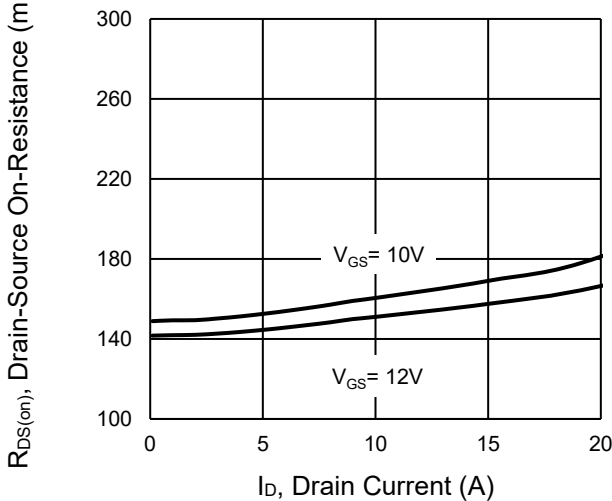
Output Characteristics



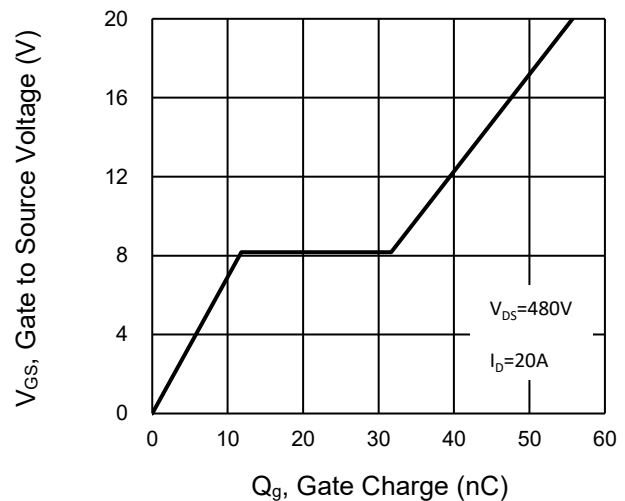
Transfer Characteristics



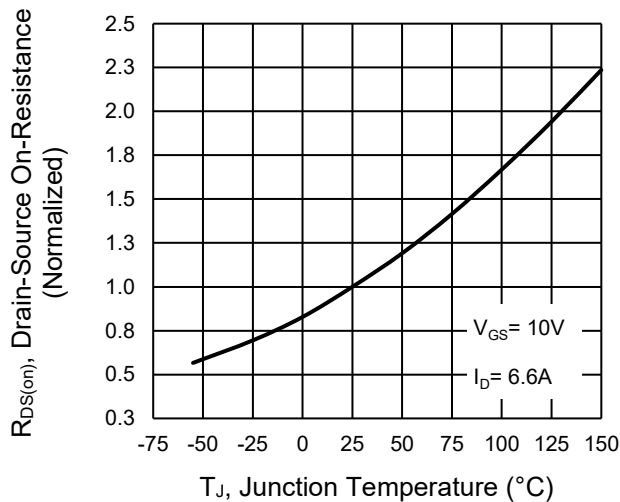
On-Resistance vs. Drain Current



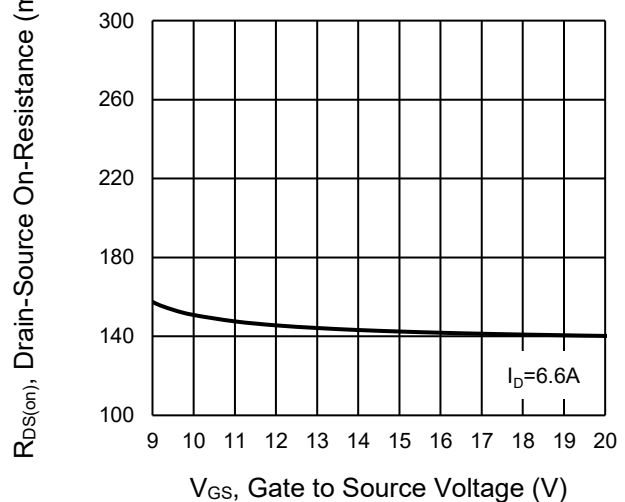
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



