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 (Note 7)
60V	3.1mΩ @ V_{GS} = 10V	100A
	4.5mΩ @ V_{GS} = 4.5V	100A

Description and Applications

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

- Primary switches in isolated DC-DC
- Synchronous rectifiers
- Load switches

Features

- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low $R_{DS(ON)}$ – Minimizes Power Losses
- Low Q_g – Minimizes Switching Losses

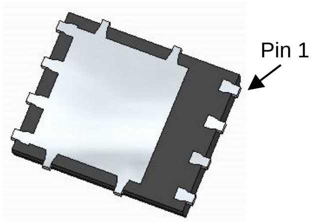
Mechanical Data

- 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 ⓔ3
- Weight: 0.097 grams (Approximate)

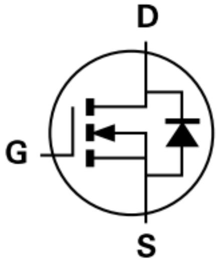
Site 1:

PowerDI5060-8

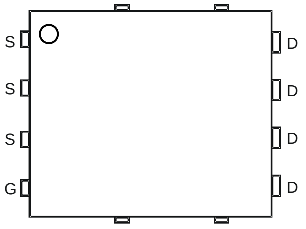
Top View



Bottom View



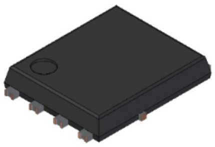
Internal Schematic



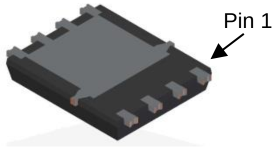
Top View
Pin Configuration

Site 2:

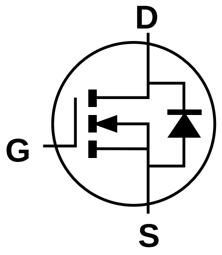
PowerDI5060-8/SWP (Type UX)



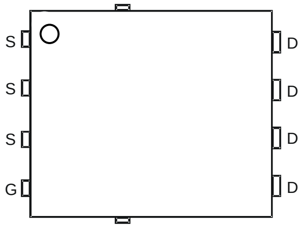
Top View



Bottom View



Internal Schematic



Top View
Pin Configuration

Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated’s definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green” products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

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}	±20	V
Continuous Drain Current (Note 5)	T_A = +25°C T_A = +70°C	I_D	22 16	A
Continuous Drain Current (Notes 6 & 7)	T_C = +25°C T_C = +70°C	I_D	100 100	A
Maximum Continuous Body Diode Forward Current (Note 6)		I_S	100	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I_{DM}	400	A
Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%)		I_{SM}	400	A
Avalanche Current, L = 0.2mH		I_{AS}	40	A
Avalanche Energy, L = 0.2mH		E_{AS}	160	mJ

Thermal Characteristic

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	2.5	W
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\theta JA}$	47	°C/W
Total Power Dissipation (Note 6)	T_C = +25°C	P_D	139	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	0.9	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

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. Limited by package.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	V_{GS} = 0V, I_D = 1mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	V_{DS} = 48V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	2.5	3.1	mΩ	V_{GS} = 10V, I_D = 25A
		—	3.3	4.5	mΩ	V_{GS} = 4.5V, I_D = 20A
Diode Forward Voltage	V_{SD}	—	—	1.3	V	V_{GS} = 0V, I_S = 25A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	5399	—	pF	V_{DS} = 30V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	1306	—		
Reverse Transfer Capacitance	C_{rss}	—	92	—		
Gate Resistance	R_g	—	0.64	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 10V)	Q_g	—	78.3	—	nC	V_{DD} = 30V, I_D = 25A
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	38.5	—		
Gate-Source Charge	Q_{gs}	—	10.2	—		
Gate-Drain Charge	Q_{gd}	—	20.4	—		
Turn-On Delay Time	$t_{D(ON)}$	—	9.9	—	ns	V_{DD} = 30V, V_{GS} = 10V I_D = 25A, R_g = 3.5Ω
Turn-On Rise Time	t_R	—	17.7	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	53.5	—		
Turn-Off Fall Time	t_F	—	32.9	—		
Body Diode Reverse Recovery Time	t_{RR}	—	49.7	—	ns	I_F = 25A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q_{RR}	—	78.9	—	nC	

