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**
40V	6.5mΩ @ V_{GS} = 10V	85A
	9.8mΩ @ V_{GS} = 4.5V	70A

Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Thermally Efficient Package – Cooler Running Applications
- High Conversion Efficiency
- Low $R_{DS(ON)}$ – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- <1.1mm Package Profile – Ideal for Thin Applications

Description and Applications

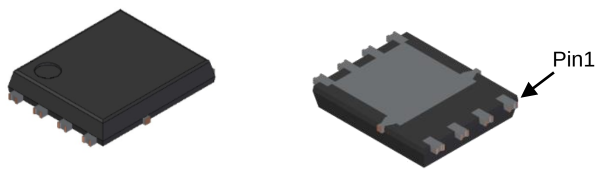
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP, and is ideal for use in:

- Motor controls
- DC-DC converters
- Load switches

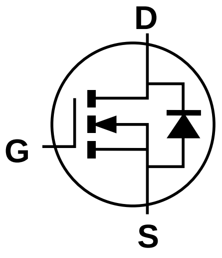
Mechanical Data

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

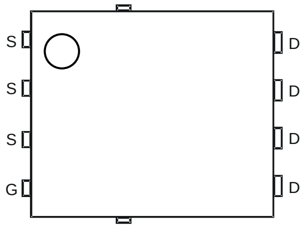
PowerDI5060-8/SWP (Type UX)



Top View Bottom View



Internal Schematic



Top View
Pin Configuration

Maximum Ratings (@T_A = +25°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	15 11	A
Continuous Drain Current, V_{GS} = 10V (Note 6)	Steady State	T_C = +25°C T_C = +100°C	I_D	85 60	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	85	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	340	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	2.7	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	55	°C/W
Total Power Dissipation (Note 6)	T_C = +25°C	P_D	83.3	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	—	3	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	5.4	6.5	mΩ	V_{GS} = 10V, I_D = 20A
		—	8.4	9.8		V_{GS} = 4.5V, 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}	—	1895	—	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	485	—		
Reverse Transfer Capacitance	C_{rss}	—	20.9	—		
Gate Resistance	R_g	0.1	0.62	1.8	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	12.4	—	nC	V_{DS} = 30V, I_D = 20A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	29.1	—		
Gate-Source Charge	Q_{gs}	—	5.9	—		
Gate-Drain Charge	Q_{gd}	—	3.5	—		
Turn-On Delay Time	$t_{D(ON)}$	—	5.4	—	ns	V_{DD} = 30V, V_{GS} = 10V, I_D = 20A, R_G = 3Ω
Turn-On Rise Time	t_R	—	4.5	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	16.2	—		
Turn-Off Fall Time	t_F	—	3.5	—		
Body Diode Reverse-Recovery Time	t_{RR}	—	30.6	—	ns	I_F = 20A, di/dt = 100A/µs
Body Diode Reverse-Recovery Charge	Q_{RR}	—	28.1	—	nC	