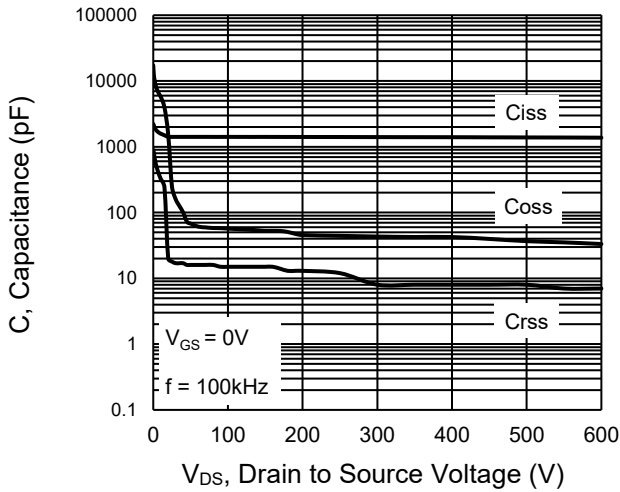
On-Resistance vs. Gate-Source Voltage



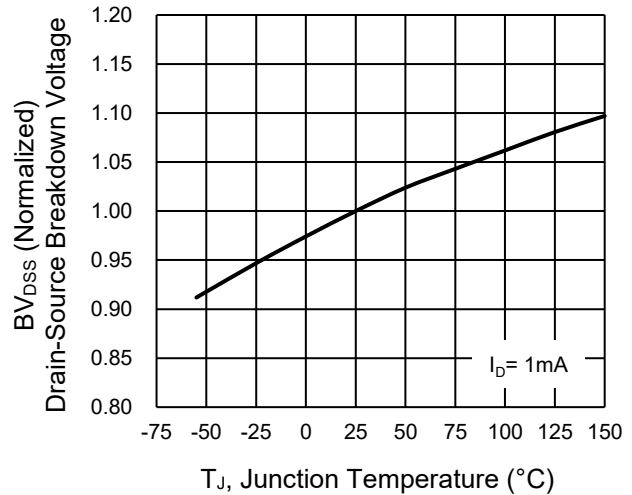
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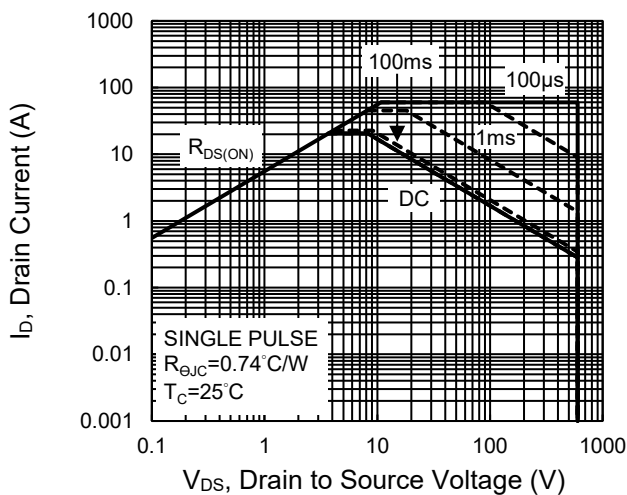
Capacitance vs. Drain-Source Voltage



