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}	**$R_{DS(ON)}$**	**I_D T_C = +25°C (Note 9)**
60V	8mΩ @ V_{GS} = 10V	100A
	12mΩ @ V_{GS} = 4.5V	85A

Features

- 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
- Low $R_{DS(ON)}$ – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed

Description and Applications

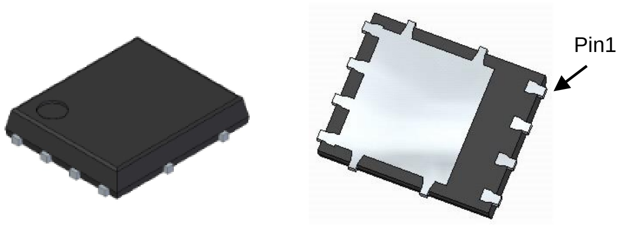
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Engine management systems
- Body control electronics
- DC-DC converters

Mechanical Data

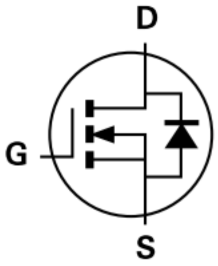
- Package: PowerDI®5060-8
- Package Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 ⓔ3
- Weight: 0.097 grams (Approximate)

PowerDI5060-8

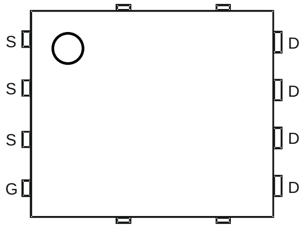


Top View

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}	±20	V
Continuous Drain Current (Note 5)	T_A = +25°C T_A = +70°C	I_D	13.5 10.4	A
Continuous Drain Current (Notes 6 & 9)	T_C = +25°C T_C = +100°C	I_D	100 75	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=0.1mH		I_{AS}	20	A
Avalanche Energy, L=0.1mH		E_{AS}	20	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	2.6	W
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\theta JA}$	57	°C/W
Total Power Dissipation (Note 6)	T_C = +25°C	P_D	136	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	1.1	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	°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).

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	$V_{GS} = 0V$, $I_D = 1mA$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	$V_{DS} = 48V$, $V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	$V_{GS} = \pm 20V$, $V_{DS} = 0V$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	$V_{DS} = V_{GS}$, $I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	6.4	8	mΩ	$V_{GS} = 10V$, $I_D = 20A$
		—	8.3	12		$V_{GS} = 4.5V$, $I_D = 20A$
Diode Forward Voltage	V_{SD}	—	0.8	1.2	V	$V_{GS} = 0V$, $I_S = 20A$
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	2,090	—	pF	$V_{DS} = 30V$, $V_{GS} = 0V$, f = 1MHz
Output Capacitance	C_{oss}	—	746	—		
Reverse Transfer Capacitance	C_{rss}	—	38.5	—		
Gate Resistance	R_g	0.2	0.59	1.5	Ω	$V_{DS} = 0V$, $V_{GS} = 0V$, f = 1MHz
Total Gate Charge ($V_{GS} = 4.5V$)	Q_g	—	19.3	—	nC	$V_{DS} = 30V$, $I_D = 20A$
Total Gate Charge ($V_{GS} = 10V$)	Q_g	—	41.3	—		
Gate-Source Charge	Q_{gs}	—	6	—		
Gate-Drain Charge	Q_{gd}	—	8.8	—		
Turn-On Delay Time	$t_{D(ON)}$	—	5.7	—	ns	$V_{DD} = 30V$, $V_{GS} = 10V$, $I_D = 20A$, $R_G = 3\Omega$
Turn-On Rise Time	t_R	—	4.3	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	23.4	—		
Turn-Off Fall Time	t_F	—	9.7	—		
Body Diode Reverse Recovery Time	t_{RR}	—	35.4	—	ns	$I_F = 20A$, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q_{RR}	—	38.2	—	nC	

