



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	66mΩ @ V _{GS} = 10V	25A

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
- Low R_{DS(ON)} – Minimizes On-State Losses
- Low Q_g – Minimizes Switching Losses
- < 1.1mm Package Profile – Ideal for Thin Applications (PowerDI®)

Description and Applications

This new generation MOSFET features low on-resistance and fast switching, making it ideal for high-efficiency power-management applications.

- Power-management functions
- DC-DC converters
- Backlighting

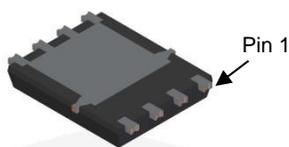
Mechanical Data

- 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
- Terminals: Finish – Matte Tin Annealed over Copper Lead-Frame.
Solderable per MIL-STD-202, Method 208 Ⓔ3
- Weight: 0.097 grams (Approximate)

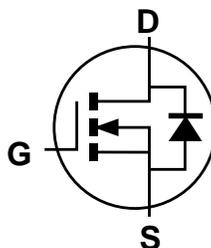
PowerDI5060-8/SWP (Type UX)



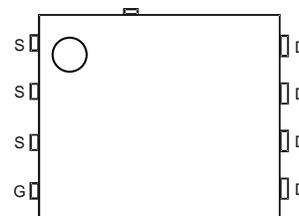
Top View



Bottom View



Internal Schematic



Top View
Pin Configuration

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

Characteristic		Symbol	Value	Unit	
Drain-Source Voltage		V_{DSS}	150	V	
Gate-Source Voltage		V_{GSS}	± 20	V	
Continuous Drain Current $V_{GS} = 10\text{V}$ (Note 5)	Steady State	I_D	$T_C = +25^\circ\text{C}$	25	A
			$T_C = +100^\circ\text{C}$	18	
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)		I_{DM}	100	A	
Maximum Continuous Body Diode Forward Current (Note 5)		I_S	25	A	
Pulsed Body Diode Current (10 μs Pulse, Duty Cycle = 1%)		I_{SM}	100	A	
Avalanche Current, $L = 1\text{mH}$		I_{AS}	11.7	A	
Avalanche Energy, $L = 1\text{mH}$		E_{AS}	68.4	mJ	

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	2.3	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	65	$^\circ\text{C/W}$
Total Power Dissipation (Note 7)	$T_A = +25^\circ\text{C}$	P_D	4	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$	38	$^\circ\text{C/W}$
Total Power Dissipation (Note 5)	$T_C = +25^\circ\text{C}$	P_D	107	W
Thermal Resistance, Junction to Case (Note 5)		$R_{\theta JC}$	1.4	$^\circ\text{C/W}$
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	$^\circ\text{C}$

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

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
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	$V_{GS} = \pm 20V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	2	3.2	4	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	46	66	$m\Omega$	$V_{GS} = 10V, I_D = 20A$
Diode Forward Voltage	V_{SD}	—	0.9	1	V	$V_{GS} = 0V, I_S = 20A$
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	814	—	pF	$V_{DS} = 75V, V_{GS} = 0V$ $f = 1MHz$
Output Capacitance	C_{oss}	—	84	—		
Reverse Transfer Capacitance	C_{rss}	—	3.7	—		
Gate Resistance	R_g	—	0.6	—	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$
Total Gate Charge	Q_g	—	11.5	—	nC	$V_{DS} = 75V, I_D = 4.1A$ $V_{GS} = 10V$
Gate-Source Charge	Q_{gs}	—	4.6	—		
Gate-Drain Charge	Q_{gd}	—	2.8	—		
Turn-On Delay Time	$t_{D(ON)}$	—	5.7	—	ns	$V_{DS} = 75V, V_{GS} = 10V$ $I_D = 4.1A, R_g = 6\Omega$
Turn-On Rise Time	t_r	—	17.7	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	15.7	—		
Turn-Off Fall Time	t_f	—	12.7	—		
Reverse Recovery Time	t_{RR}	—	47	—	ns	$I_F = 4.1A, di/dt = 100A/\mu s$
Reverse Recovery Charge	Q_{RR}	—	87	—	nC	

