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 T_C = +25°C (Note 9)**
40V	3.3mΩ @ V_{GS} = 10V	100A
	5.0mΩ @ V_{GS} = 5V	95A

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:

- BLDC motors
- DC-DC converters
- Load switches

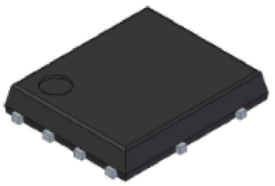
Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable And Robust End Application
- Low $R_{DS(ON)}$ – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed

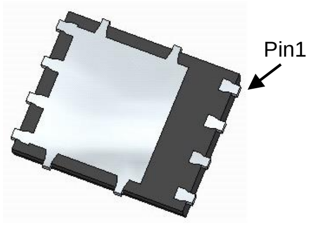
Mechanical Data

- 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)

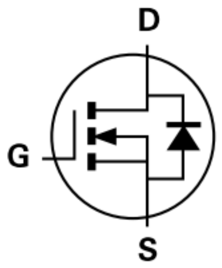
PowerDI5060-8



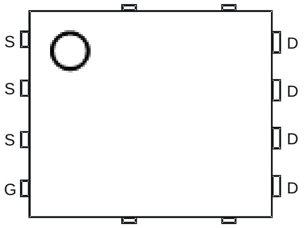
Top View



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}	40	V
Gate-Source Voltage		V_{GSS}	±20	V
Continuous Drain Current, V_{GS} = 10V (Note 5)	T_A = +25°C T_A = +100°C	I_D	22 15.5	A
Continuous Drain Current, V_{GS} = 10V (Note 6) (Note 9)	T_C = +25°C T_C = +100°C	I_D	100 82	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I_{DM}	350	A
Maximum Continuous Body Diode Forward Current (Note 6)		I_S	69	A
Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%)		I_{SM}	350	A
Avalanche Current, L = 1mH		I_{AS}	13.2	A
Avalanche Energy, L = 1mH		E_{AS}	87	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	2.7	W
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\theta JA}$	55	°C/W
Total Power Dissipation (Note 6)	T_C = +25°C	P_D	83	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	1.8	°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}	40	—	—	V	V_{GS} = 0V, I_D = 1mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 32V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	2.5	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance (T_C = +25°C)	$R_{DS(ON)}$	—	2.7	3.3	mΩ	V_{GS} = 10V, I_D = 20A
		—	3.6	5.0		V_{GS} = 5V, I_D = 15A
Static Drain-Source On-Resistance (T_C = +175°C) (Note 8)	$R_{DS(ON)}$	—	4.7	—	mΩ	V_{GS} = 10V, I_D = 20A
Diode Forward Voltage	V_{SD}	—	—	1.2	V	V_{GS} = 0V, I_S = 20A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{ISS}	—	2,693	3,367	pF	V_{DS} = 20V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{OSS}	—	850	1105		
Reverse Transfer Capacitance	C_{RSS}	—	52	104		
Gate Resistance	R_G	—	2.54	5.1	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 10V)	Q_G	—	38.5	49	nC	V_{DS} = 20V, I_D = 20A
Total Gate Charge (V_{GS} = 4.5V)	Q_G	—	17.6	22		
Gate-Source Charge	Q_{GS}	—	6.9	11		
Gate-Drain Charge	Q_{GD}	—	6.9	11		
Turn-On Delay Time	$t_{D(ON)}$	—	5.2	10	ns	V_{DD} = 20V, V_{GS} = 10V, I_D = 20A, R_G = 1.6Ω
Turn-On Rise Time	t_R	—	5.7	11		
Turn-Off Delay Time	$t_{D(OFF)}$	—	23.5	46		
Turn-Off Fall Time	t_F	—	11	22		
Body Diode Reverse Recovery Time	t_{RR}	—	35.4	70	ns	I_F = 15A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	32.9	—	nC	

Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch 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.
9. Package limit.

