



YOUSHANG SEMICONDUCTOR

设计研发新型功率器件

各类小信号开关

中低压及高压大电流等场效应管

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Product Summary

BV_{DSS}	$R_{DS(ON) MAX}$	I_D $T_c = +25^\circ C$
-40V	11m Ω @ $V_{GS} = -10V$	-83.4A
	19m Ω @ $V_{GS} = -4.5V$	-66.5A

Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low On-Resistance
- Fast Switching Speed
- Wettable Flank for Improved Optical Inspections

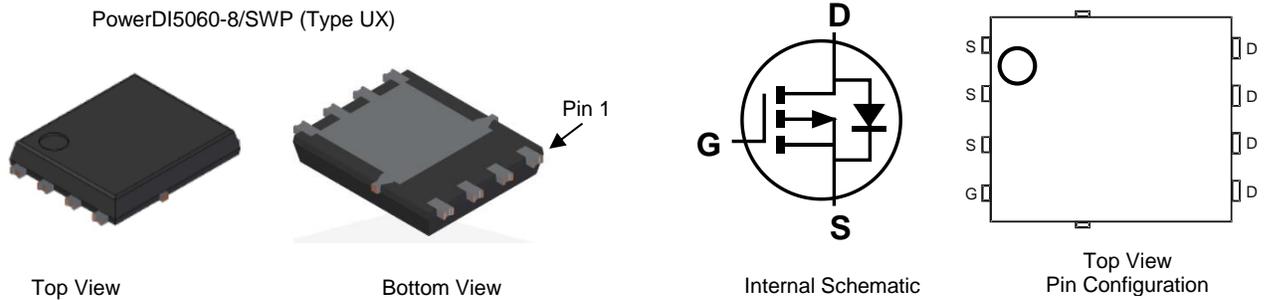
Description and Applications

This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- DC-DC converters
- Power-management functions
- Analog switches

Mechanical Data

- Package: PowerDI[®]5060-8
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.097 grams (Approximate)



Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DS}	-40	V
Gate-Source Voltage			V_{GS}	± 20	V
Continuous Drain Current (Note 5) $V_{GS} = -10\text{V}$	Steady State	$T_C = +25^\circ\text{C}$ $T_C = +100^\circ\text{C}$	I_D	-83.4 -59	A
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	-333.6	A
Maximum Body Diode Continuous Current			I_S	-83.6	A
Pulsed Source Current (10 μs Pulse, Duty Cycle = 1%)			I_{SM}	-333.6	A
Avalanche Current $L = 1\text{mH}$			I_{AS}	-28.1	A
Avalanche Energy $L = 1\text{mH}$			E_{AS}	394.9	mJ

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	4.6	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	32	$^\circ\text{C/W}$
Total Power Dissipation (Note 5)	$T_C = +25^\circ\text{C}$	P_D	143	W
Thermal Resistance, Junction to Case (Note 5)		$R_{\theta JC}$	1.05	$^\circ\text{C/W}$
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	$^\circ\text{C}$

- Notes:
- Thermal resistance from junction to soldering point (on the exposed drain pad).
 - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV _{DSS}	-40	—	—	V	V _{GS} = 0V, I _D = -250μA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	-1	μA	V _{DS} = -40V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(TH)}	-1.0	—	-2.5	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	6.7	11	mΩ	V _{GS} = -10V, I _D = -9.8A
		—	9.3	19		V _{GS} = -4.5V, I _D = -9.8A
Diode Forward Voltage	V _{SD}	—	-0.67	-1	V	V _{GS} = 0V, I _S = -1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{iss}	—	5697	—	pF	V _{DS} = -20V, V _{GS} = 0V f = 1MHz
Output Capacitance	C _{oss}	—	534	—		
Reverse Transfer Capacitance	C _{rss}	—	408	—		
Gate Resistance	R _g	—	7	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = -4.5V)	Q _g	—	53	—	nC	V _{DS} = -20V, I _D = -9.8A
Total Gate Charge (V _{GS} = -10V)	Q _g	—	112	—		
Gate-Source Charge	Q _{gs}	—	20	—		
Gate-Drain Charge	Q _{gd}	—	18	—		
Turn-On Delay Time	t _{D(ON)}	—	11.5	—	ns	V _{GS} = -10V, V _{DD} = -20V R _g = 2Ω, I _D = -9.8A
Turn-On Rise Time	t _R	—	41	—		
Turn-Off Delay Time	t _{D(OFF)}	—	146	—		
Turn-Off Fall Time	t _F	—	165	—		
Reverse Recovery Time	t _{RR}	—	27	—	ns	I _F = -9.8A, dI/dt = -100A/μs
Reverse Recovery Charge	Q _{RR}	—	22	—	nC	I _F = -9.8A, dI/dt = -100A/μs

Notes: 7. Short duration pulse test used to minimize self-heating effect.
 8. Guaranteed by design. Not subject to product testing.