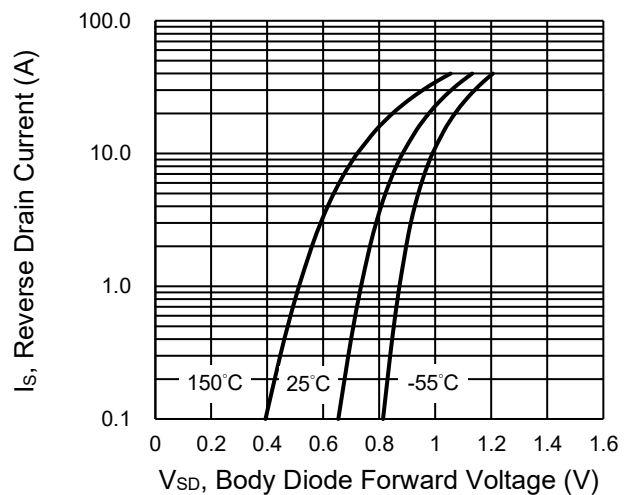
BV_{DSS} vs. Junction Temperature



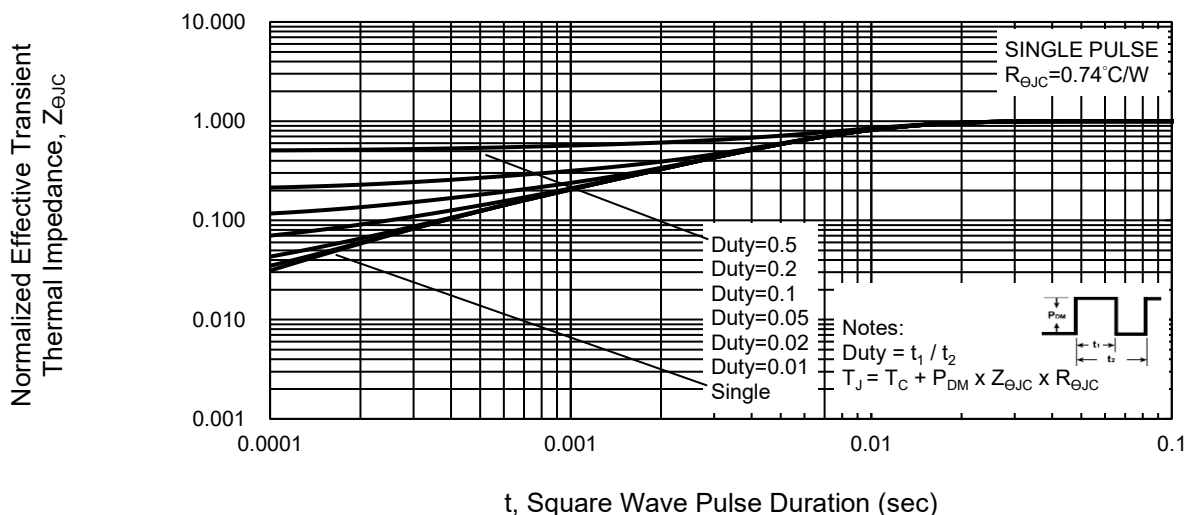
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage

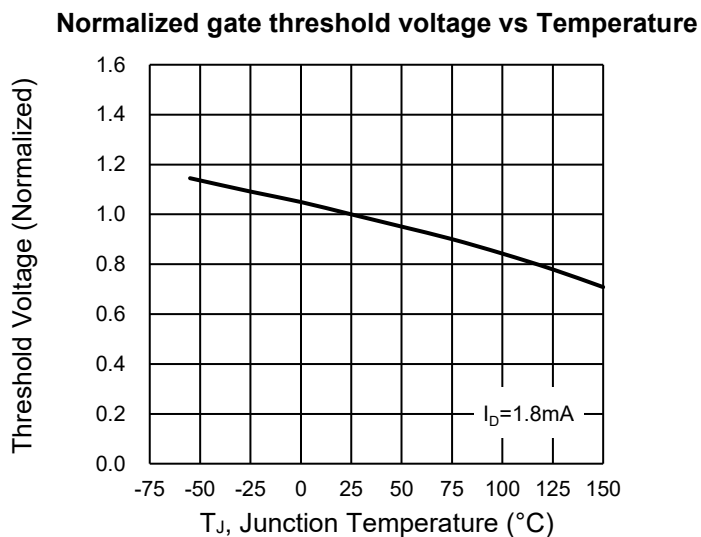
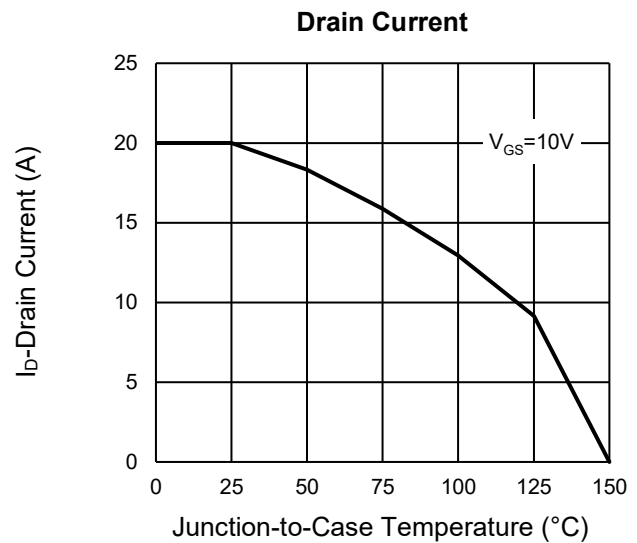
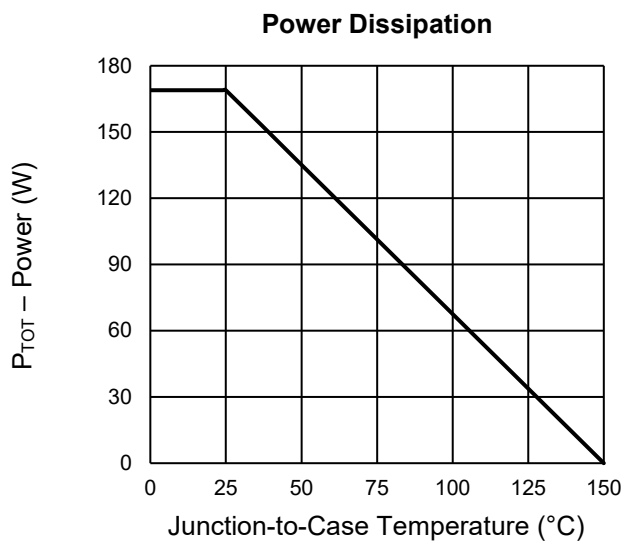


