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Green

DMNH6009SPS

60V 175°C N-CHANNEL ENHANCEMENT MODE MOSFET
PowerDI5060-8

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_C = +25°C
60V	7.3mΩ @ V_{GS} = 10V	95A
	15mΩ @ V_{GS} = 4.5V	67A

Features

- Rated to +175°C—Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low $R_{DS(ON)}$—Minimizes Power Losses
- Low Q_g—Minimizes Switching Losses
- <1.1mm Package Profile—Ideal for Thin Applications
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative.**
  https://www.diodes.com/quality/product-definitions/

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.

- Power Management Functions
- DC-DC Converters
- Backlighting

Mechanical Data

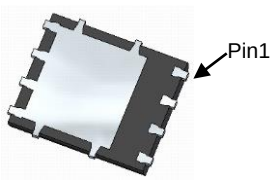
- Case: PowerDI®5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Terminals: Finish—Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.097 grams (Approximate)

Site 1:

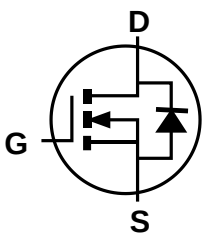
PowerDI5060-8



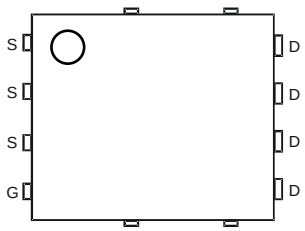
Top View



Bottom View



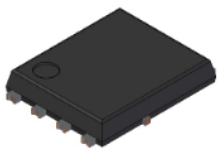
Internal Schematic



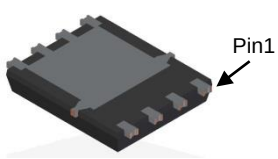
Top View
Pin Configuration

Site 2:

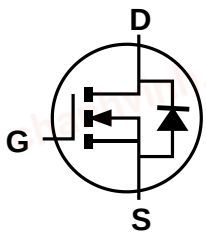
PowerDI5060-8 (SWP) (Type UX)



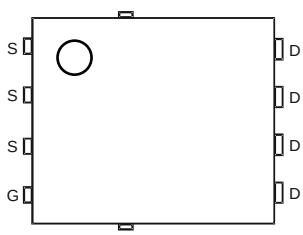
Top View



Bottom View



Internal Schematic



Top View
Pin Configuration

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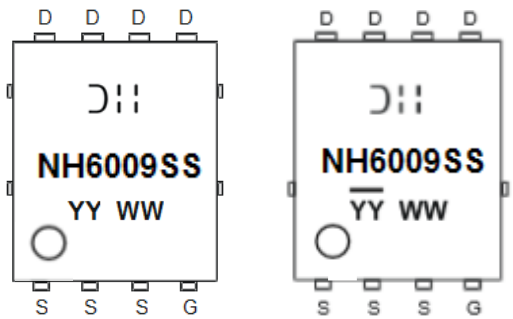
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Ordering Information (Note 4)

Part Number	Case	Packaging
DMNH6009SPS-13	PowerDI5060-8/ PowerDI5060-8 (SWP) (Type UX)	2500/Tape & Reel

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.
4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



= Manufacturer's Marking
NH6009SS = Product Type Marking Code
YYWW = Date Code Marking
YY or $\overline{YY}$= Last Two Digits of Year (ex: 20 = 2020)
WW = Week Code (01 to 53)

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 7) V_{GS} = 10V	T_C = +25°C T_C = +100°C	I_D	95 67	A
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)		I_{DM}	380	A
Maximum Continuous Body Diode Forward Current (Note 7)		I_S	95	A
Pulsed Source Current (380µs Pulse, Duty Cycle = 1%)		I_{SM}	380	A
Avalanche Current, L = 0.1mH (Note 8)		I_{AS}	56	A
Avalanche Energy, L = 0.1mH (Note 8)		E_{AS}	226	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)		P_D	1.6	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	95	°C/W
Total Power Dissipation (Note 6)		P_D	3.3	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	46	°C/W
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	1.5	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	°C

Notes:
5. Device mounted on FR-4 PCB, with minimum recommended pad layout, single sided.
6. Device mounted on FR-4 substrate PCB, 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.