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

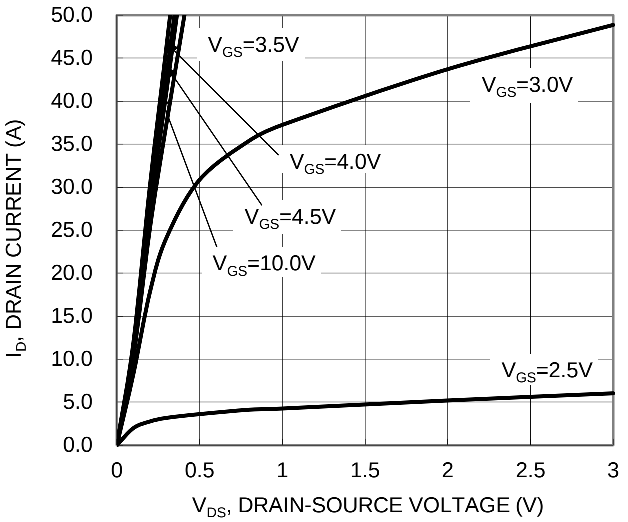


Figure 1. Typical Output Characteristic

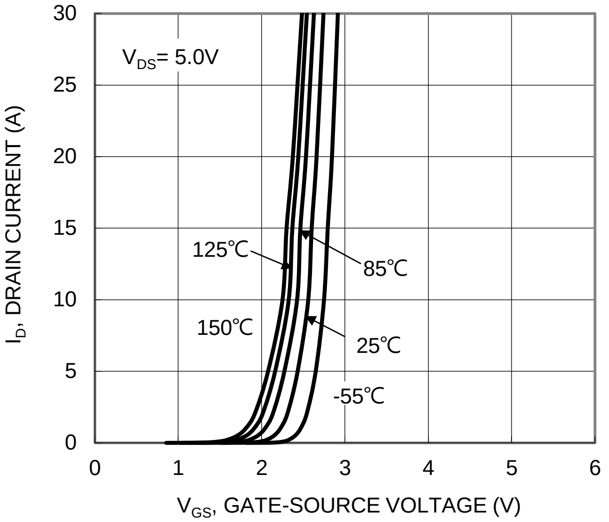


Figure 2. Typical Transfer Characteristic

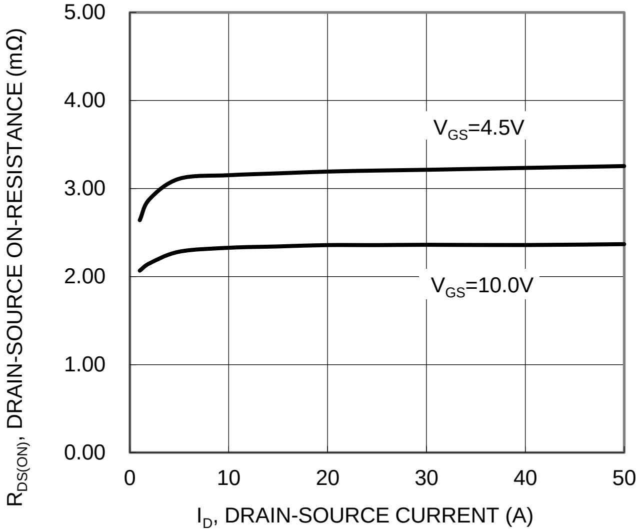