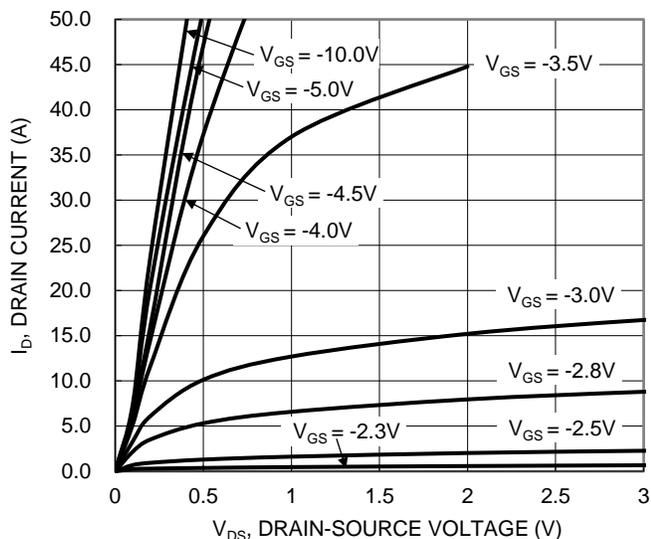


Figure 1. Typical Output Characteristic

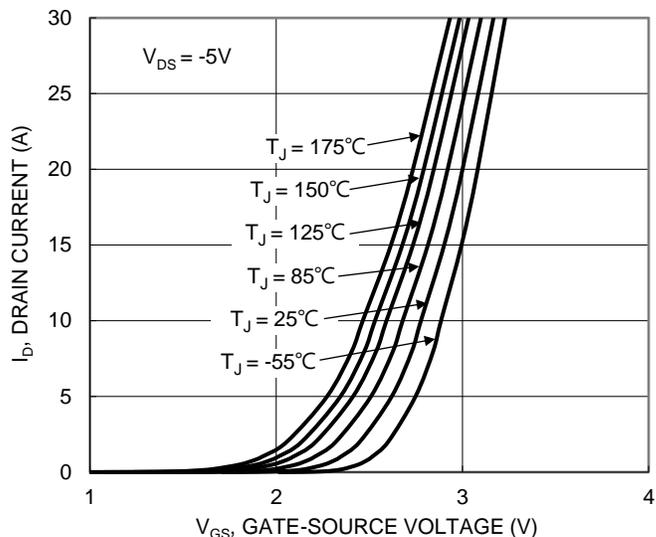


Figure 2. Typical Transfer Characteristic

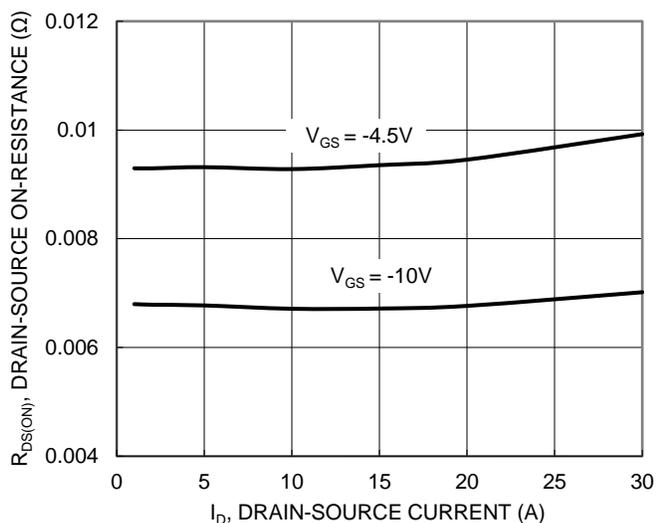


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

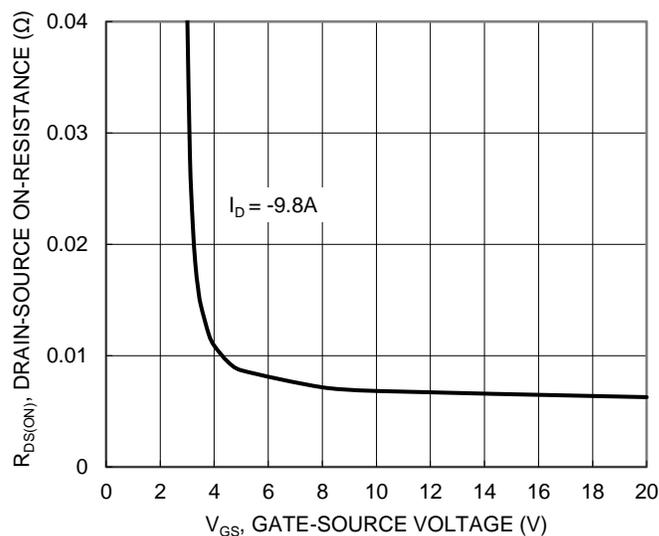


Figure 4. Typical Transfer Characteristic