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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}	60	—	—	V	V_{GS} = 0V, I_D = 1mA
Zero Gate Voltage Drain Current, T_J = +25°C	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 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	2	3	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	4.6	7.3	mΩ	V_{GS} = 10V, I_D = 50A
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	7.1	15	mΩ	V_{GS} = 4.5V, I_D = 25A
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 1.7A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	1882	—	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	374	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	111	—	pF	
Gate Resistance	R_g	—	2.1	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	18.5	—	nC	V_{DS} = 30V, I_D = 25A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	37.3	—	nC	
Gate-Source Charge	Q_{gs}	—	5.0	—	nC	
Gate-Drain Charge	Q_{gd}	—	11.2	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	5.7	—	ns	V_{GS} = 10V, V_{DS} = 30V, R_g = 3Ω, I_D = 25A
Turn-On Rise Time	t_R	—	7.5	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	16.9	—	ns	
Turn-Off Fall Time	t_F	—	6.3	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	32	—	ns	I_F = 25A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q_{RR}	—	30	—	nC	

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

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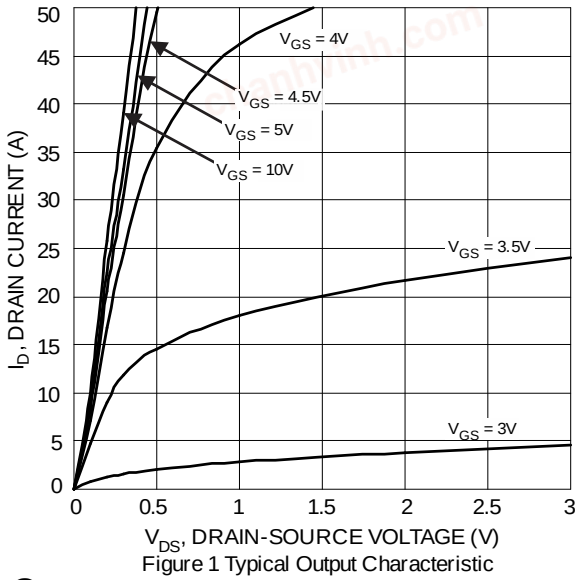


