



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)}	I _D T _C = +25°C
60V	12.5mΩ @ V _{GS} = 10V	49
	16.8mΩ @ V _{GS} = 4.5V	42

Features and Benefits

- 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
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**

Description and Applications

This MOSFET is designed to minimize the on-state resistance (R_{DS(ON)}) and maintain superior switching performance, making it ideal for high-efficiency power-management applications.

- Wireless charging
- DC-DC converters
- Power managements

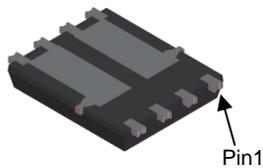
Mechanical Data

- 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
- Terminal Finish – Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 
- Weight: 0.097 grams (Approximate)

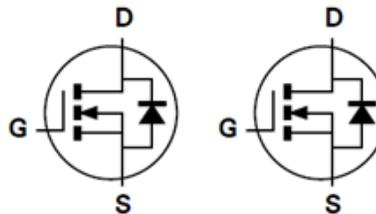
PowerDI5060-8/SWP (Type UXD)



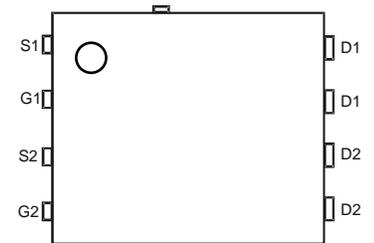
Top View



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}	60	V
Gate-Source Voltage	V _{GSS}	±16	V
Continuous Drain Current, V _{GS} = 10V (Note 6)	I _D	T _C = +25°C	49
		T _C = +100°C	34
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I _{DM}	196	A
Maximum Continuous Body Diode Forward Current (Note 6)	I _S	48	A
Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%)	I _{SM}	196	A
Avalanche Current, L = 0.1mH	I _{AS}	32	A
Avalanche Energy, L = 0.1mH	E _{AS}	51.2	mJ

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P _D	2.8	W
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	54	°C/W
Total Power Dissipation (Note 6)	P _D	51.7	W
Thermal Resistance, Junction to Case (Note 6)	R _{θJC}	2.9	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +175	°C

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}	60	—	—	V	V _{GS} = 0V, I _D = 250µA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	1	µA	V _{DS} = 48V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±16V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(TH)}	0.7	—	2	V	V _{DS} = V _{GS} , I _D = 250µA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	10.7	12.5	mΩ	V _{GS} = 10V, I _D = 20A
		—	12.4	16.8		V _{GS} = 4.5V, I _D = 15A
Diode Forward Voltage	V _{SD}	—	0.9	1.2	V	V _{GS} = 0V, I _S = 20A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{ISS}	—	2178	—	pF	V _{DS} = 30V, V _{GS} = 0V, f = 1MHz
Output Capacitance	C _{OSS}	—	456	—		
Reverse Transfer Capacitance	C _{RSS}	—	29.5	—		
Gate Resistance	R _G	—	1.7	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 10V)	Q _g	—	32	—	nC	V _{DD} = 30V, I _D = 13.5A
Total Gate Charge (V _{GS} = 4.5V)	Q _g	—	14	—		
Gate-Source Charge	Q _{gs}	—	10	—		
Gate-Drain Charge	Q _{gd}	—	2.6	—		
Turn-On Delay Time	t _{D(ON)}	—	6.84	—	ns	V _{GS} = 10V, V _{DD} = 30V, R _G = 6Ω, I _D = 13.5A
Turn-On Rise Time	t _R	—	25.7	—		
Turn-Off Delay Time	t _{D(OFF)}	—	51.5	—		
Turn-Off Fall Time	t _F	—	38	—		
Reverse Recovery Time	t _{RR}	—	42	—	ns	I _F = 13.5A, di/dt = 300A/µs
Reverse Recovery Charge	Q _R	—	70	—	nC	

- Notes:
5. Device mounted on FR-4 substrate PC board, 2oz. copper, with thermal bias to bottom layer 1inch square copper plate.
 6. Thermal resistance from junction to soldering point (on the exposed drain pad).
 7. Short duration pulse test used to minimize self-heating effect.
 8. Guaranteed by design. Not subject to product testing.