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

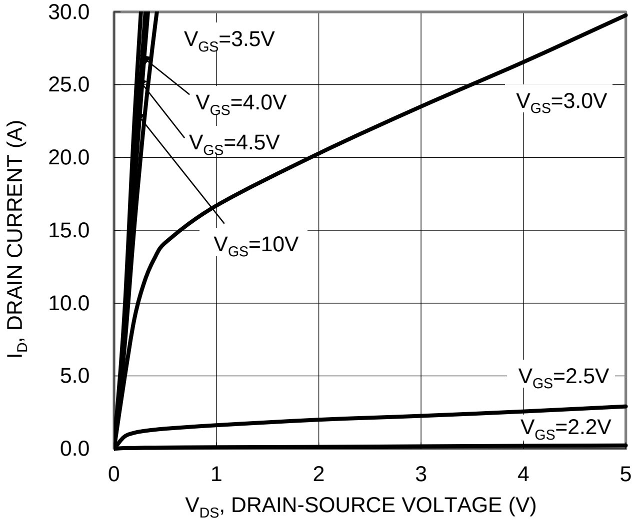


Figure 1. Typical Output Characteristic

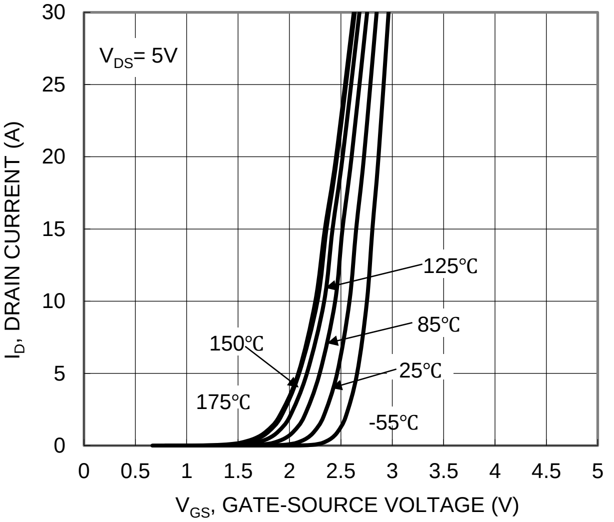


Figure 2. Typical Transfer Characteristic

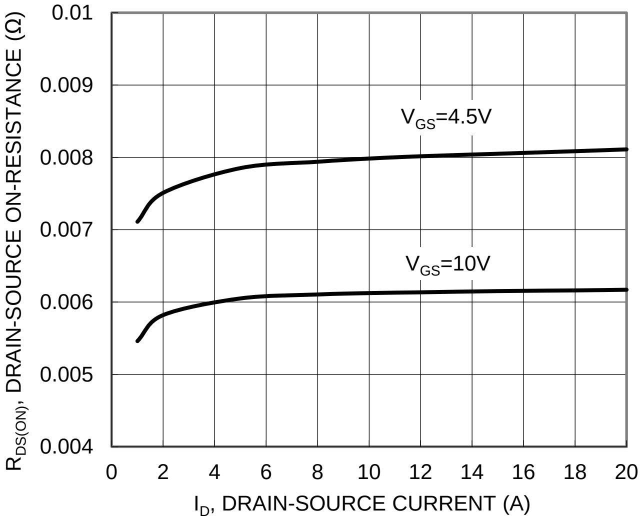


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

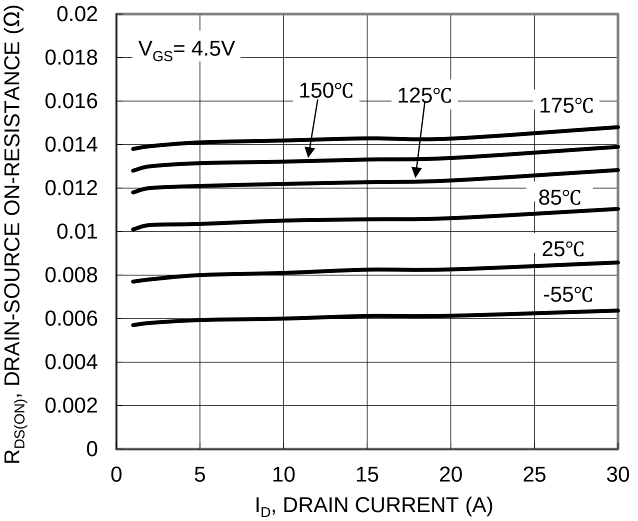