Figure 1 Typical Output Characteristic

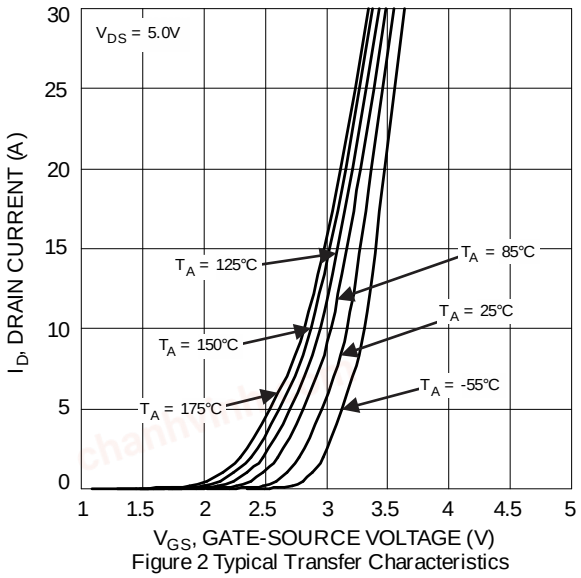


Figure 2 Typical Transfer Characteristics

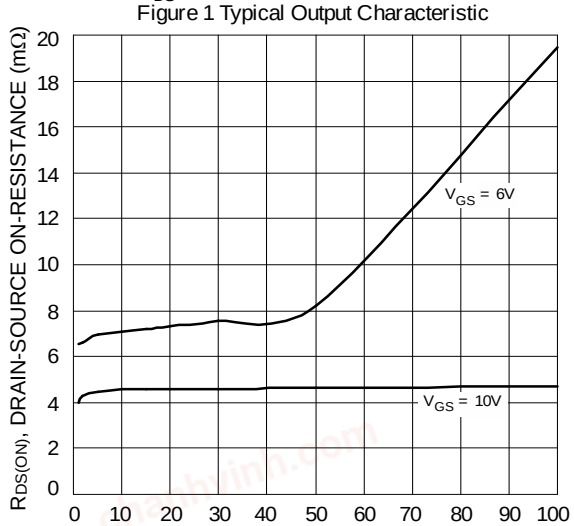


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

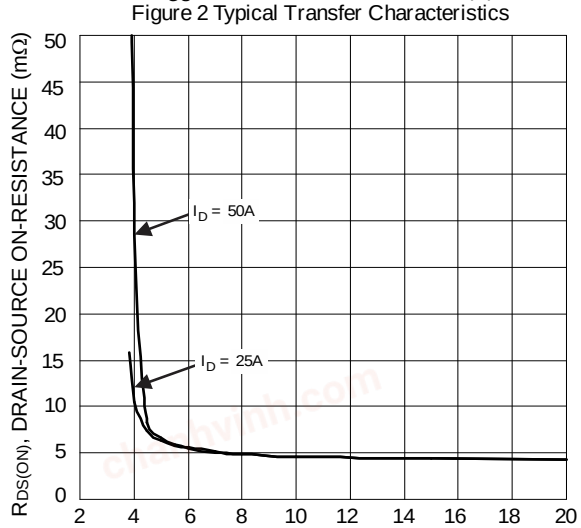


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

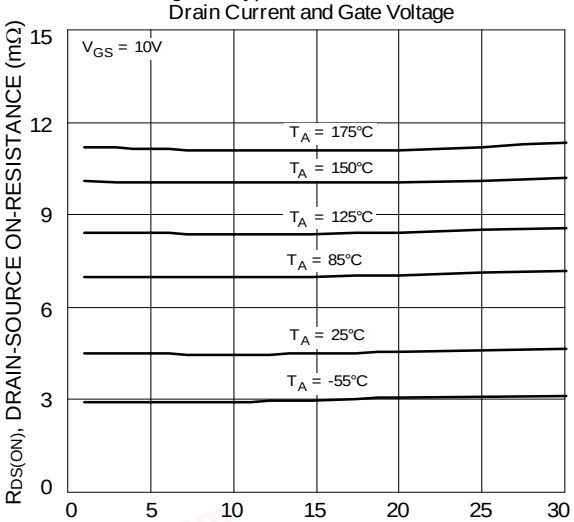


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

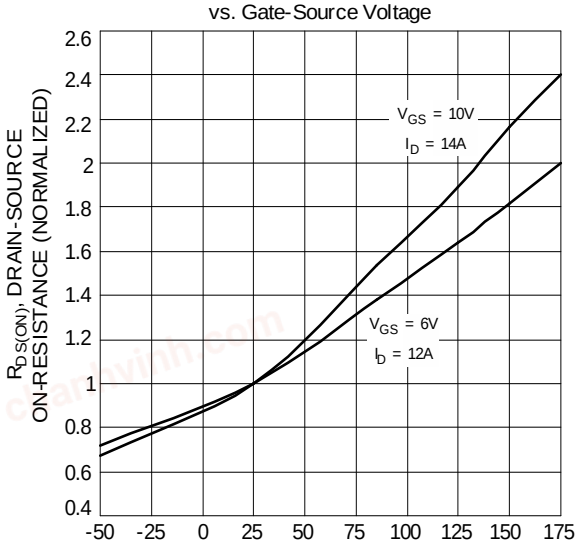


Figure 6 On-Resistance Variation with Temperature

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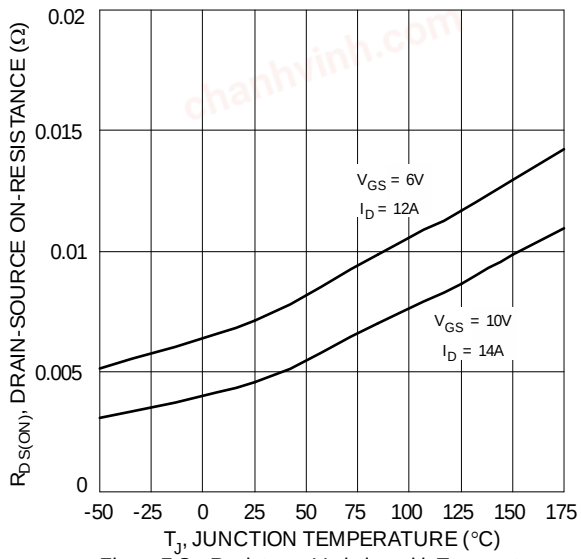