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

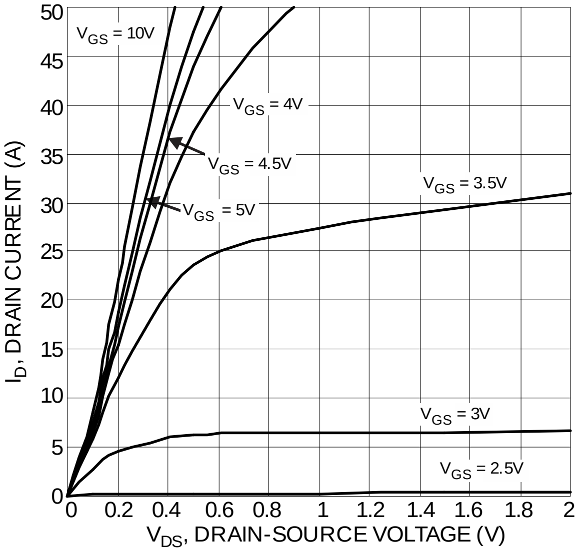


Figure 1 Typical Output Characteristic

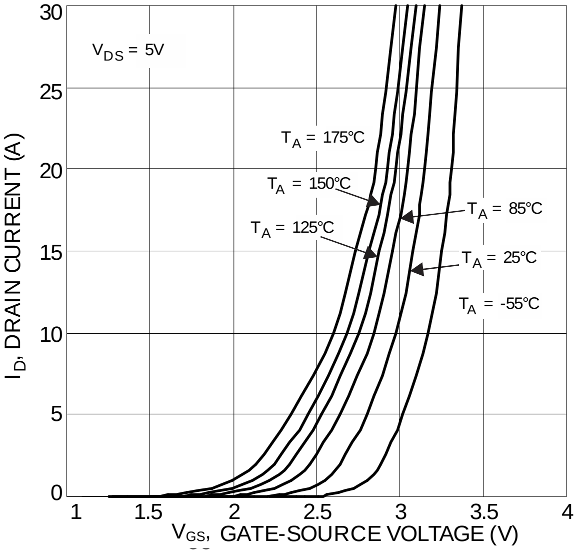


Figure 2 Typical Transfer Characteristics

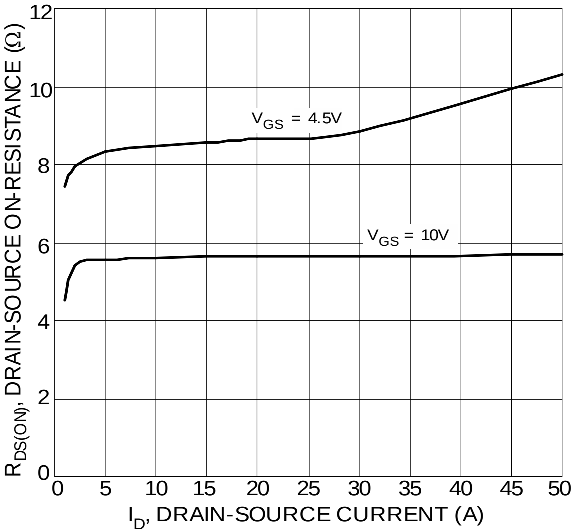


Figure 3 Typical On-Resistance vs.
Drain Current and Gate Voltage

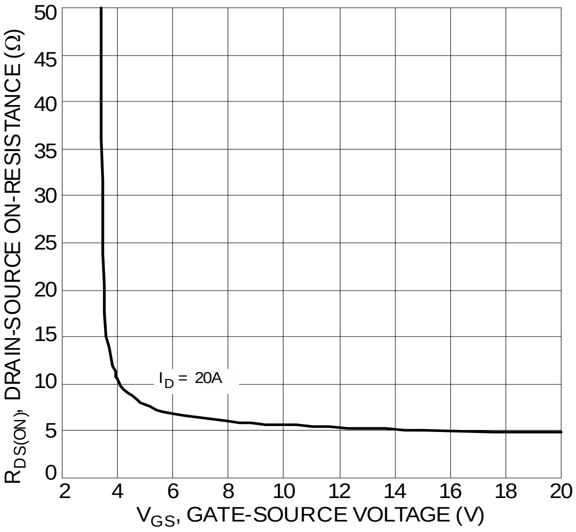