Normalized Thermal Transient Impedance, Junction-to-Case



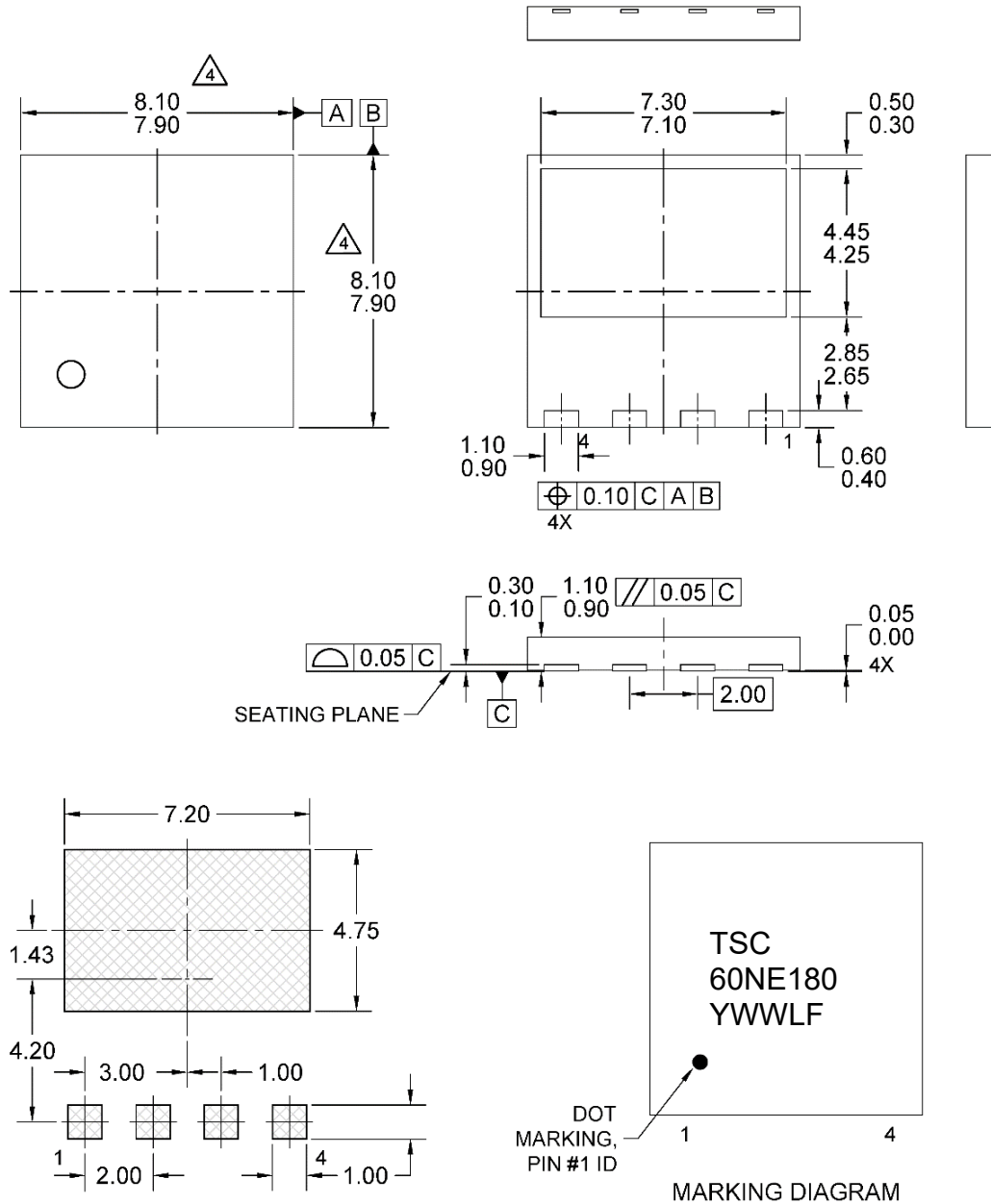
CHARACTERISTICS CURVES

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



PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

PDFN88



SUGGESTED PAD LAYOUT
(REFERENCE ONLY)

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. THERE IS NO EXISTING INDUSTRY STANDARD FOR THIS PACKAGE.
4. MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
5. DWG NO REF: HQ2SD07-PDFN88-126 REV A.

60NE180 = Device marking
Y = Year Code
WW = Week Code (01~52)
L = Lot Code (1~9,A~Z)
F = Factory Code

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