优尚

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 Max T_C = +25°C
150V	19mΩ @ V_{GS} = 10V	61A
	22mΩ @ V_{GS} = 8V	40A

Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- Thermally Efficient Package-Cooler Running Applications
- High Conversion Efficiency
- Low $R_{DS(on)}$ – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- <1.1mm Package Profile – Ideal for Thin Applications (PowerDI®)

Description and Applications

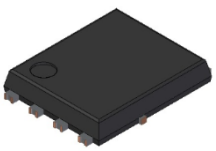
This new generation N-Channel Enhancement Mode MOSFET is designed to minimize $R_{DS(on)}$ yet maintain superior switching performance. This device is ideal for use in：

- Motor controls
- DC-DC converters
- Power managements

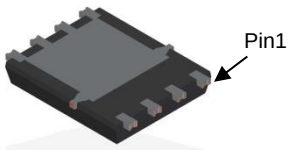
Mechanical Data

- Package: PowerDI5060-8
- Package Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Terminal Finish - Matte Tin Annealed over Copper Lead-Frame. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.097 grams (Approximate)

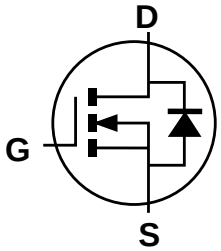
PowerDI5060-8 (SWP) (Type UX)



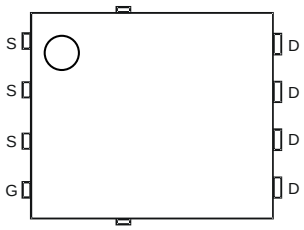
Top View



Bottom View



Internal Schematic



Top View
Pin Configuration

Maximum Ratings (@ T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	150	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current V_{GS} = 10V (Note 6)	Steady State	T_A = +25°C	I_D	11	A
		T_A = +100°C		7	
Continuous Drain Current V_{GS} = 10V (Note 7)	Steady State	T_C = +25°C	I_D	61	A
		T_C = +100°C		40	
Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)			I_{DM}	250	A
Maximum Continuous Body Diode Forward Current			I_S	61	A
Pulsed Body Diode Current (10μs Pulse, Duty Cycle = 1%)			I_{SM}	250	A
Avalanche Current (Note 8), L = 3mH			I_{AS}	14.4	A
Avalanche Energy (Note 8), L = 3mH			E_{AS}	311	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	1.5	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	97	°C/W
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	3.2	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	47	°C/W
Total Power Dissipation (Note 7)	T_C = +25°C	P_D	107	W
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	1.4	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	°C

Notes:
5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
7. Thermal resistance from junction to soldering point (on the exposed drain pad).
8. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
Drain-Source Breakdown Voltage	BV_{DSS}	150	—	—	V	V_{GS} = 0V, I_D = 10mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	V_{DS} = 120V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$V_{GS(th)}$	2	—	4	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(on)}$	—	14	19	mΩ	V_{GS} = 10V, I_D = 20A
		—	16	22		V_{GS} = 8V, I_D = 15A
Diode Forward Voltage	V_{SD}	—	0.8	1.2	V	V_{GS} = 0V, I_S = 20A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	2344	—	pF	V_{DS} = 75V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	213	—		
Reverse Transfer Capacitance	C_{rss}	—	6.9	—		
Gate Resistance	R_g	—	1.8	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge	Q_g	—	34	—	nC	V_{DD} = 75V, I_D = 20A, V_{GS} = 10V
Gate-Source Charge	Q_{gs}	—	12	—		
Gate-Drain Charge	Q_{gd}	—	9	—		
Turn-On Delay Time	$t_{D(on)}$	—	13.2	—	ns	V_{DD} = 75V, V_{GS} = 10V, I_D = 20A, R_g = 6Ω
Turn-On Rise Time	t_R	—	22.4	—		
Turn-Off Delay Time	$t_{D(off)}$	—	26.3	—		
Turn-Off Fall Time	t_F	—	16.1	—		
Reverse Recovery Time	t_{RR}	—	69	—	ns	I_F = 20A, di/dt = 100A/μs
Reverse Recovery Charge	Q_{RR}	—	196	—	nC	

Notes: 9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.