Figure 4 Typical Drain-Source On-Resistance
vs. Gate-Source Voltage

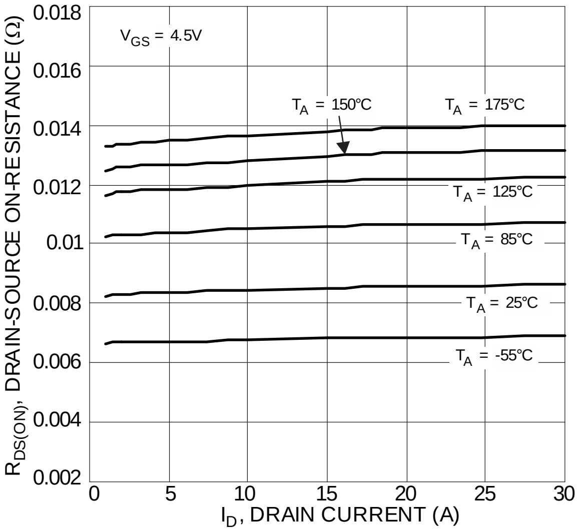


Figure 5 Typical On-Resistance vs.
Drain Current and Temperature

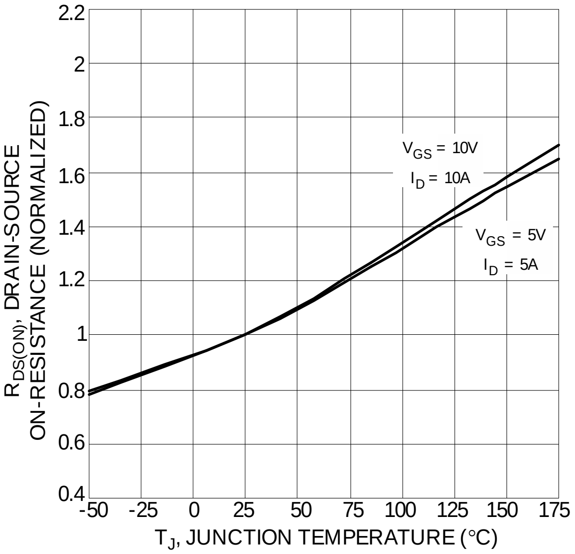


Figure 6 On-Resistance Variation with Temperature

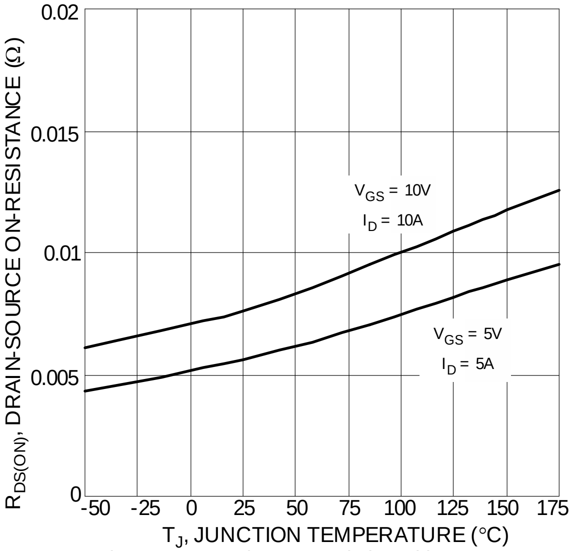


Figure 7 On-Resistance Variation with Temperature

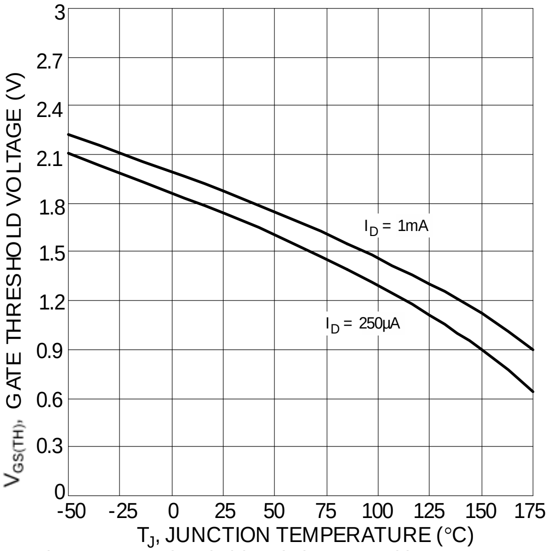