Figure 4. Typical On-Resistance vs. Drain Current and Temperature

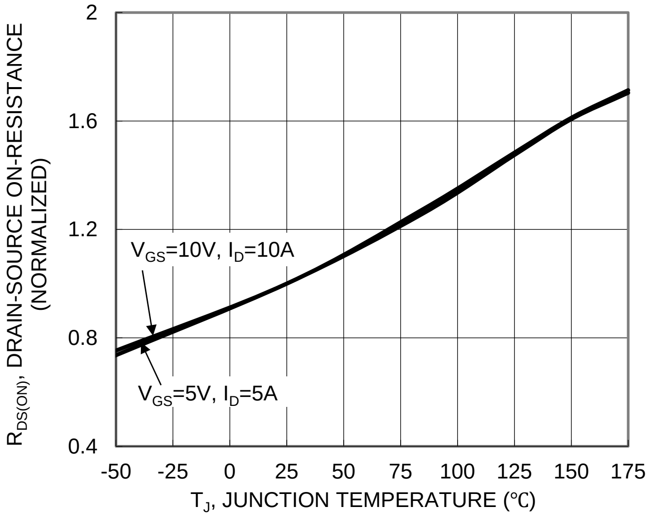


Figure 5. On-Resistance Variation with Temperature

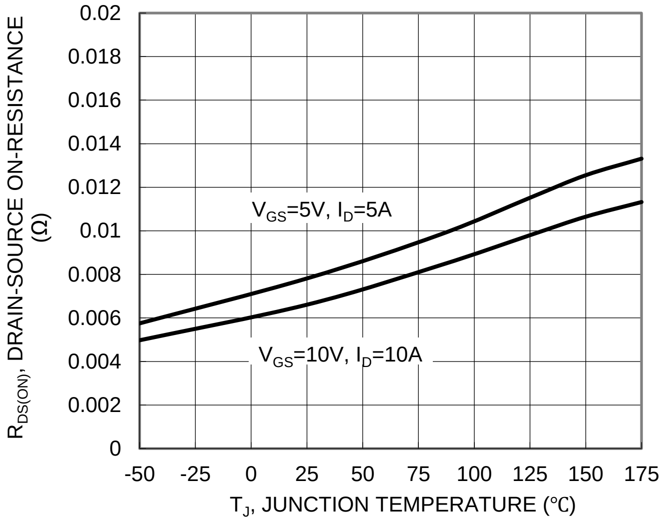


Figure 6. On-Resistance Variation with Temperature

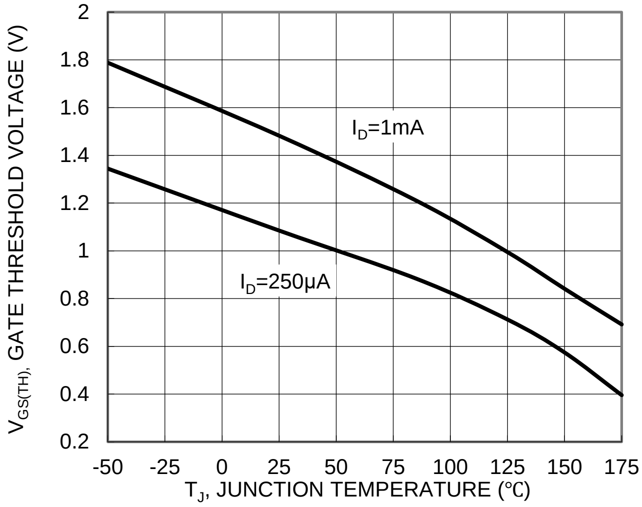