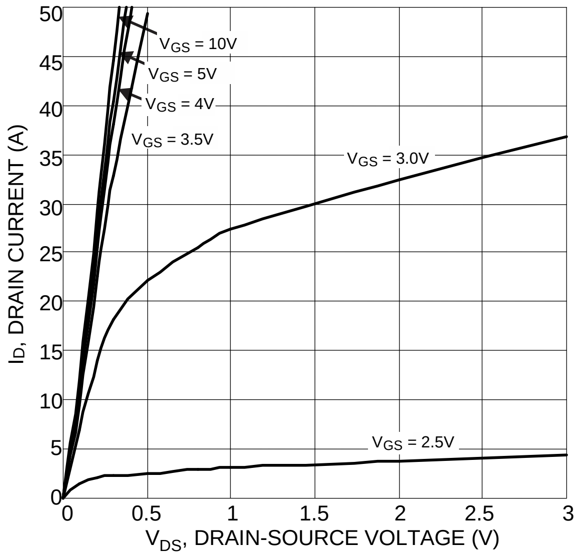


Figure 1 Typical Output Characteristic

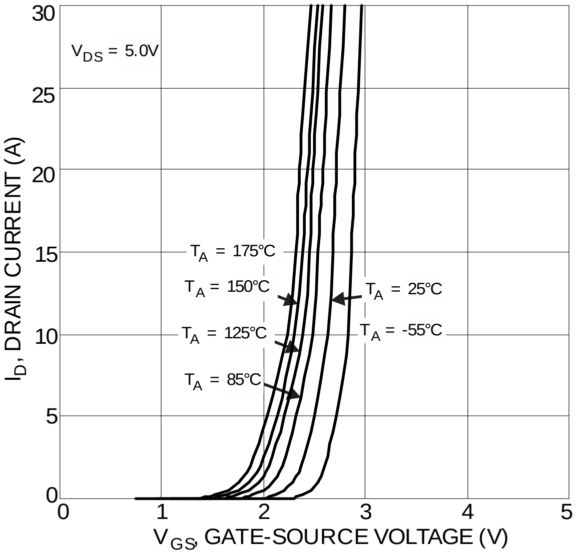


Figure 2 Typical Transfer Characteristics

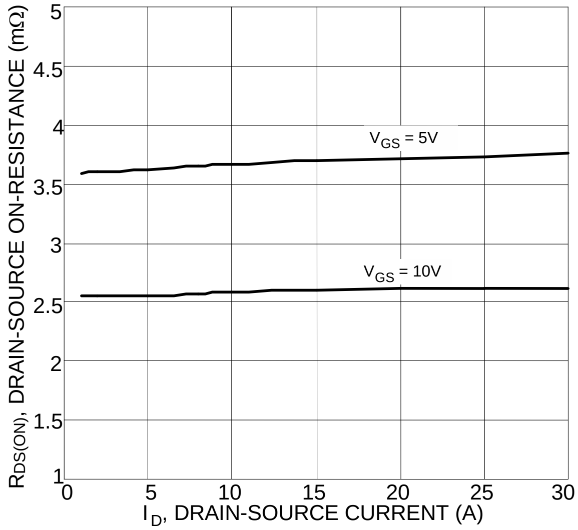


Figure 3 Typical On-Resistance vs.
Drain Current and Gate Voltage

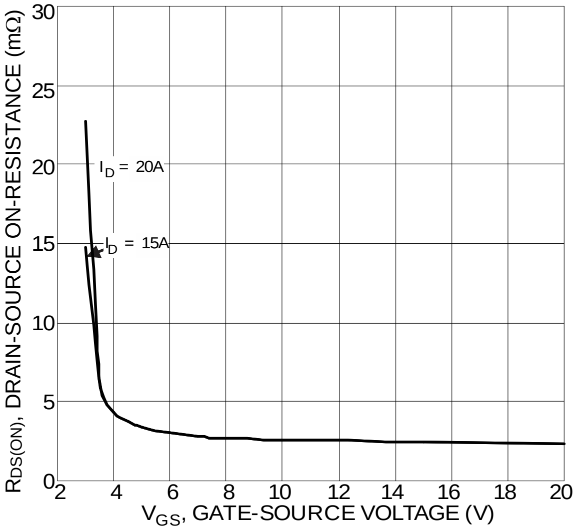