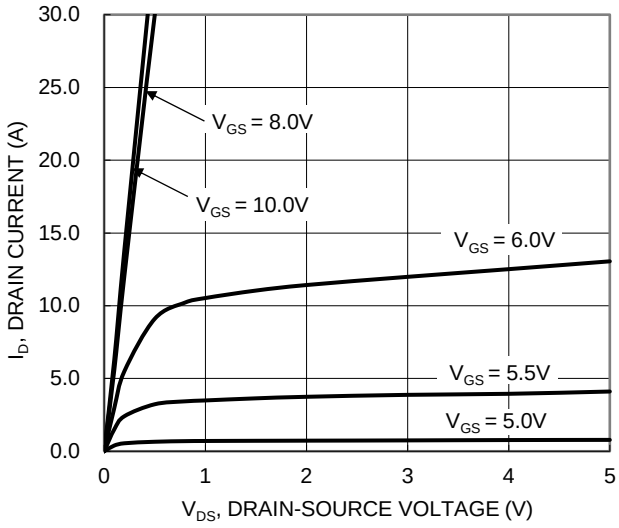


Figure 1. Typical Output Characteristic

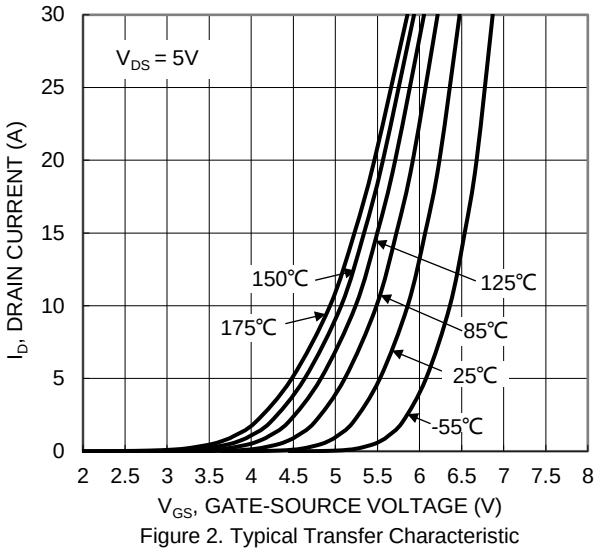


Figure 2. Typical Transfer Characteristic

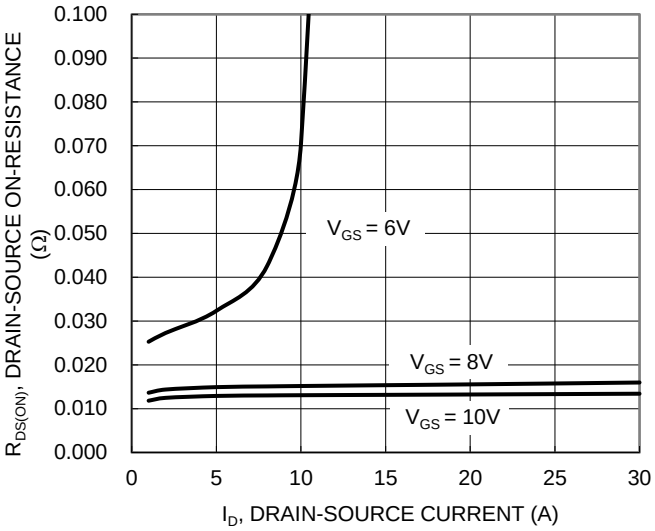


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

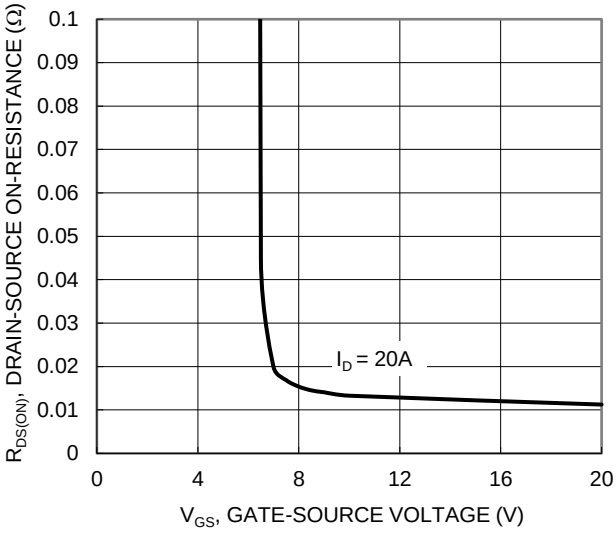