Figure 7 On-Resistance Variation with Temperature

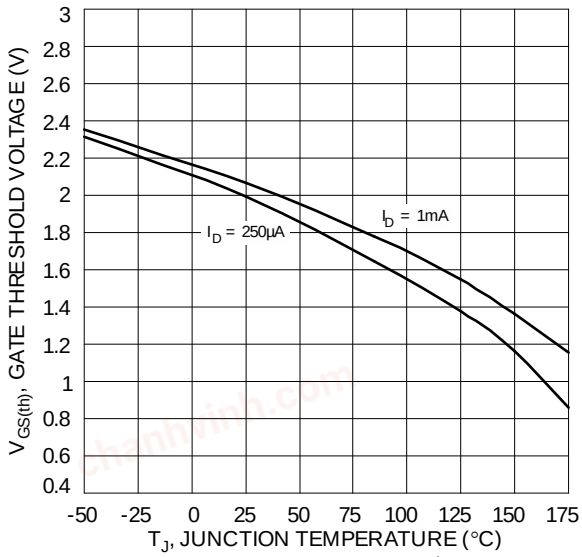


Figure 8 Gate Threshold Variation vs. Junction Temperature (°C)

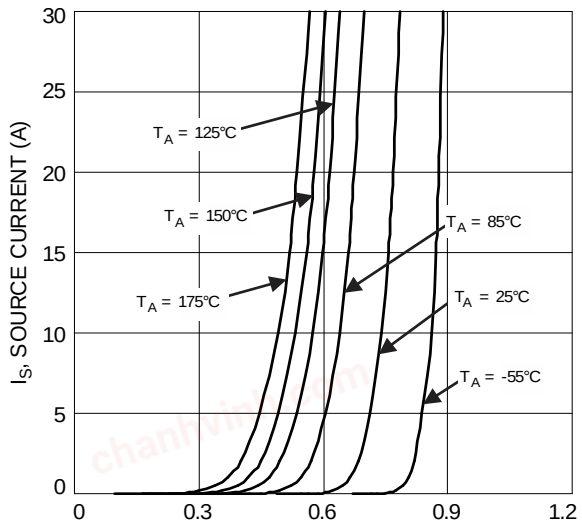


Figure 9 Diode Forward Voltage vs. Current

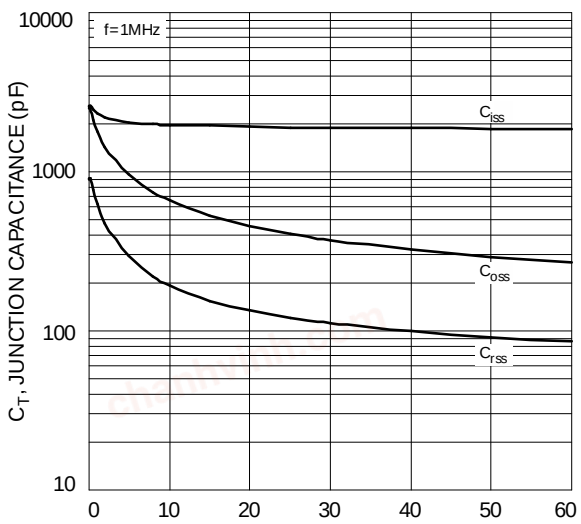


Figure 10 Typical Junction Capacitance

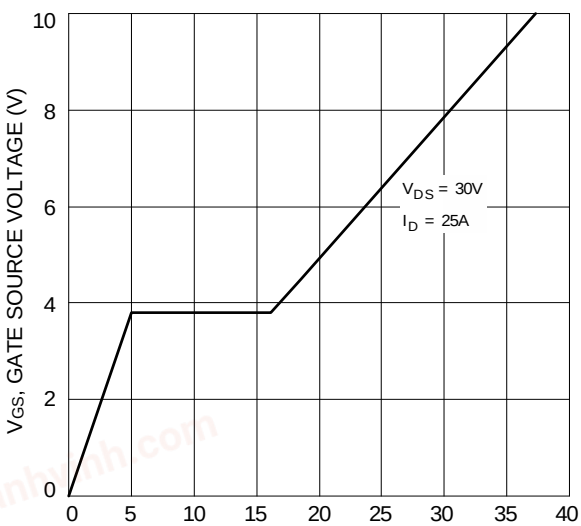


Figure 11 Gate Charge