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

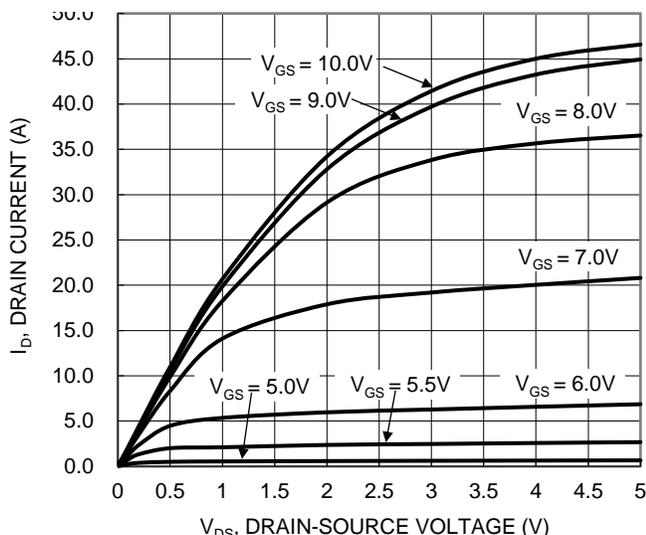


Figure 1. Typical Output Characteristic

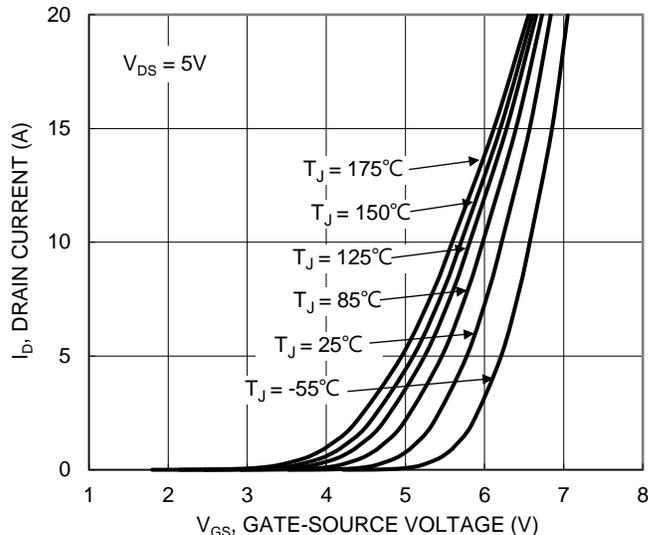


Figure 2. Typical Transfer Characteristic

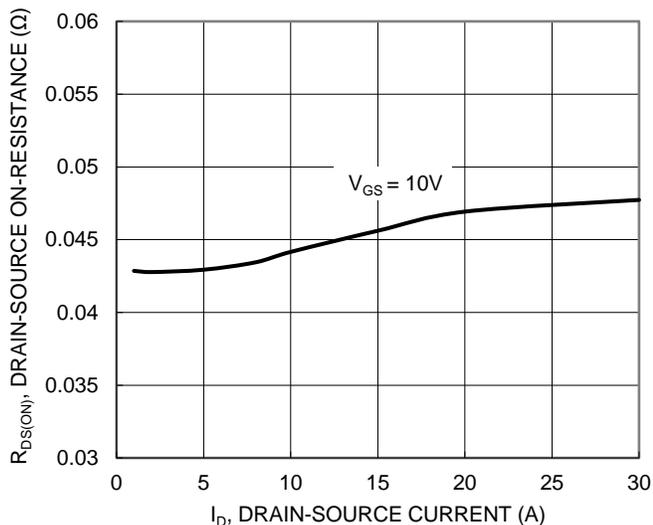


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