Figure 4. Typical Transfer Characteristic

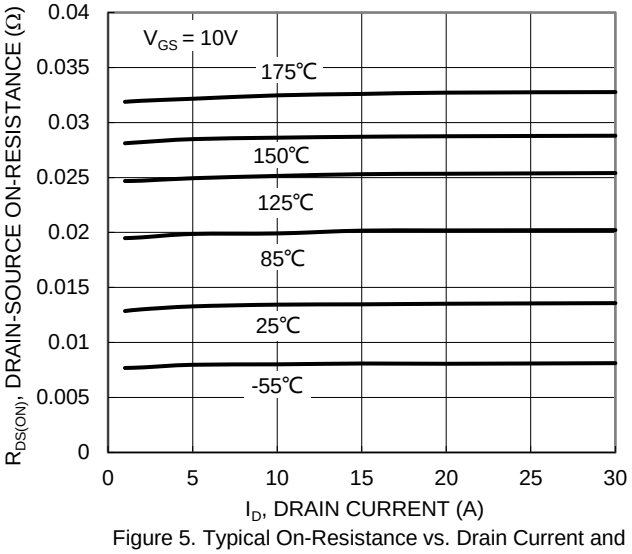


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

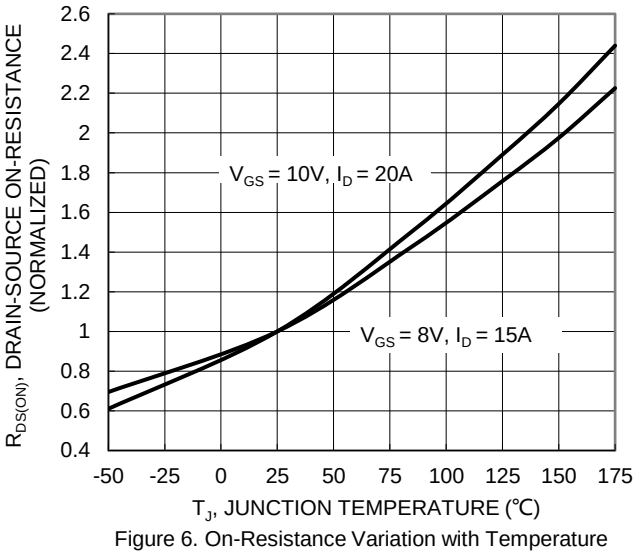


Figure 6. On-Resistance Variation with Temperature

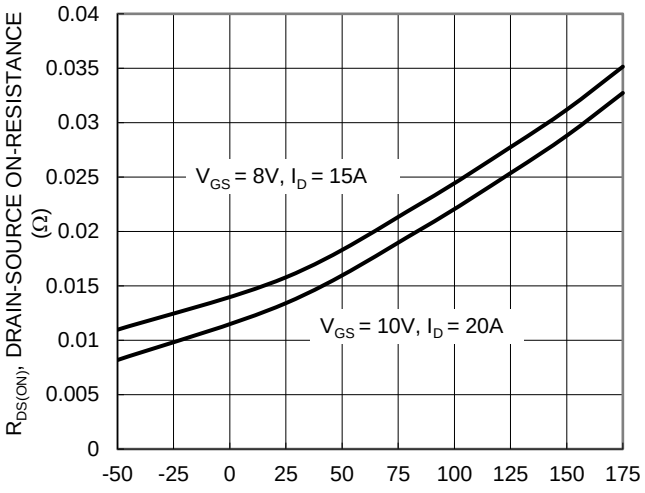