Figure 7. Gate Threshold Variation vs. Junction Temperature

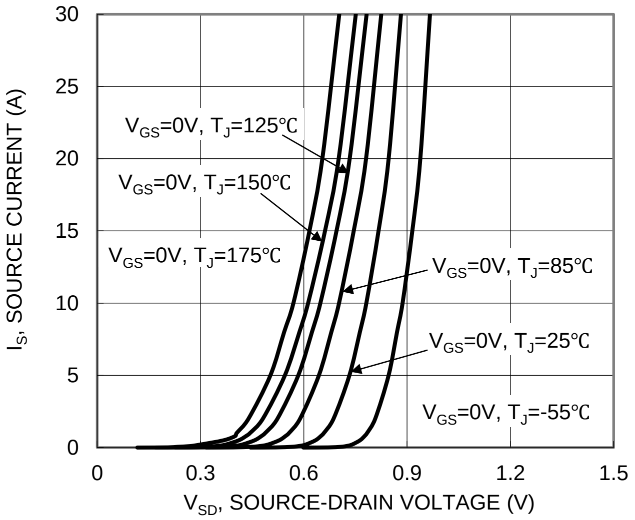


Figure 8. Diode Forward Voltage vs. Current

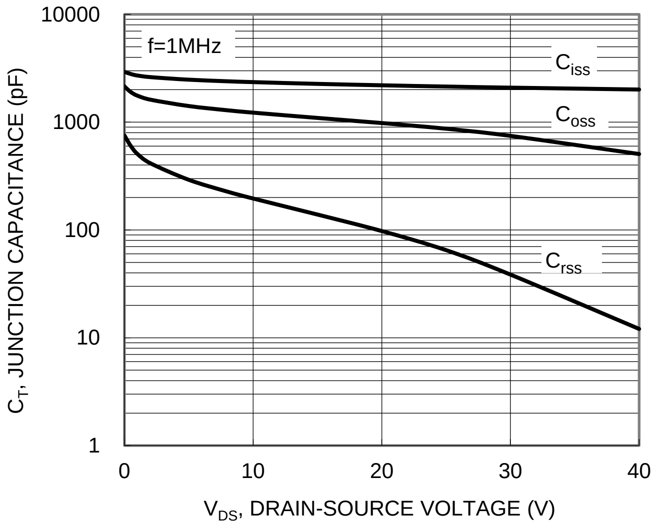


Figure 9. Typical Junction Capacitance

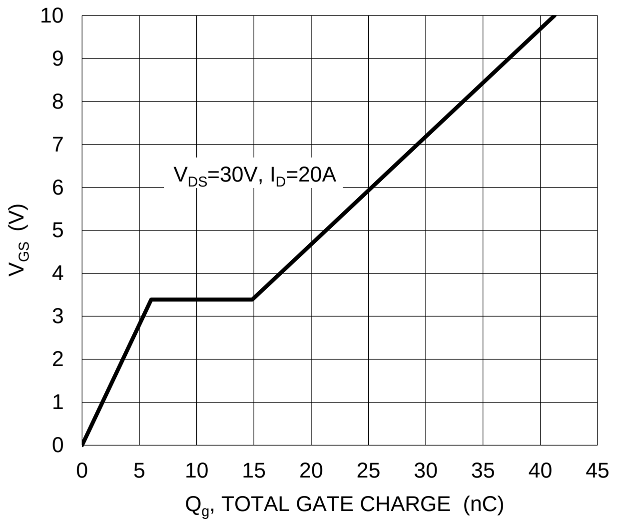


Figure 10. Gate Charge

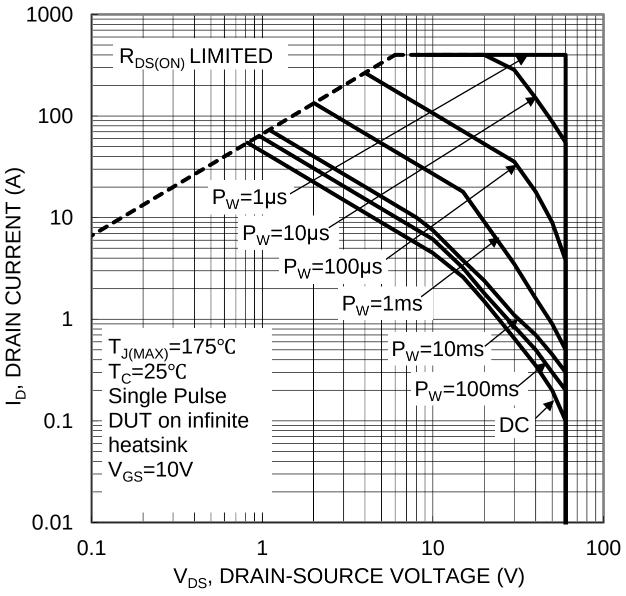


Figure 11. SOA, Safe Operation Area