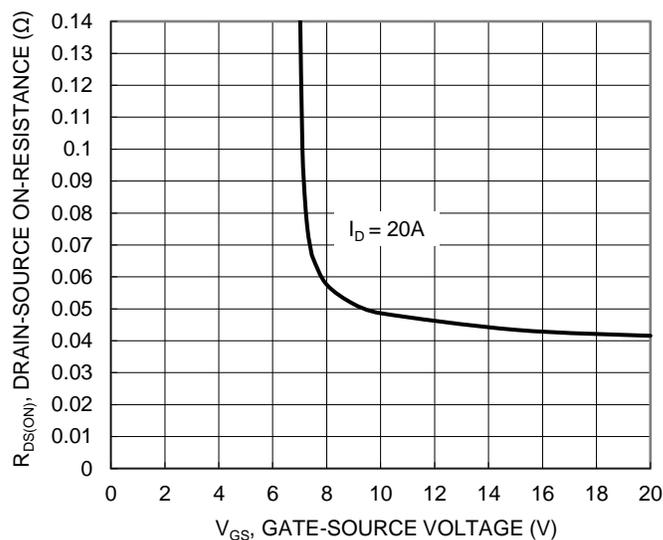


Figure 4. Typical Transfer Characteristic

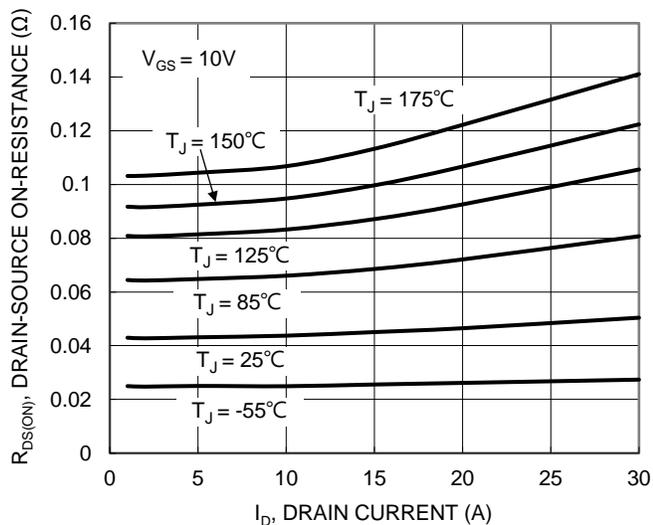


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

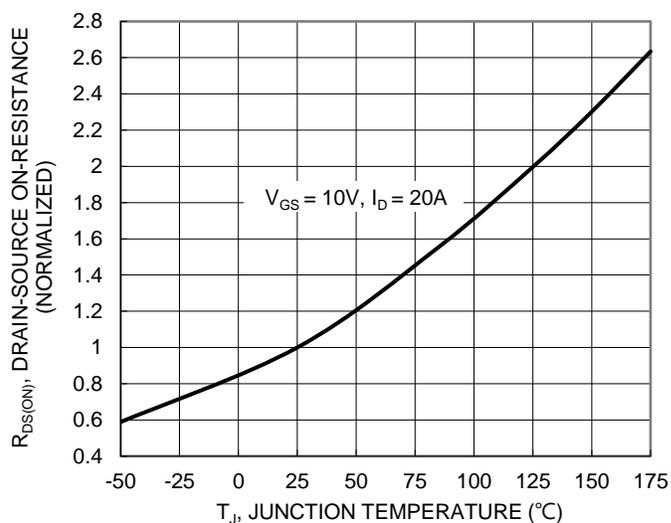


Figure 6. On-Resistance Variation with Junction Temperature