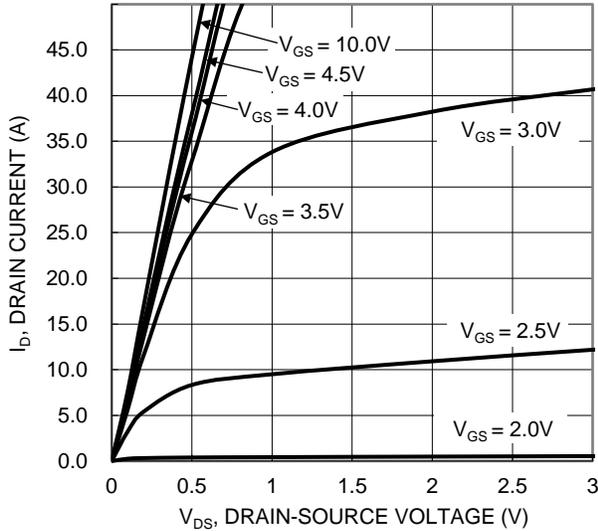


Figure 1. Typical Output Characteristic

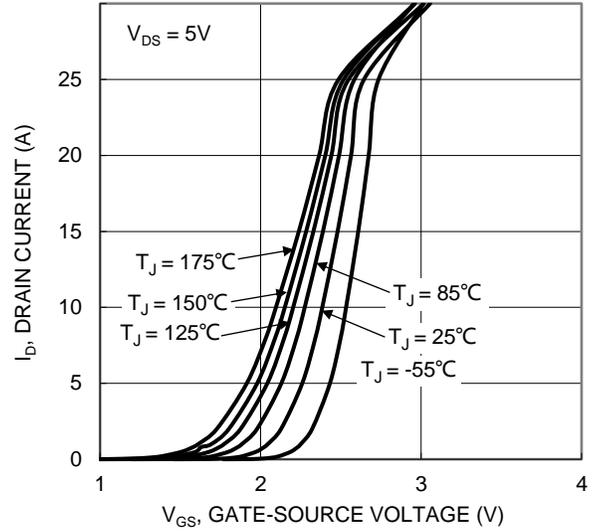


Figure 2. Typical Transfer Characteristic

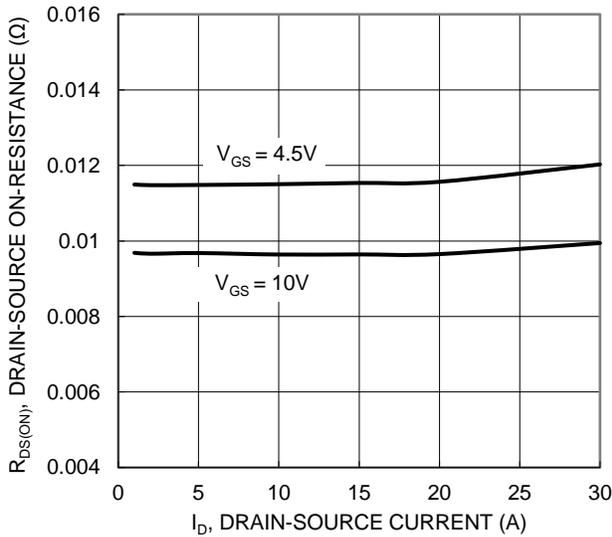


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

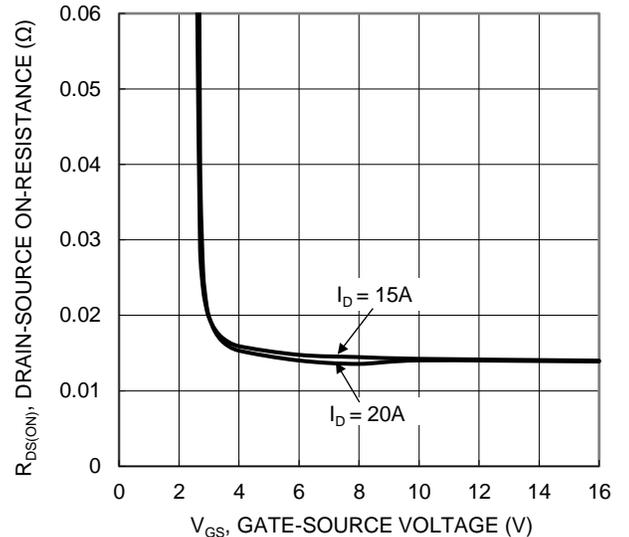


Figure 4. Typical Transfer Characteristic