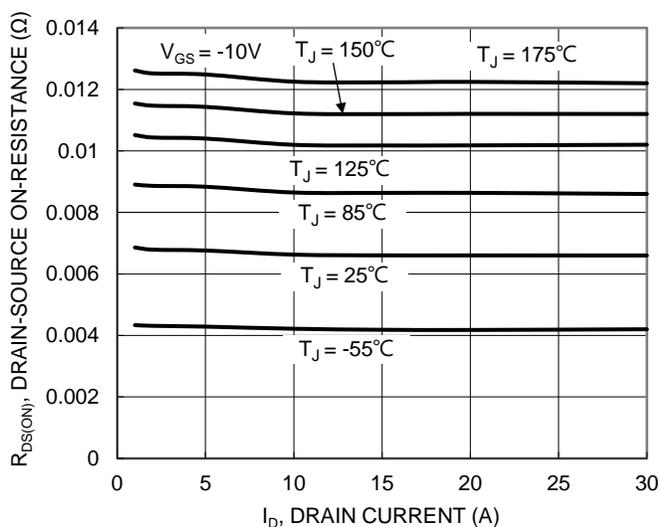


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

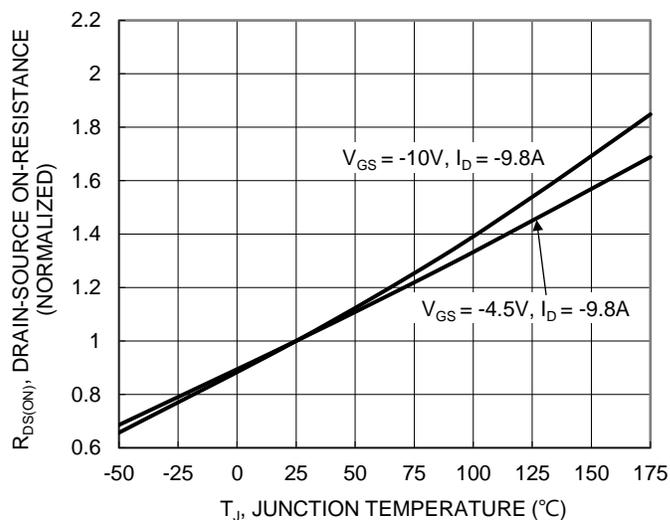


Figure 6. On-Resistance Variation with Junction Temperature

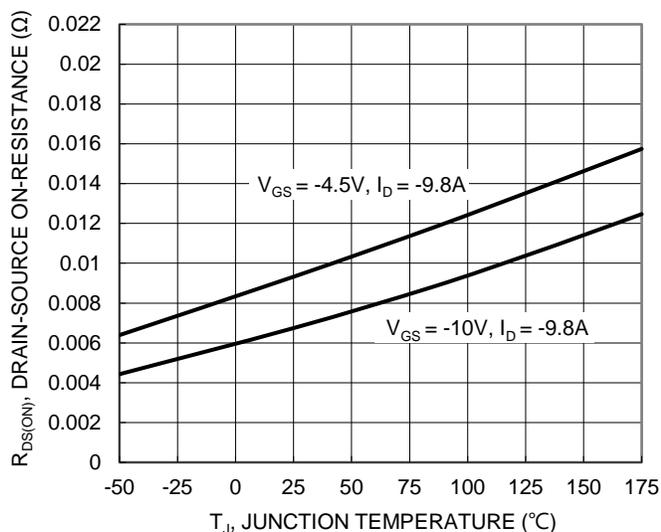


Figure 7. On-Resistance Variation with Junction Temperature

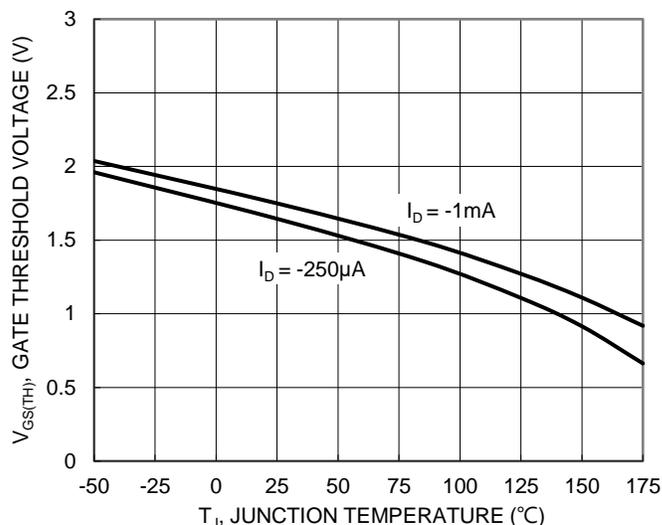