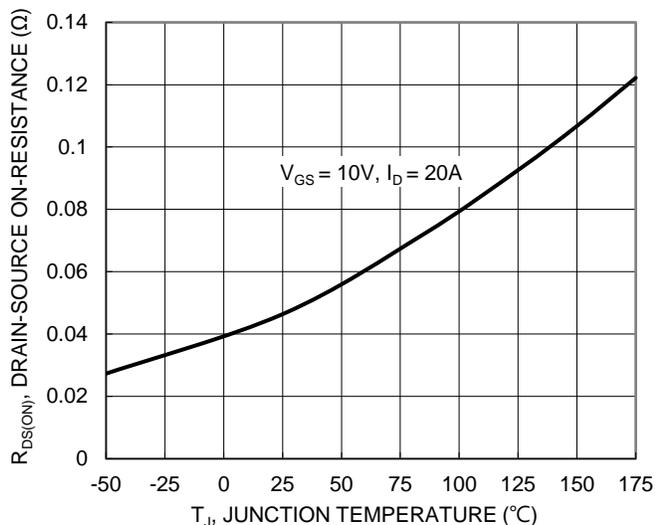


Figure 7. On-Resistance Variation with Junction Temperature

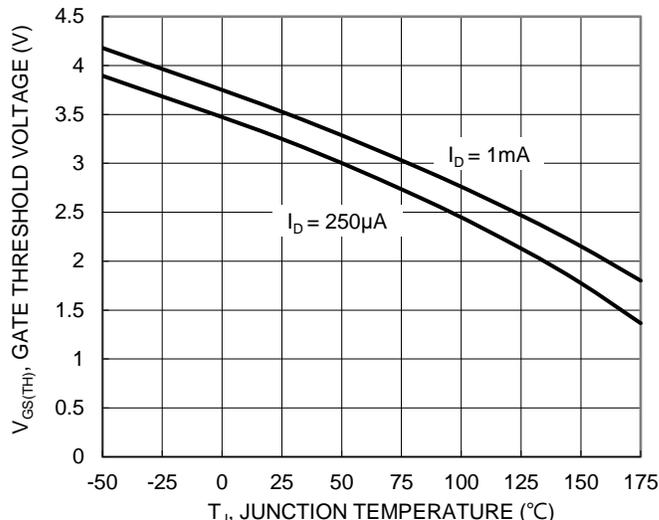


Figure 8. Gate Threshold Variation vs. Junction Temperature

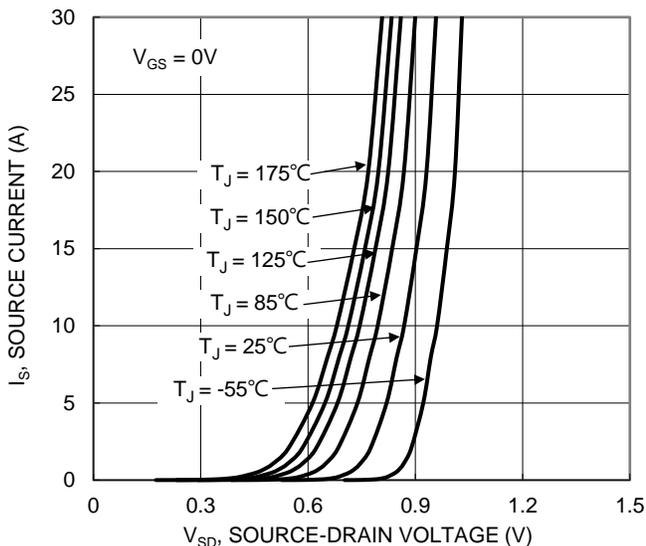


Figure 9. Diode Forward Voltage vs. Current