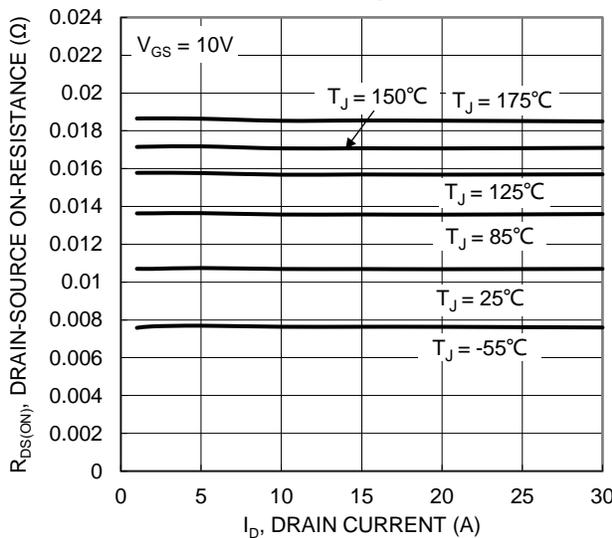


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

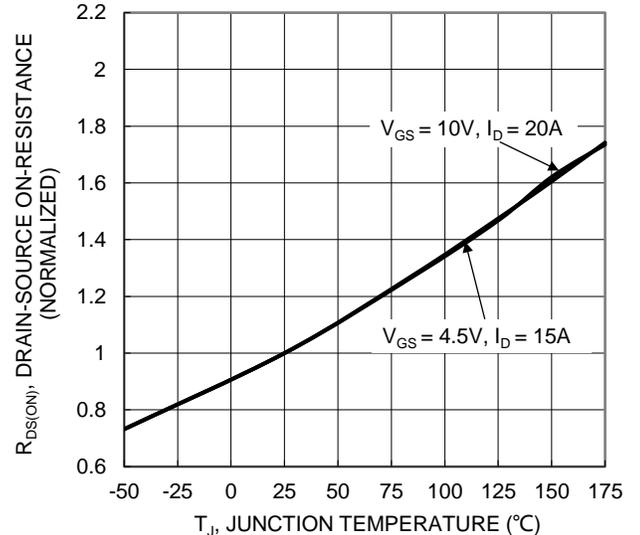


Figure 6. On-Resistance Variation with Junction Temperature

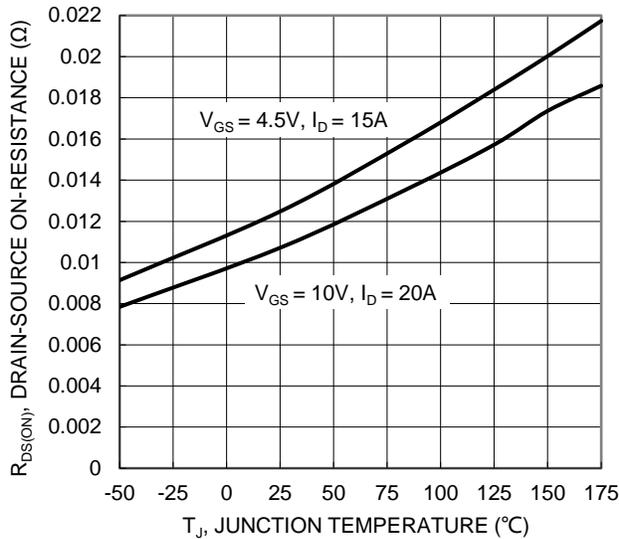


Figure 7. On-Resistance Variation with Junction Temperature

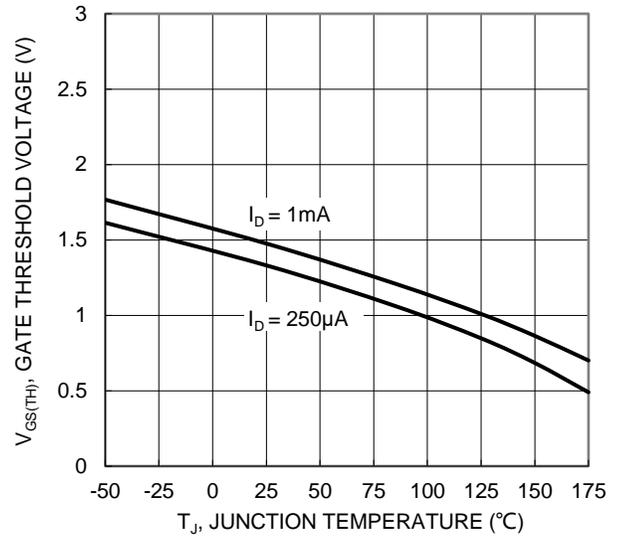