Figure 4 Typical Drain-Source On-Resistance
vs. Gate-Source Voltage

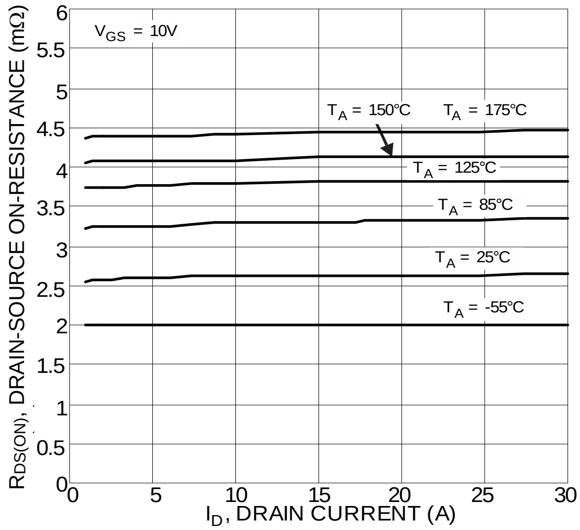


Figure 5 Typical On-Resistance vs.
Drain Current and Temperature

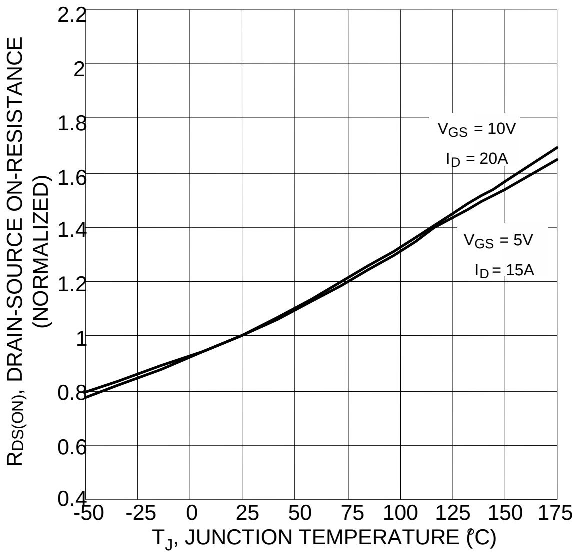


Figure 6 On-Resistance Variation with Temperature

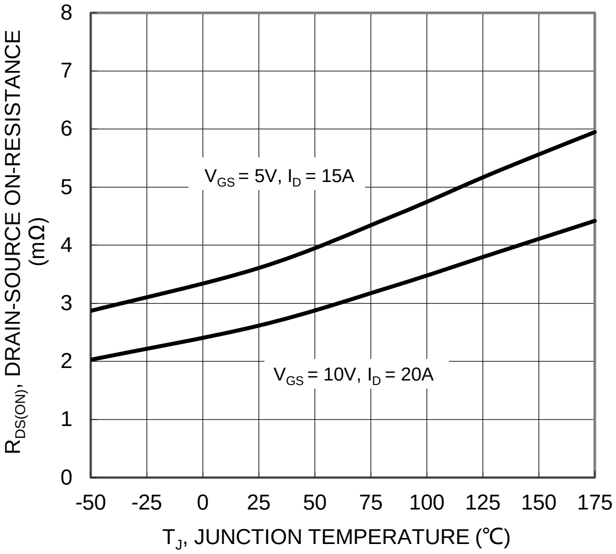


Figure 7. On-Resistance Variation with Temperature