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

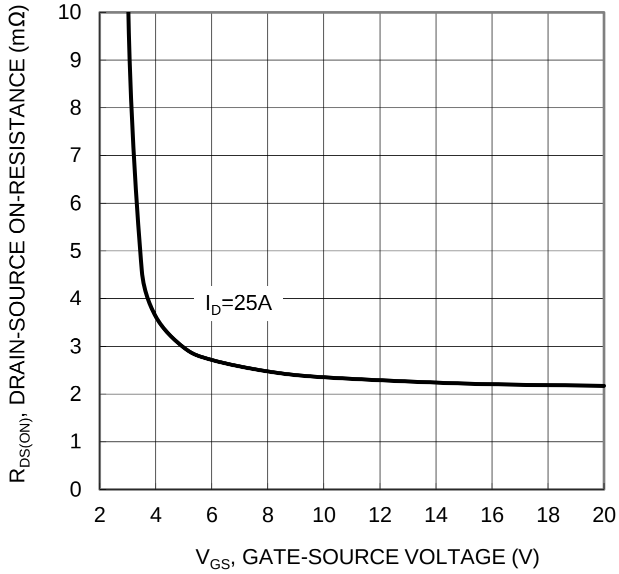


Figure 4. Typical Transfer Characteristic

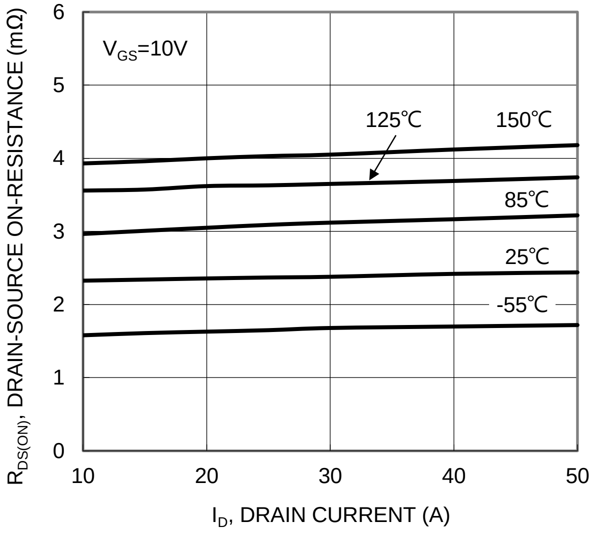


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