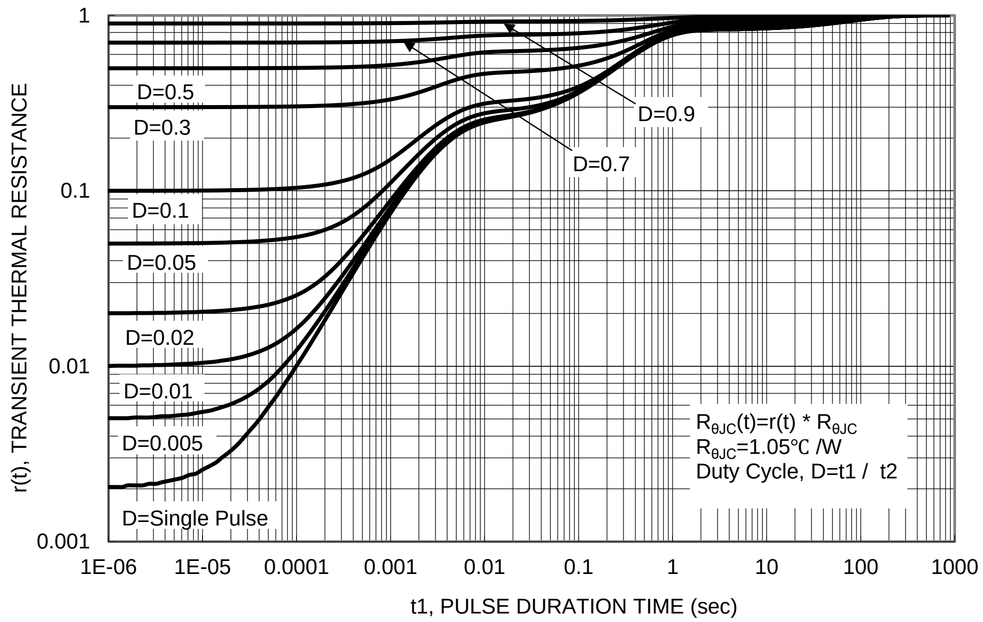
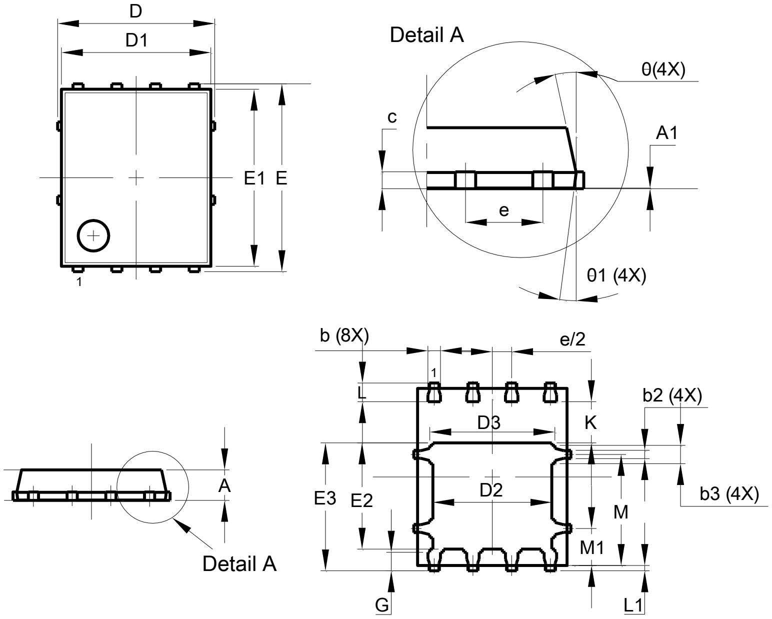


Figure 12. Transient Thermal Resistance

Package Outline Dimensions

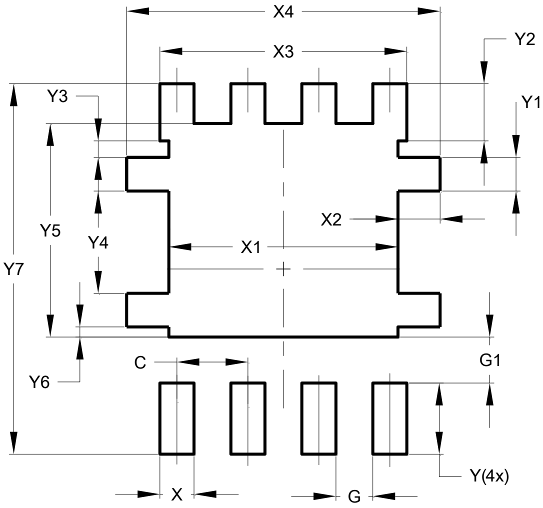
PowerDI5060-8



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			

Suggested Pad Layout

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