Figure 8. Gate Threshold Variation vs. Junction Temperature

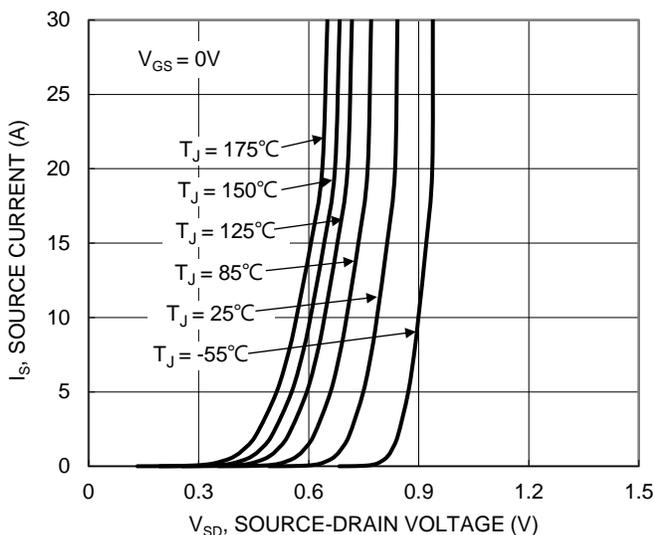


Figure 9. Diode Forward Voltage vs. Current

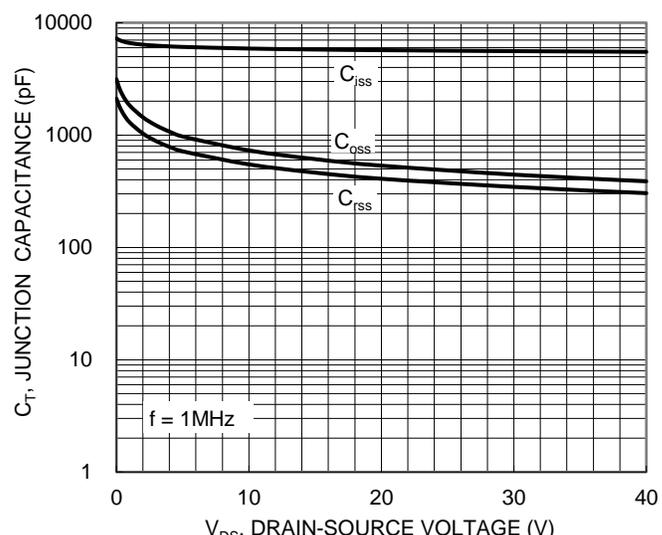


Figure 10. Typical Junction Capacitance

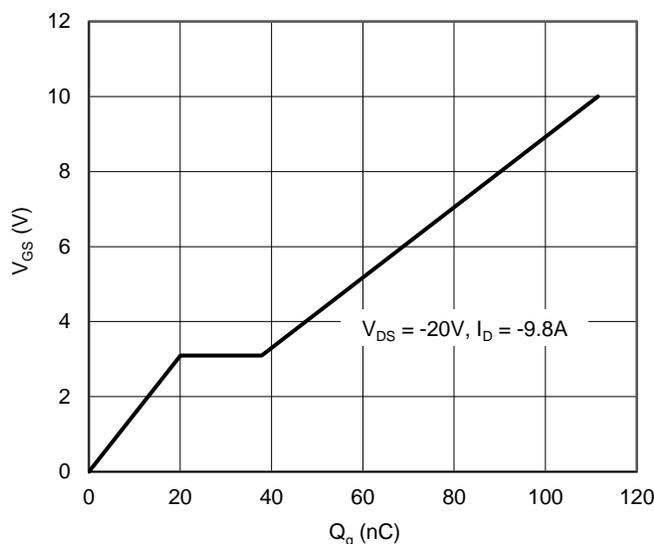


Figure 11. Gate Charge

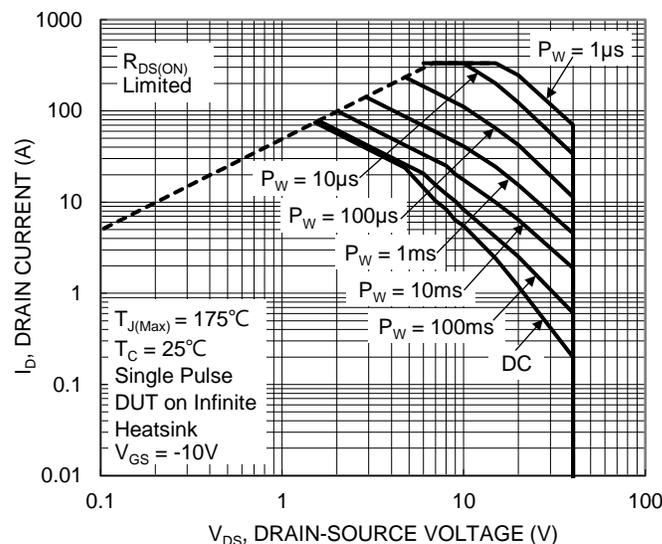


Figure 12. SOA, Safe Operation Area