Figure 8 Gate Threshold Variation vs. Ambient Temperature

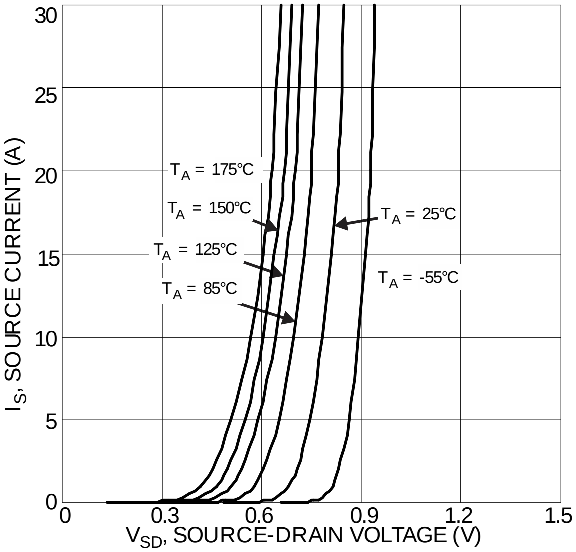


Figure 9 Diode Forward Voltage vs. Current

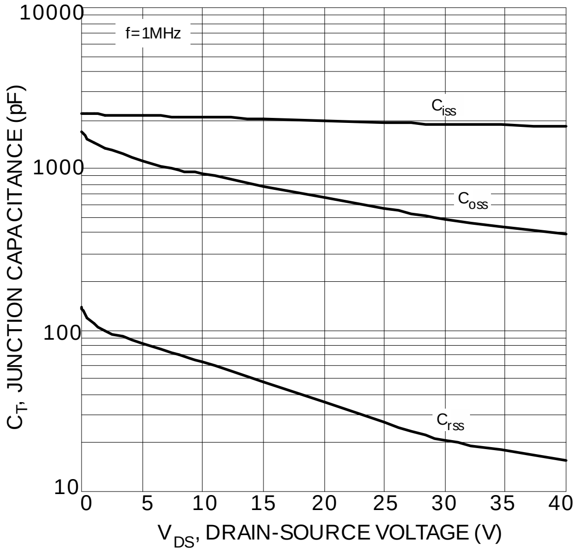


Figure 10 Typical Junction Capacitance

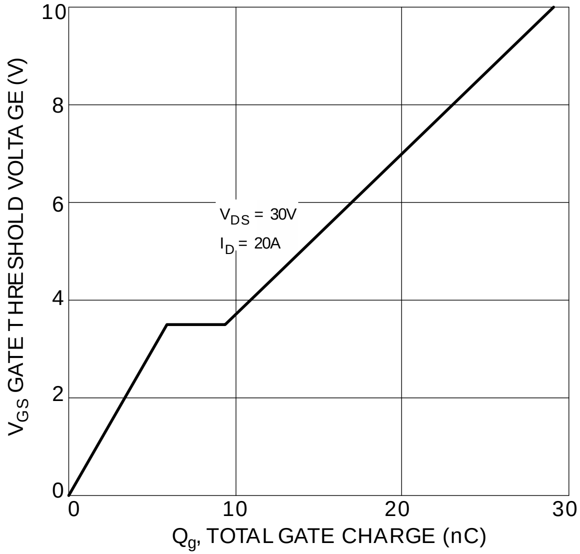


Figure 11 Gate Charge

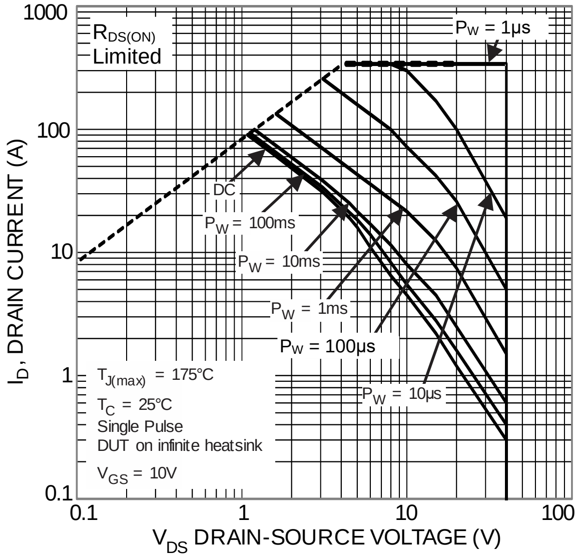


Figure 12 SOA, Safe Operation Area