Figure 7. On-Resistance Variation with Temperature

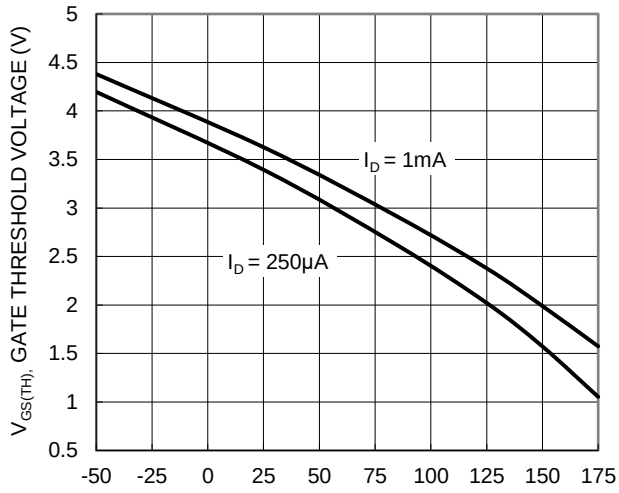


Figure 8. Gate Threshold Variation vs. Junction Temperature

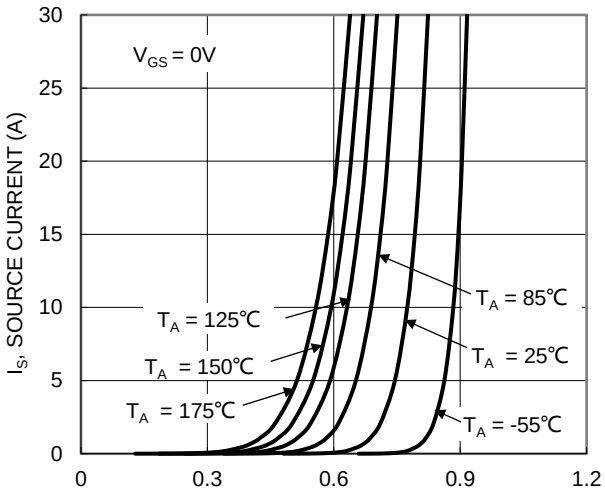


Figure 9. Diode Forward Voltage vs. Current

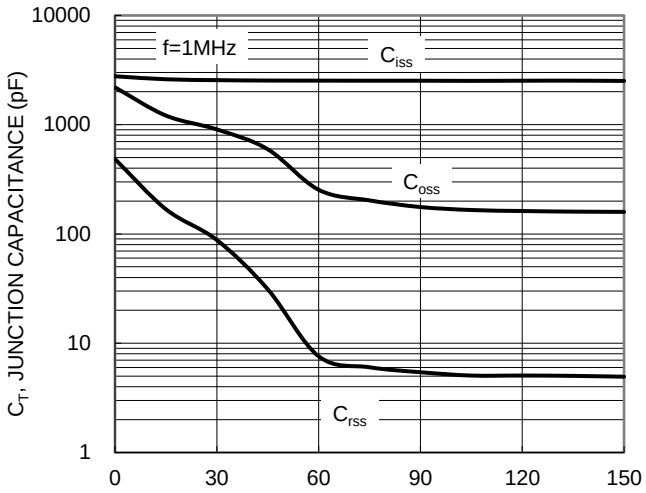