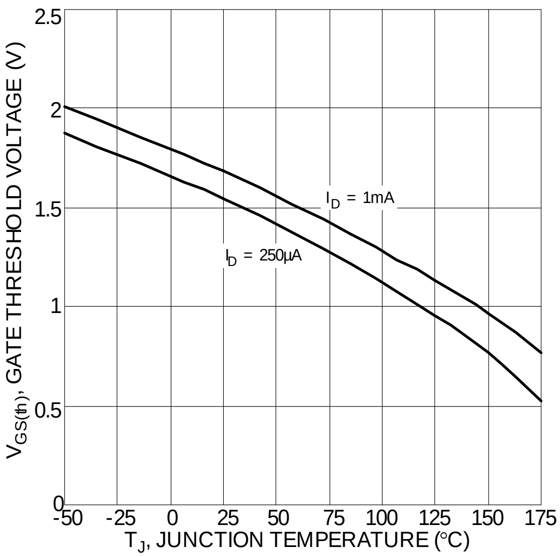


Figure 8 Gate Threshold Variation vs. Temperature

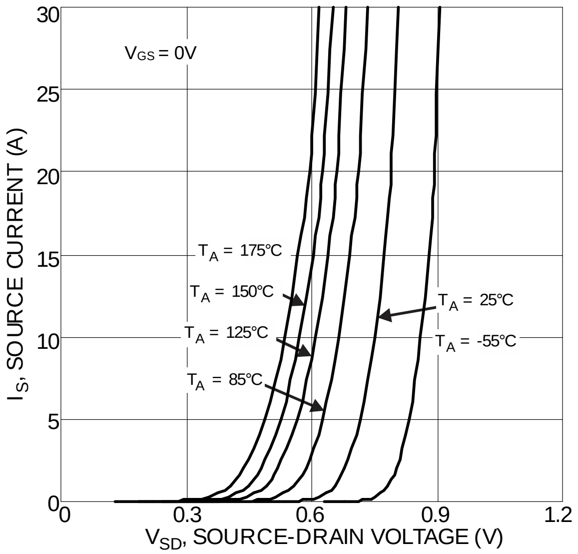


Figure 9 Diode Forward Voltage vs. Current

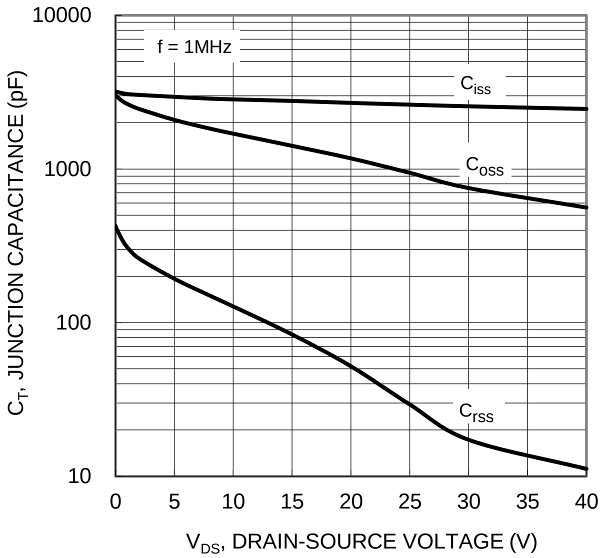


Figure 10. Typical Junction Capacitance

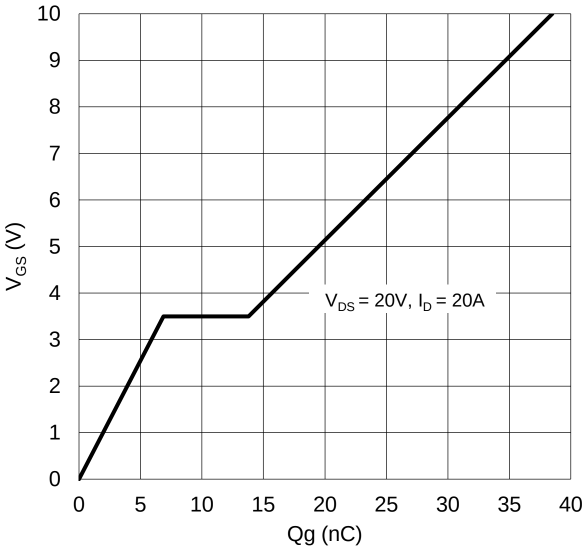


Figure 11. Gate Charge