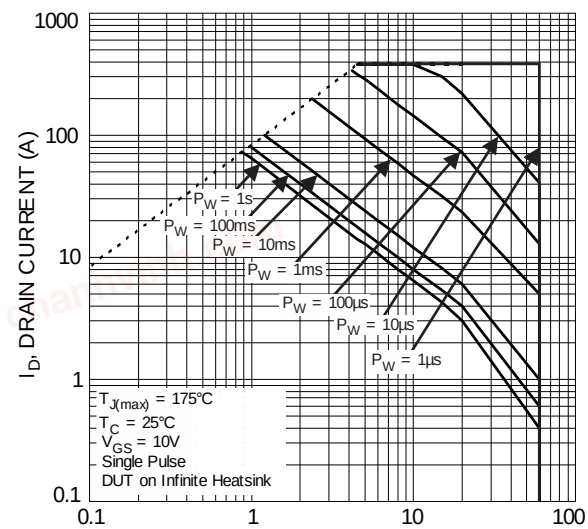


Figure 12 SOA, Safe Operation Area

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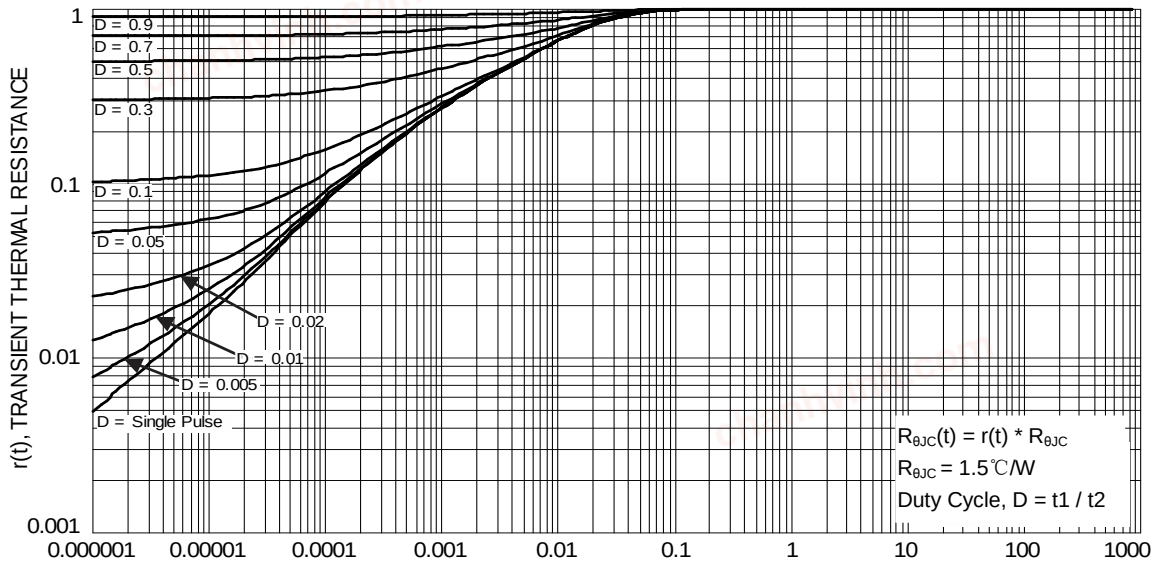


Figure 13 Transient Thermal Resistance

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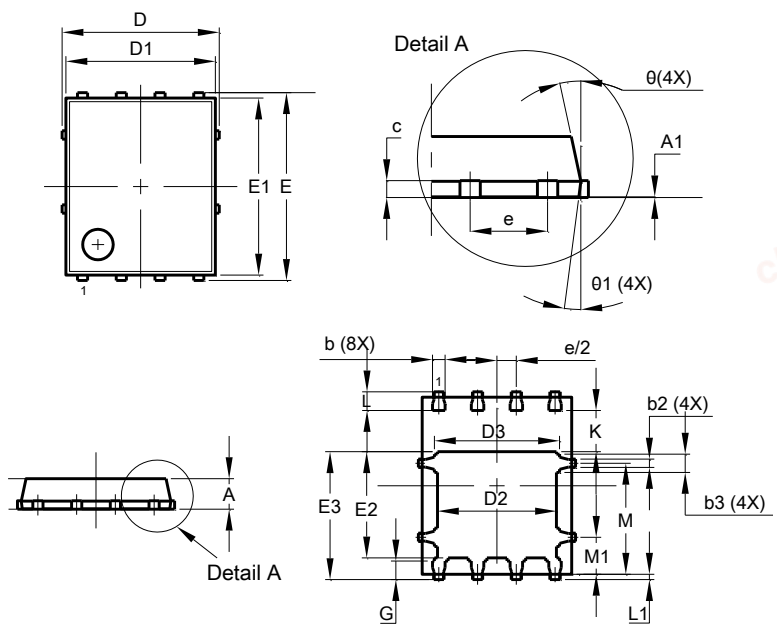
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Package Outline Dimensions