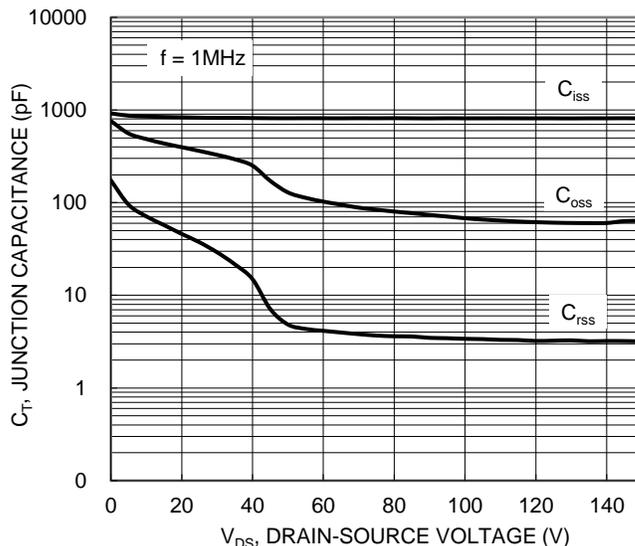


Figure 10. Typical Junction Capacitance

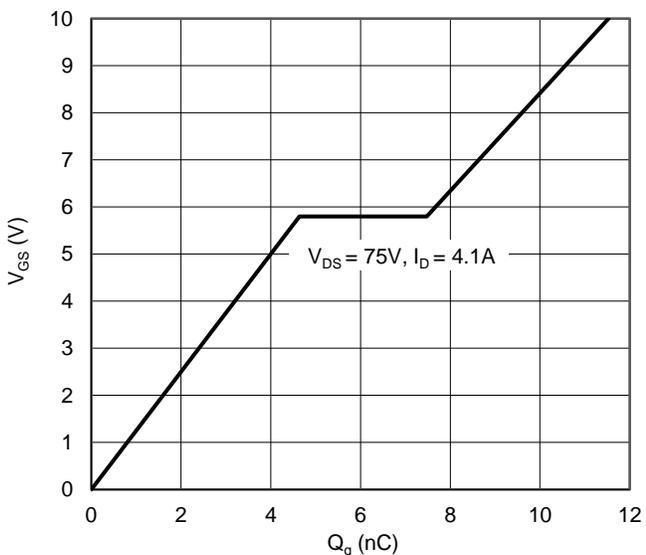


Figure 11. Gate Charge

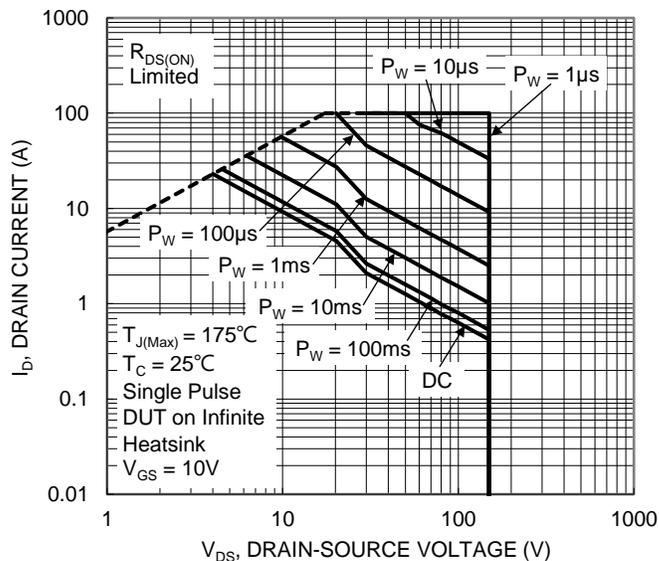


Figure 12. SOA, Safe Operation Area

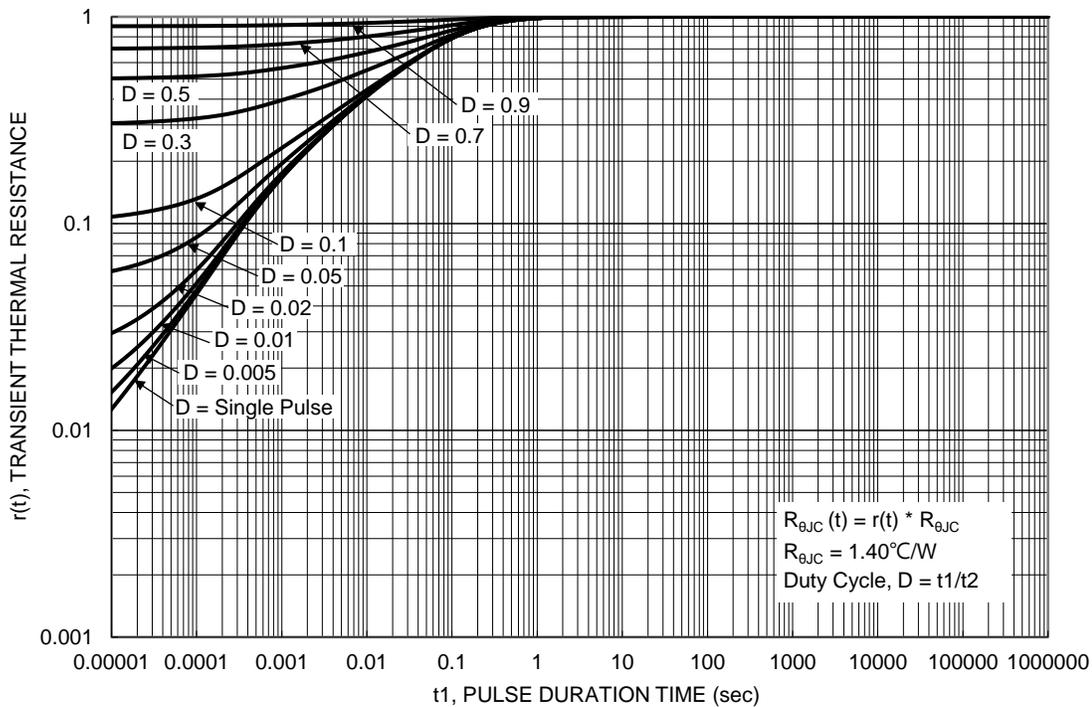
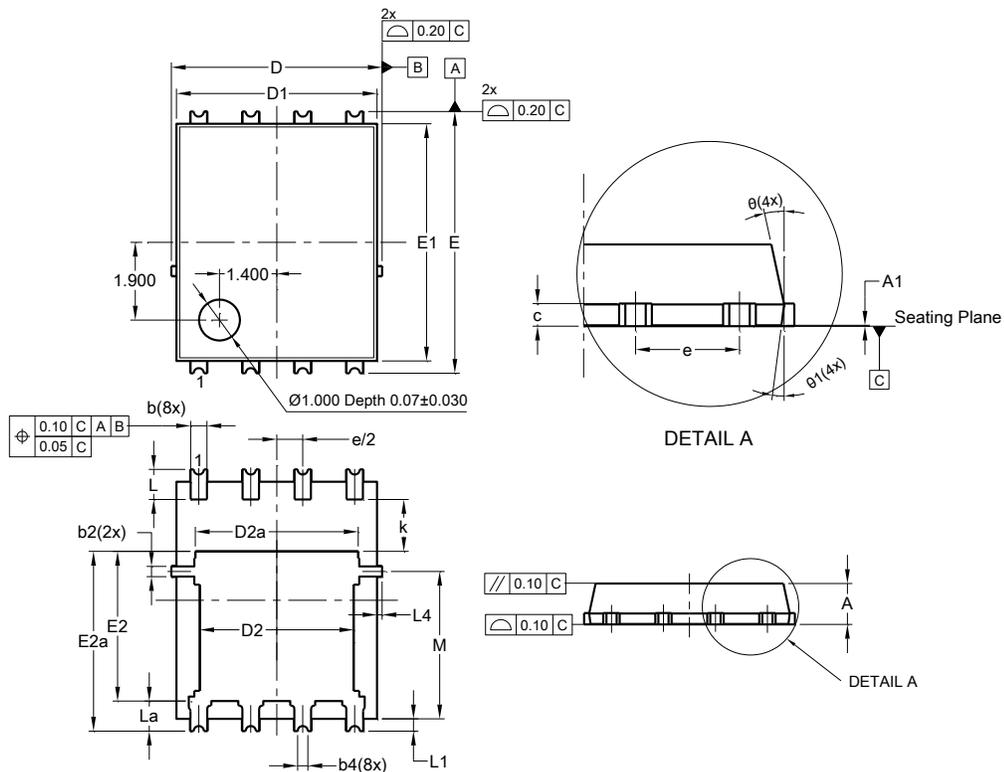


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

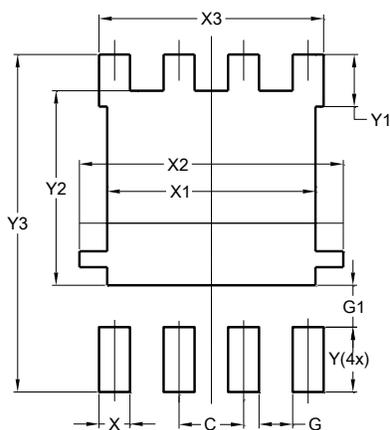
PowerDI5060-8/SWP (Type UX)



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
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	5.190
X3	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610