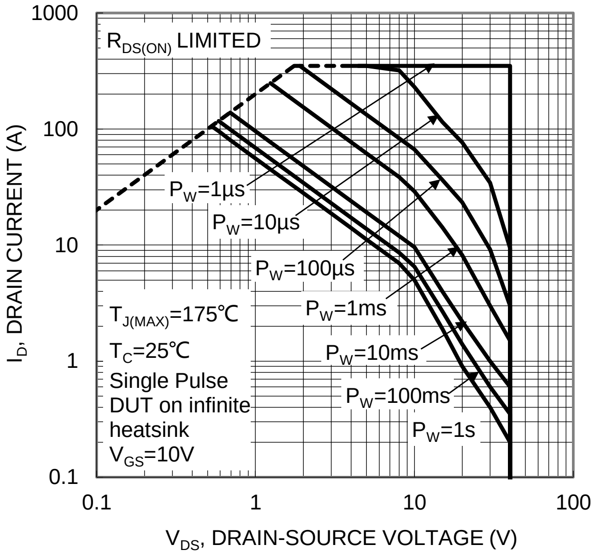


Figure 12. SOA, Safe Operation Area

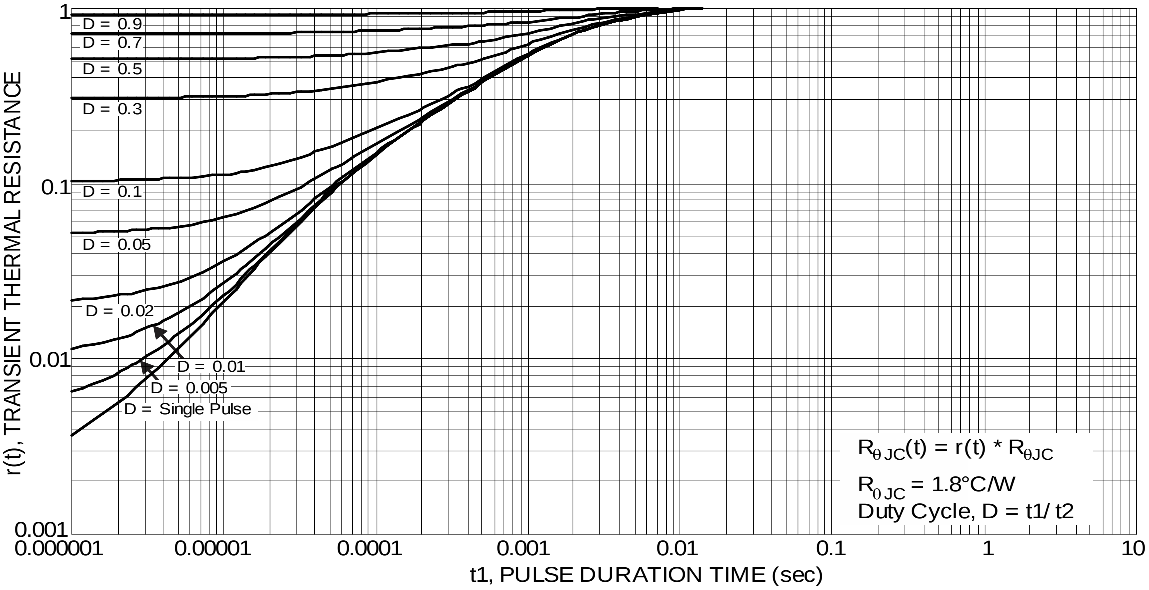
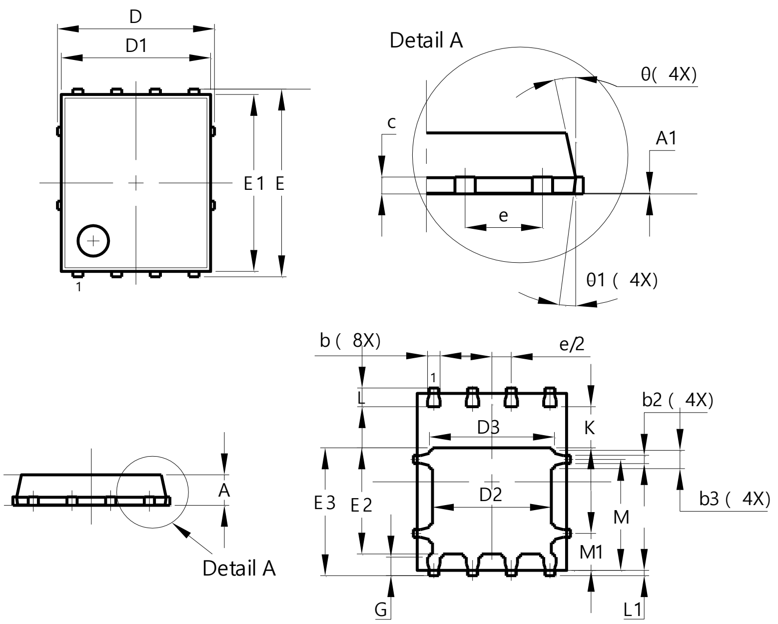


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

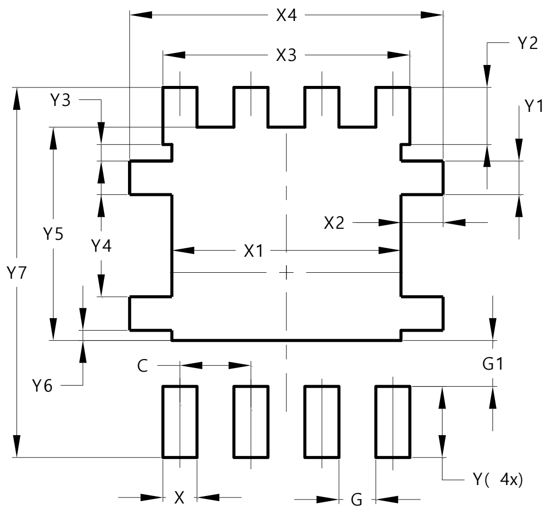
PowerDI5060-8



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