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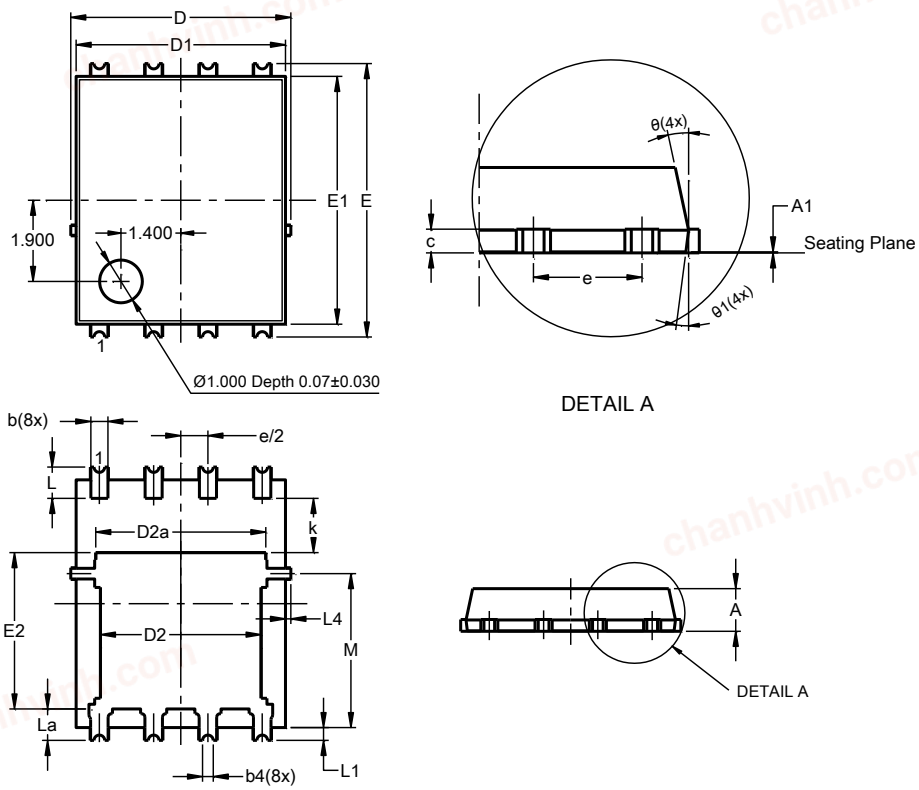
PowerDI5060-8



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			

Site2:

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			

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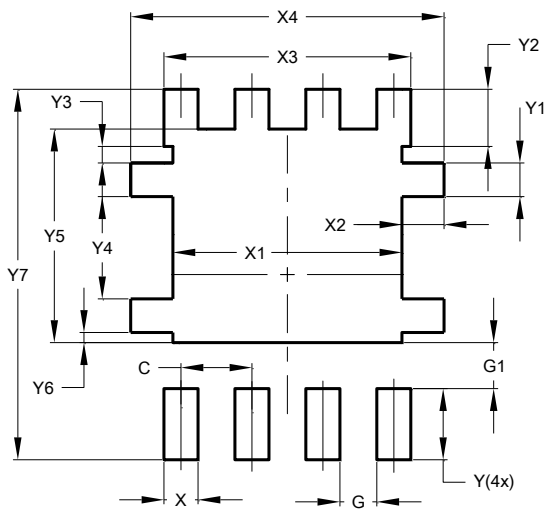
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Suggested Pad Layout

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Site1:

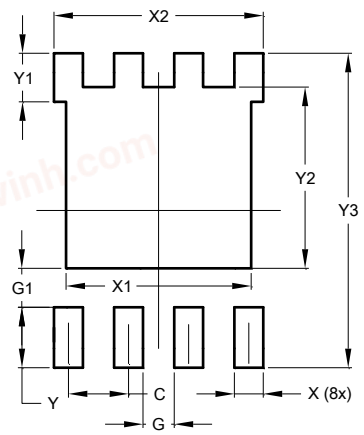
PowerDI5060-8



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

Site2:

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

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