Figure 8. Gate Threshold Variation vs. Junction Temperature

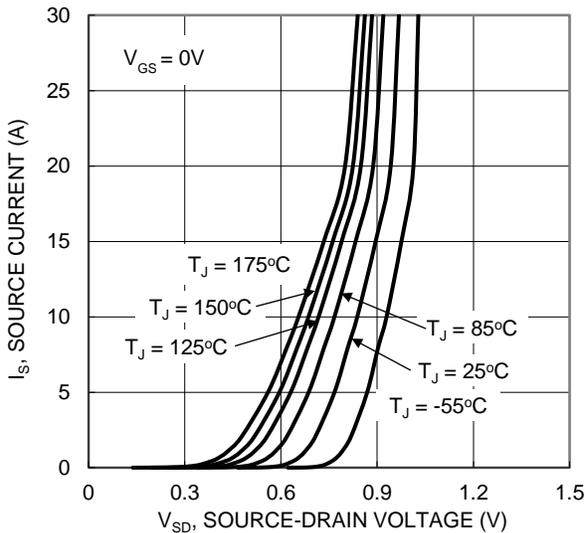


Figure 9. Diode Forward Voltage vs. Current

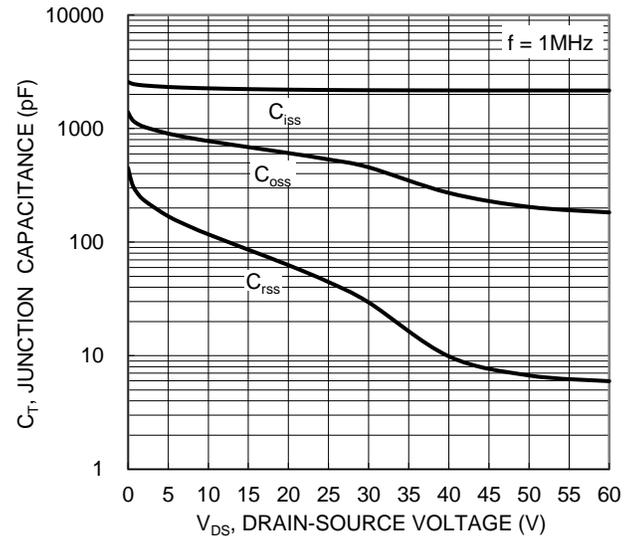


Figure 10. Typical Junction Capacitance

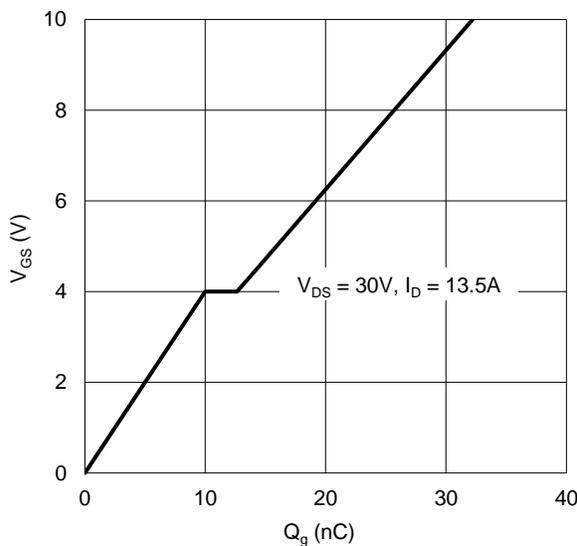


Figure 11. Gate Charge

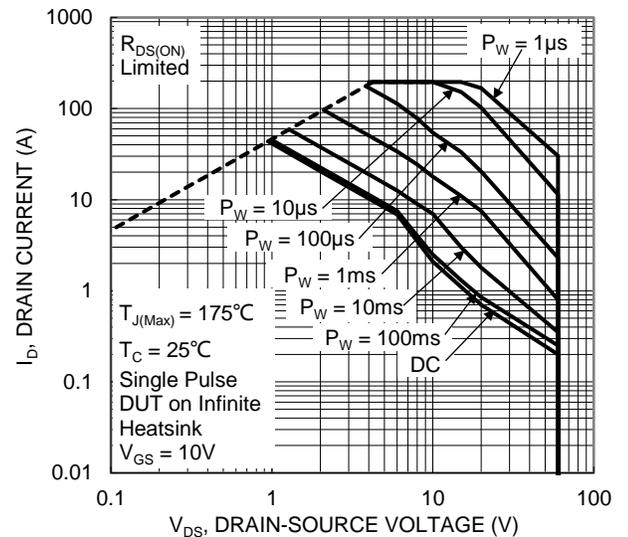


Figure 12. SOA, Safe Operation Area