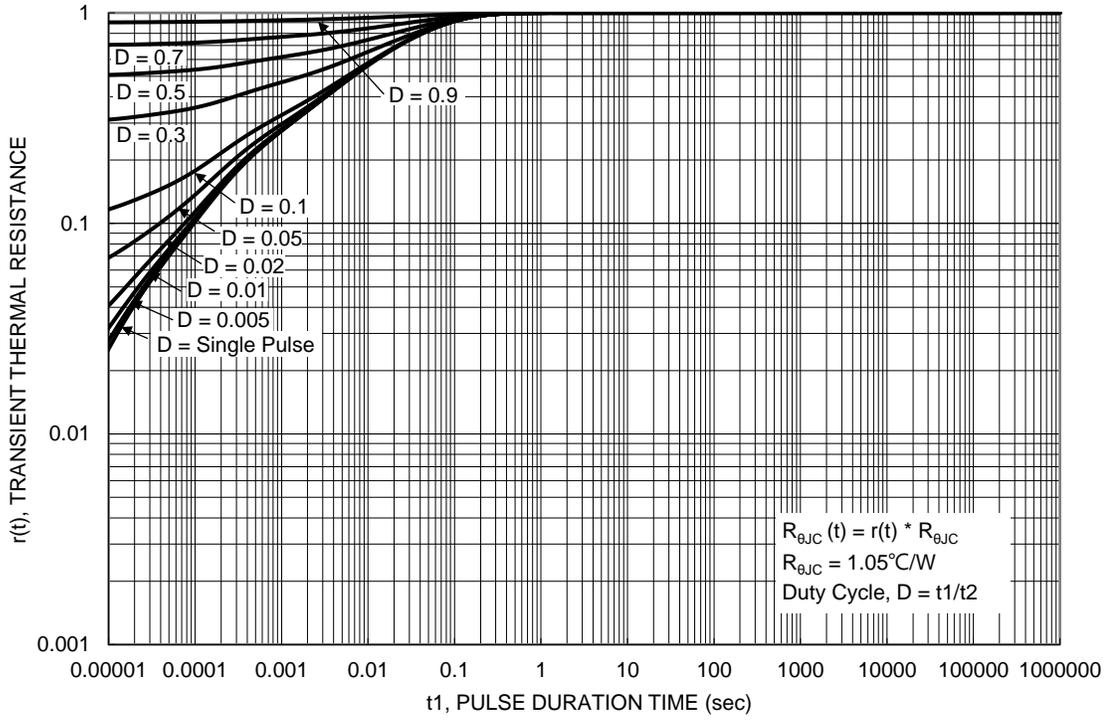
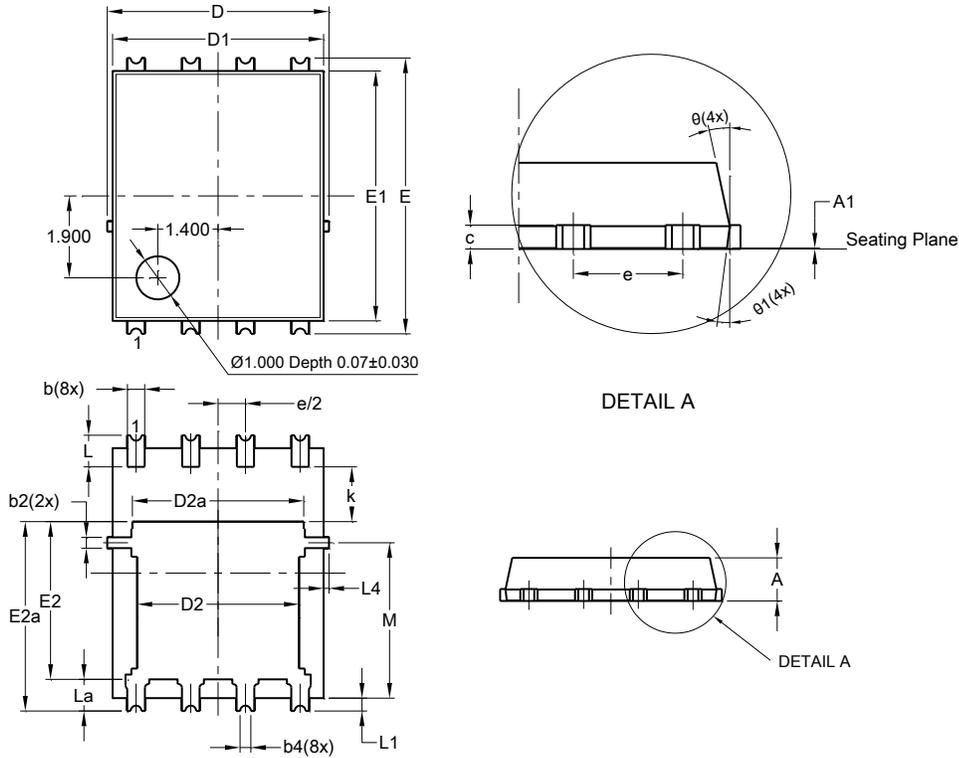


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

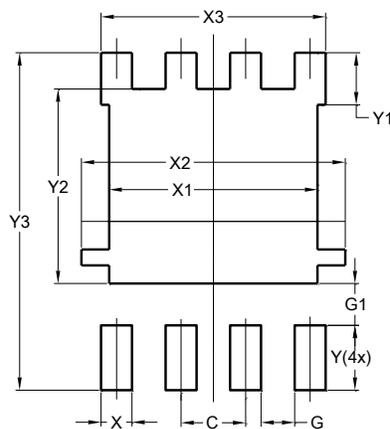
PowerDI5060-8/SWP (Type UX)



PowerDI5060-8/SWP (Type UX)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.56	3.96	3.76
D2a	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	1.27BSC		
k	1.05	--	--
L	0.635	0.835	0.735
La	0.635	0.835	0.735
L1	0.200	0.400	0.300
L1a	0.050REF		
L4	0.025	0.225	0.125
M	3.205	4.005	3.605
theta	10°	12°	11°
theta1	6°	8°	7°
All Dimensions in mm			

Suggested Pad Layout

PowerDI5060-8/SWP (Type UX)



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	4.100
X2	5.190
X3	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610