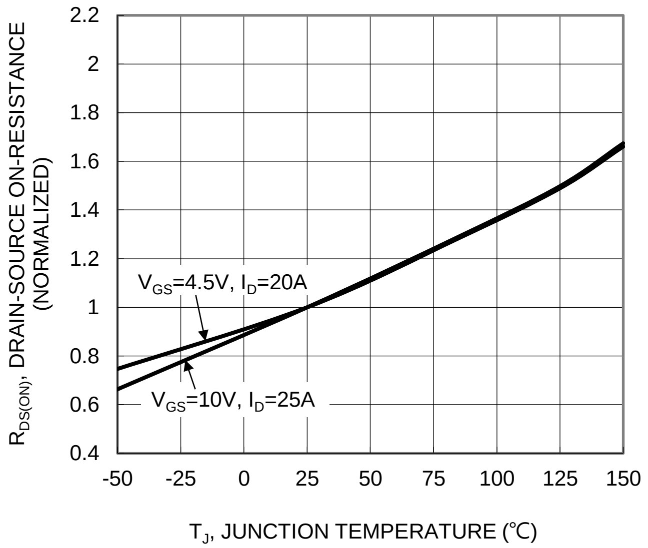


Figure 6. On-Resistance Variation with Temperature

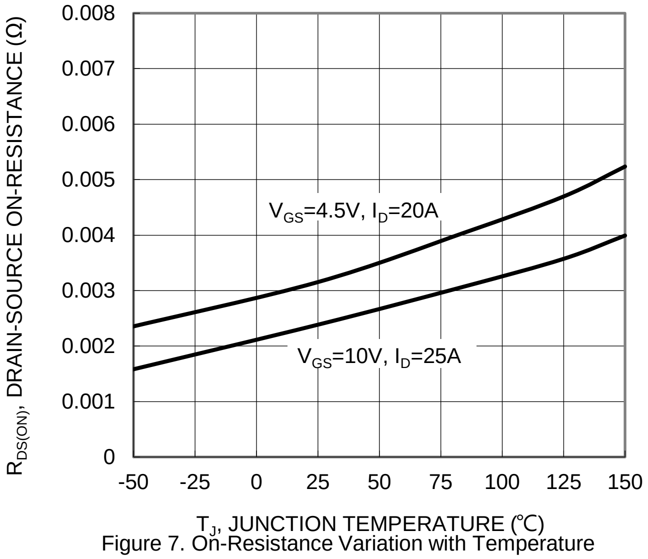


Figure 7. On-Resistance Variation with Temperature

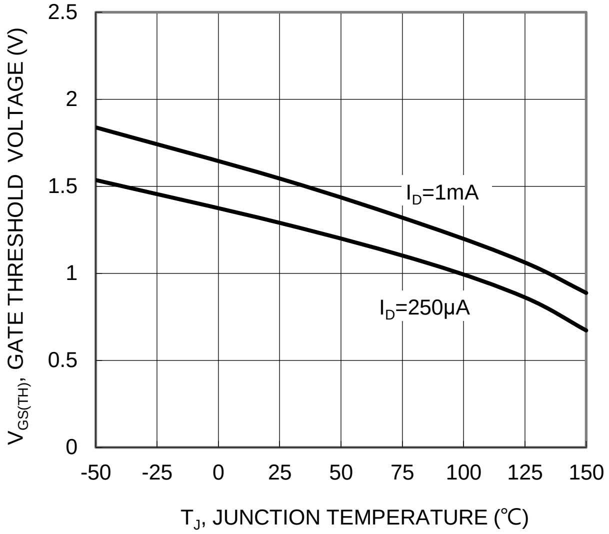