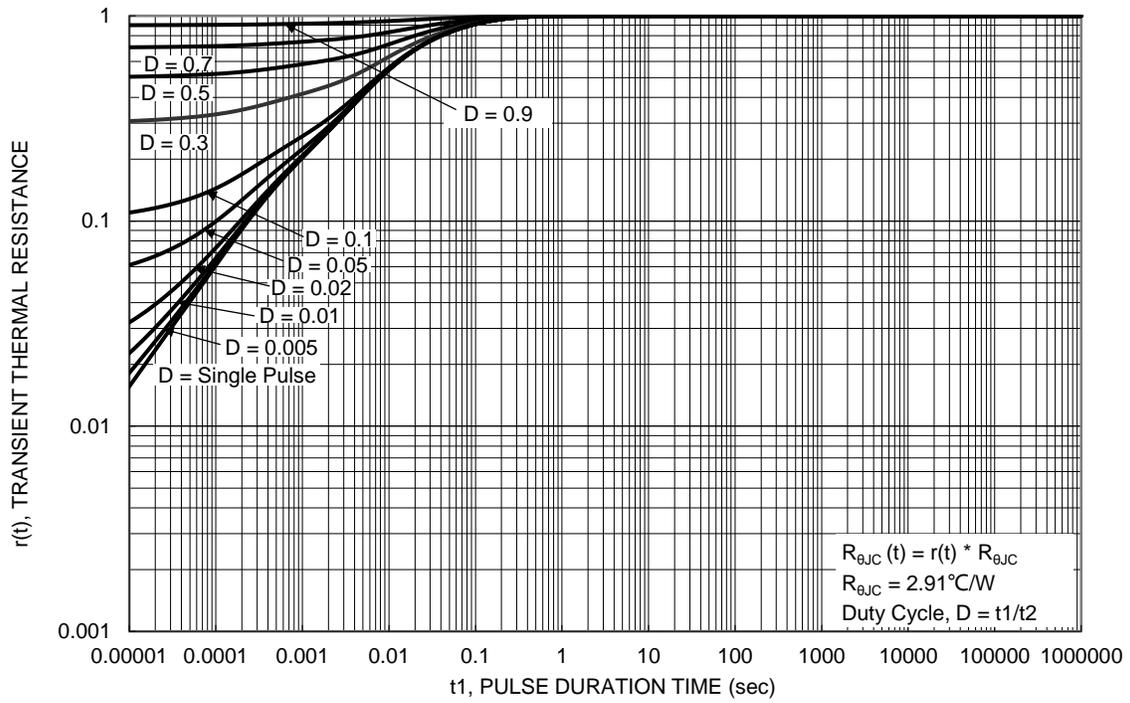
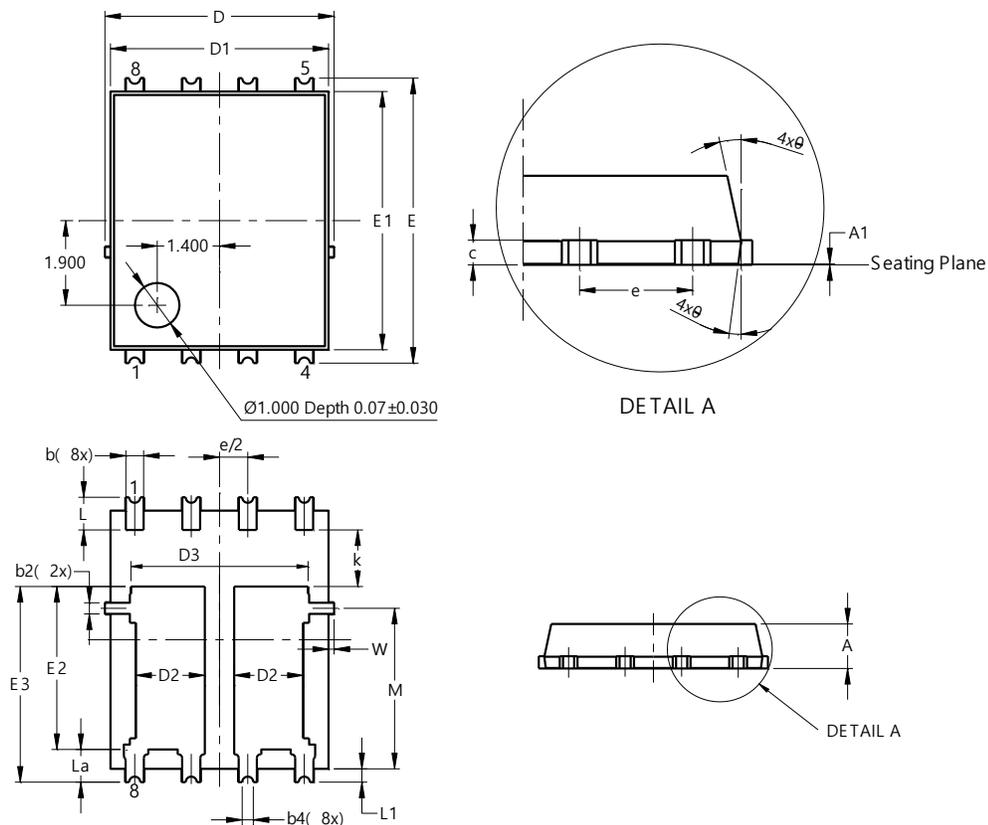


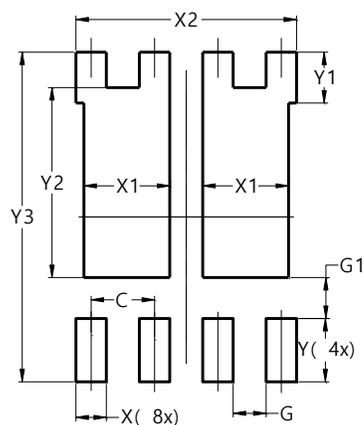
Figure 13. Transient Thermal Resistance

Package Outline Dimensions

PowerDI5060-8/SWP (Type UXD)


PowerDI5060-8/SWP (Type UXD)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	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	1.46	1.66	1.55
D3	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
M	3.205	4.005	3.605
W	0.025	0.225	0.125
θ	10°	12°	11°
θ1	6°	8°	7°
All Dimensions in mm			

Suggested Pad Layout

PowerDI5060-8/SWP (Type UXD)


Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	1.720
X2	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610