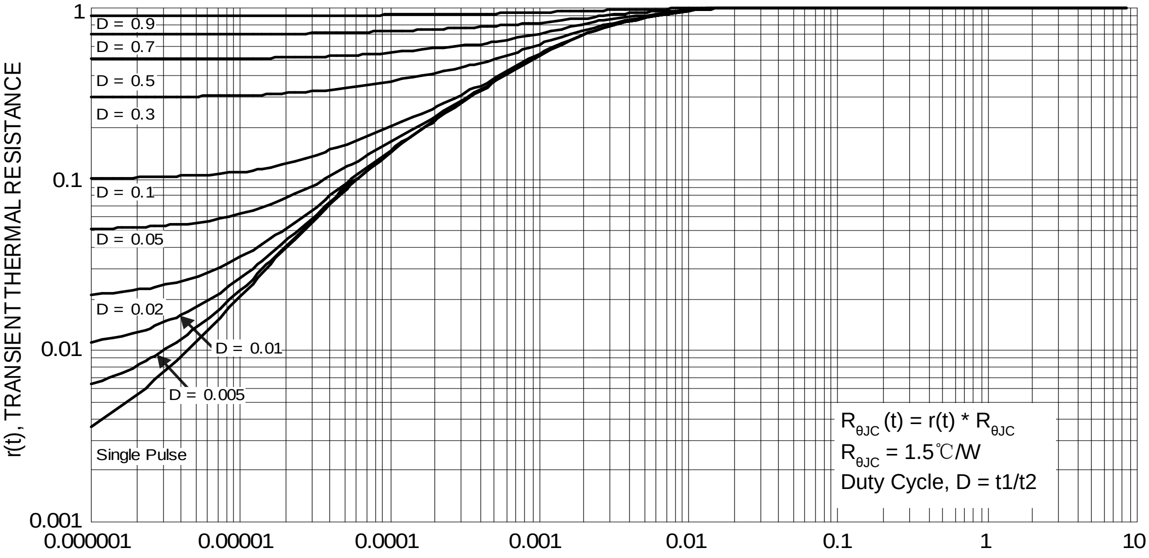
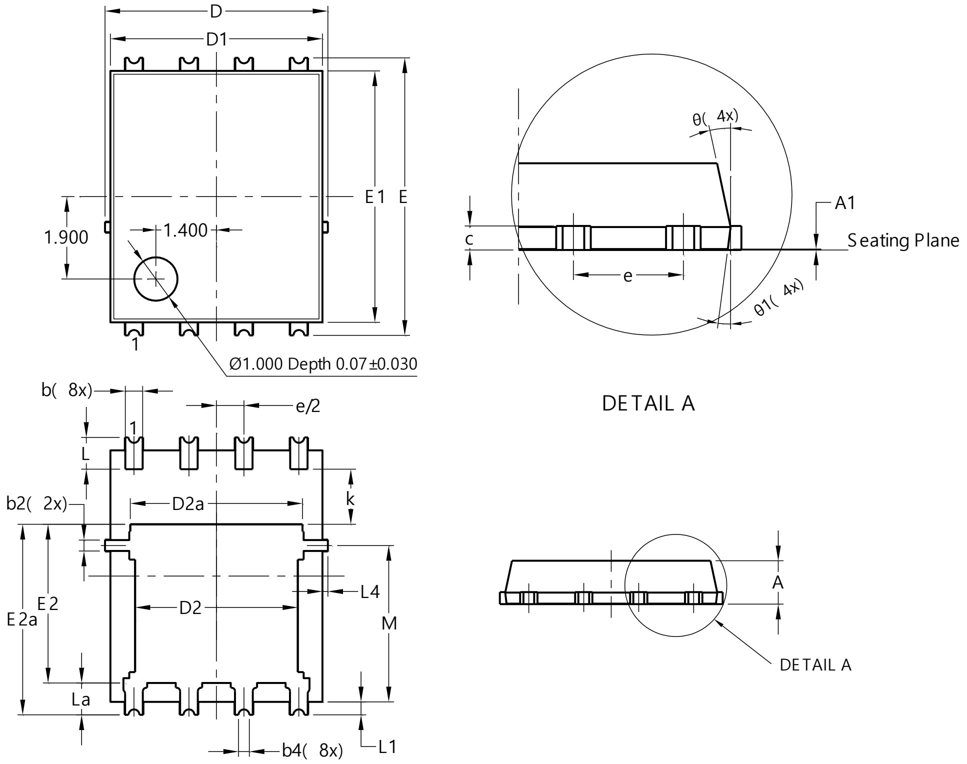


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

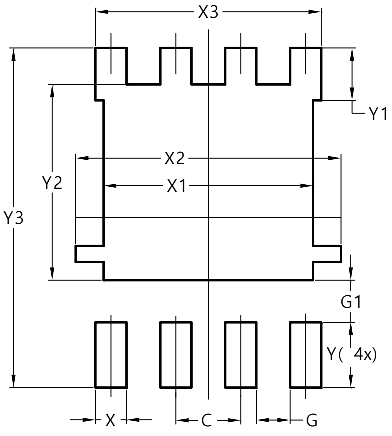
PowerDI5060-8/SWP (Type UX)



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
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

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