Figure 8. Gate Threshold Variation vs. Temperature

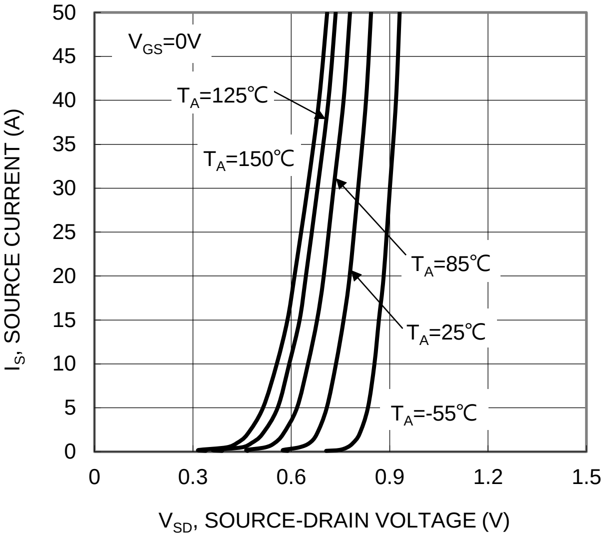


Figure 9. Diode Forward Voltage vs. Current

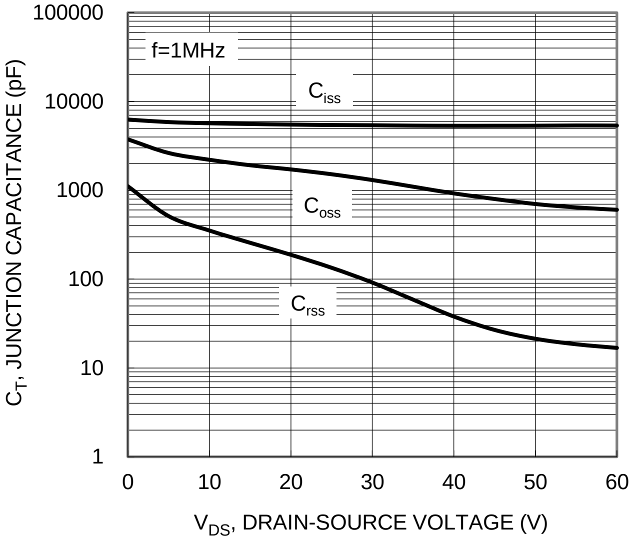


Figure 10. Typical Junction Capacitance

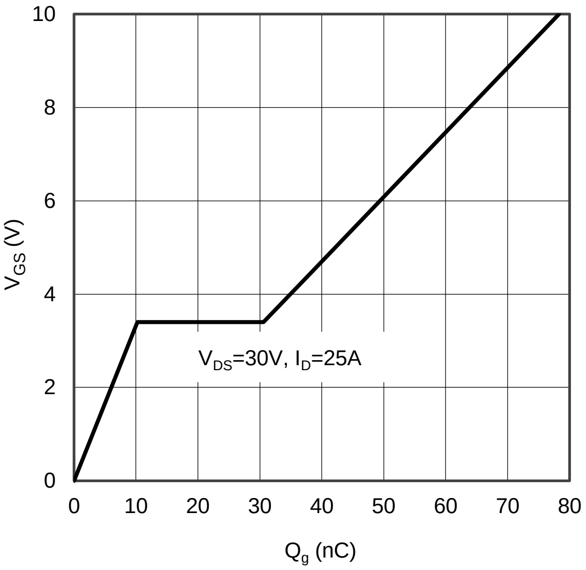