Figure 10. Typical Junction Capacitance

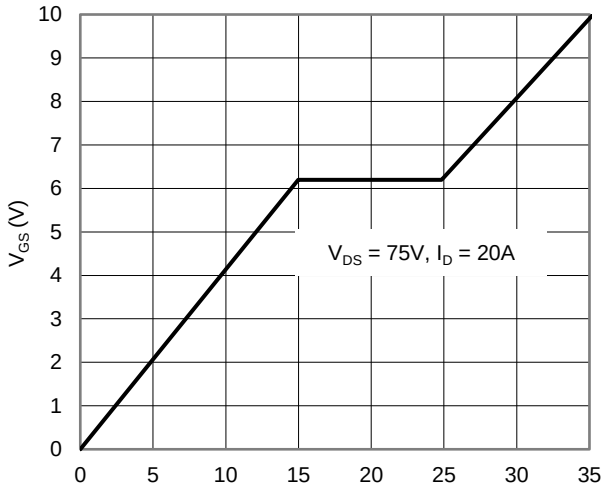


Figure 11. Gate Charge

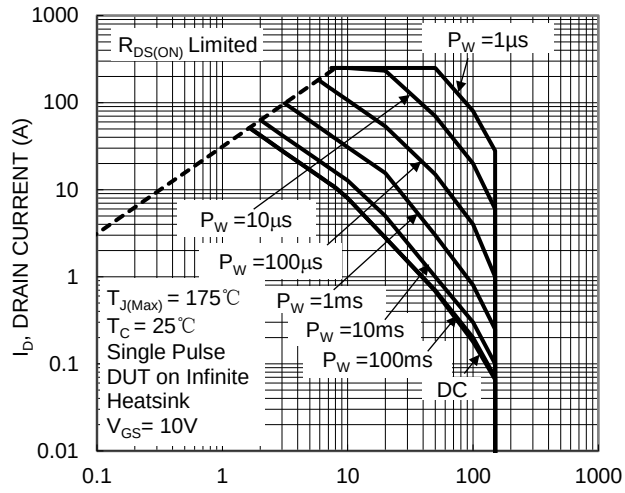


Figure 12. SOA, Safe Operation Area

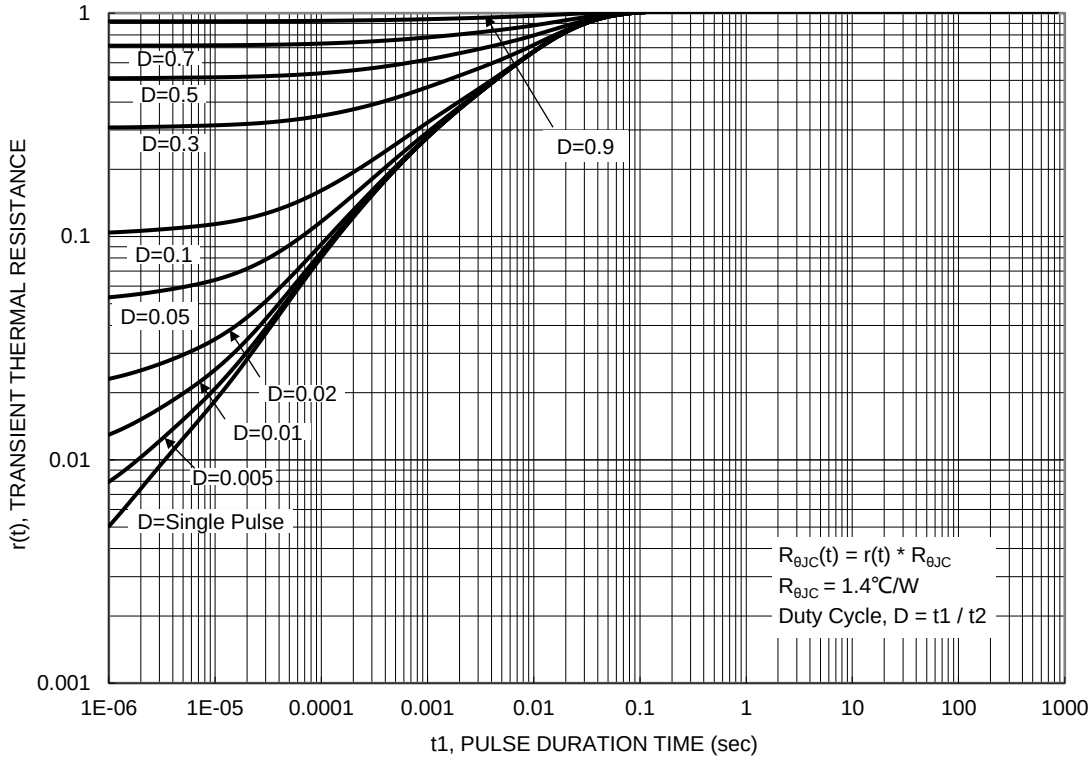
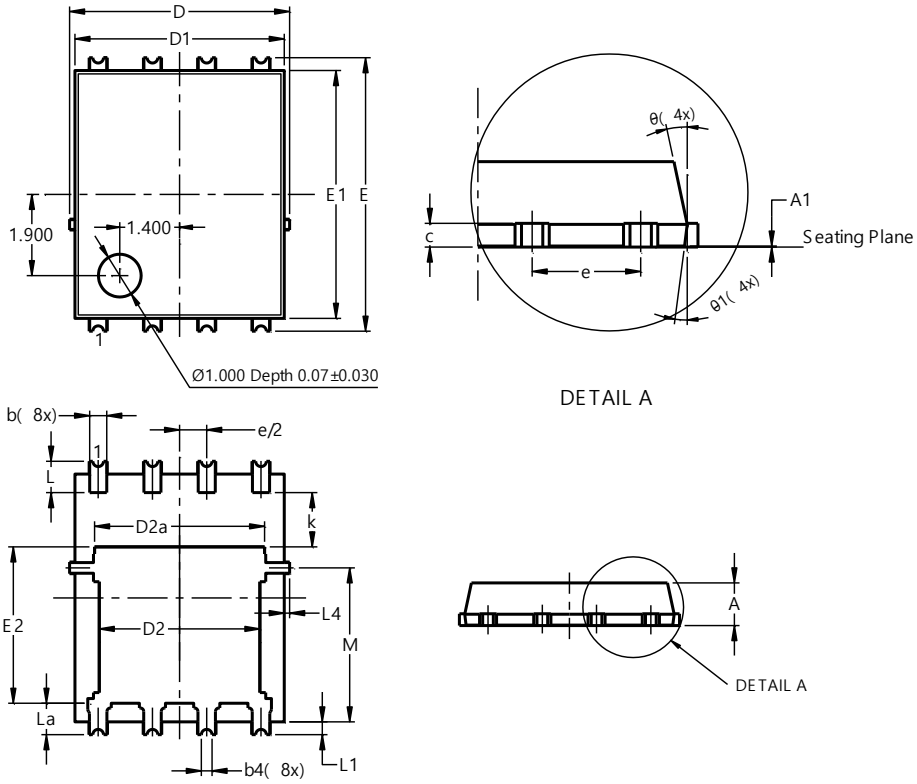


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

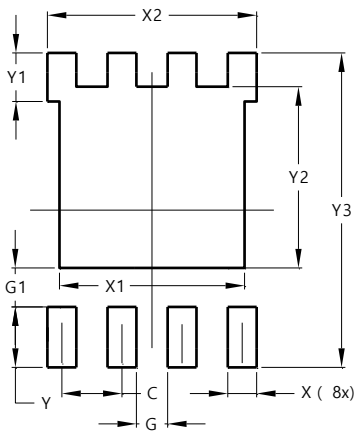
PowerDI5060-8 (SWP) (Type UX)



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
θ	10°	12°	11°
θ1	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	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610