Figure 11. Gate Charge

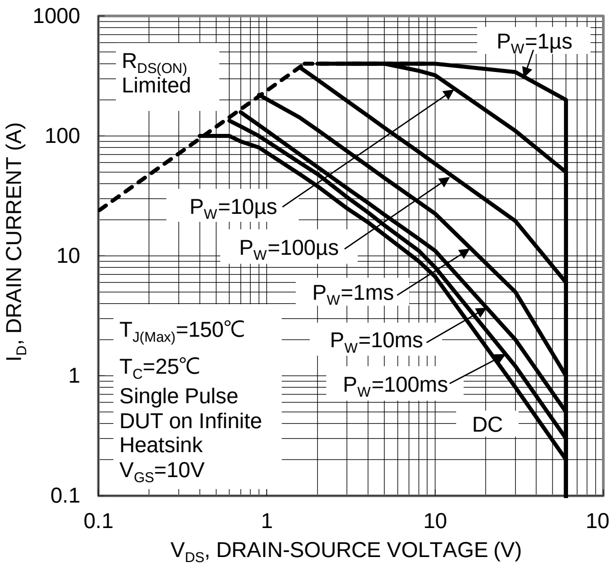


Figure 12. SOA, Safe Operation Area

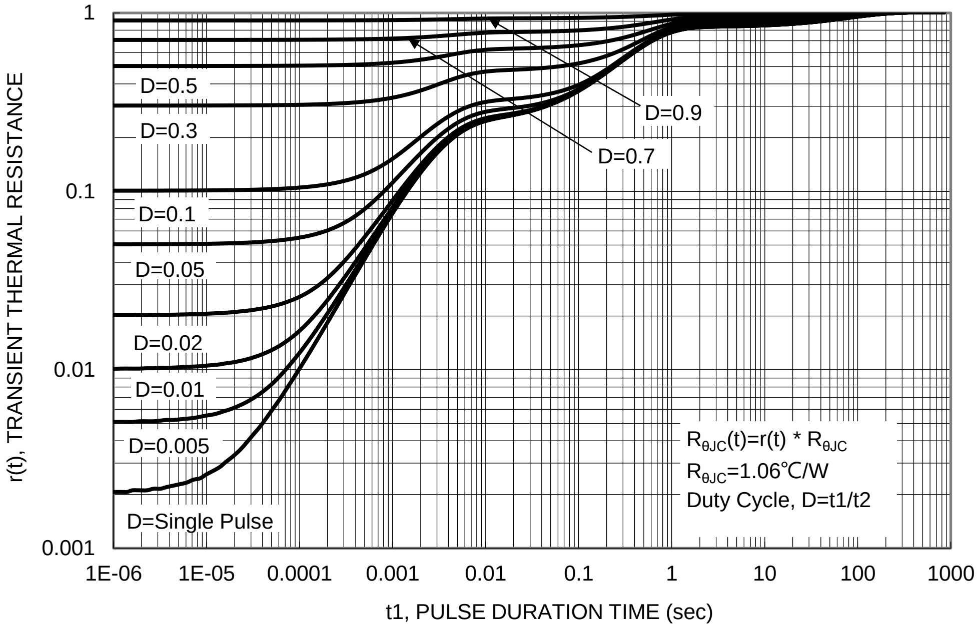
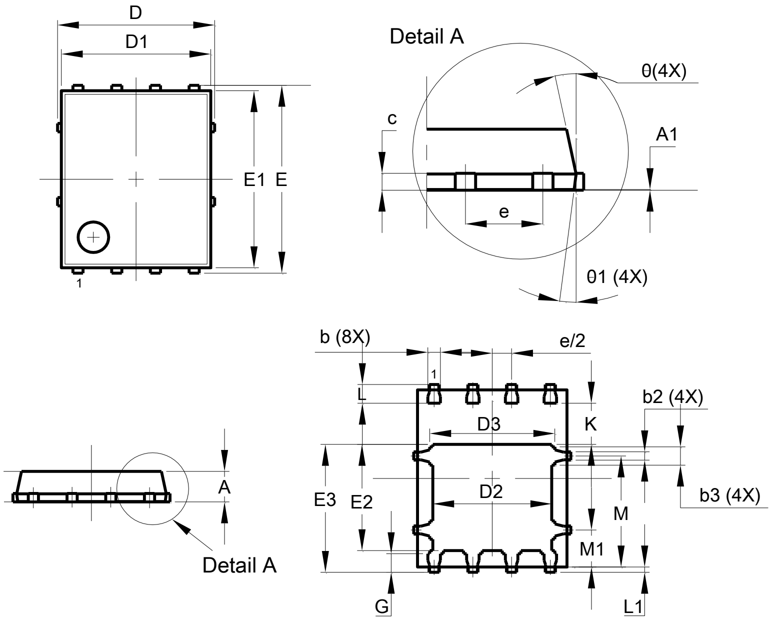


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

Site 1:

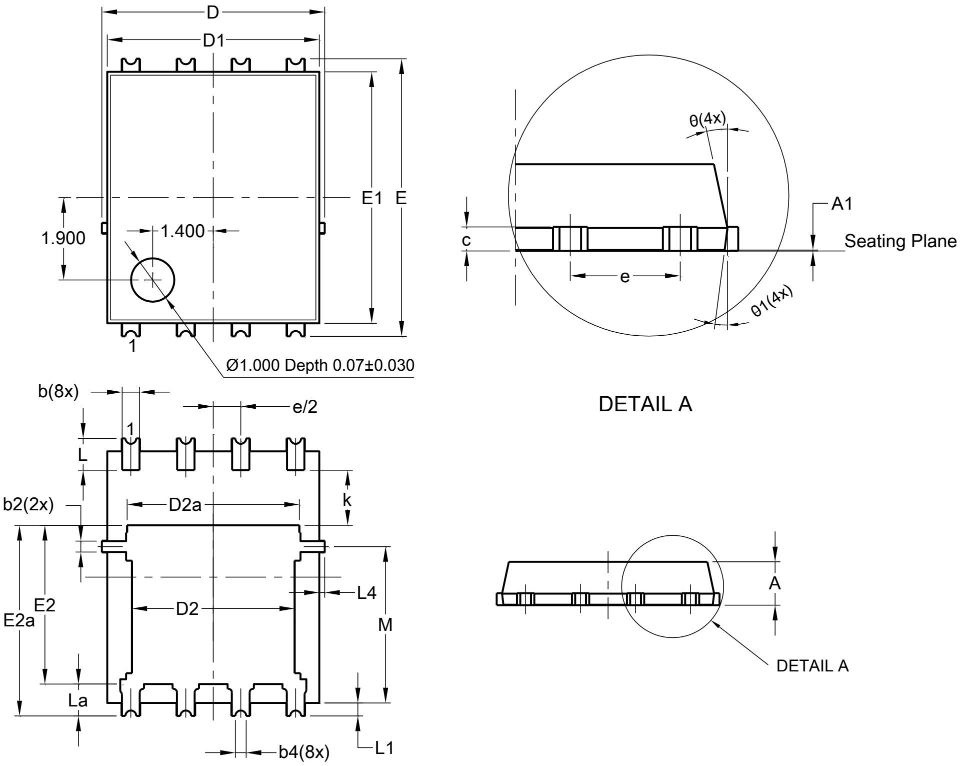
PowerDI5060-8



PowerDI5060-8			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.10	1.00
A1	0.00	0.05	–
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G	0.51	0.71	0.61
K	0.51	–	–
L	0.51	0.71	0.61
L1	0.100	0.200	0.175
M	3.235	4.035	3.635
M1	1.00	1.40	1.21
Θ	10°	12°	11°
Θ1	6°	8°	7°
All Dimensions in mm			

Site 2:

PowerDI5060-8/SWP (Type UX)

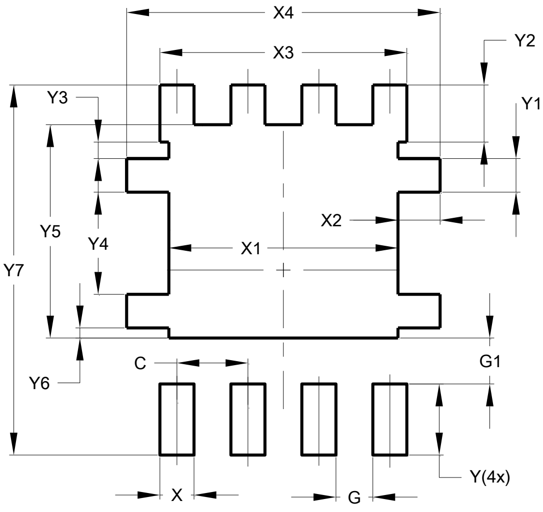


PowerDI5060-8/SWP (Type UX)			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.10	1.00
A1	0	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.56	3.96	3.76
D2a	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	1.27BSC		
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

Site 1:

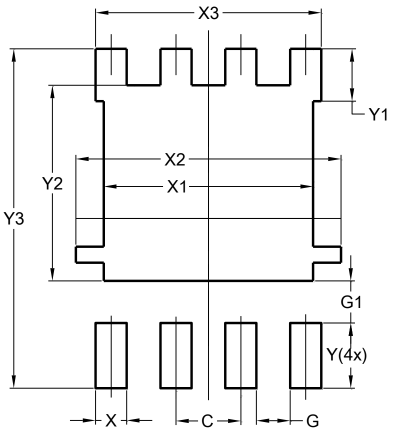
PowerDI5060-8



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	4.100
X2	0.755
X3	4.420
X4	5.610
Y	1.270
Y1	0.600
Y2	1.020
Y3	0.295
Y4	1.825
Y5	3.810
Y6	0.180
Y7	6.610

Site 2:

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