



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
40V	8.8mΩ @ V _{GS} = 10V	64.8A
	13mΩ @ V _{GS} = 5V	53.3A

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:

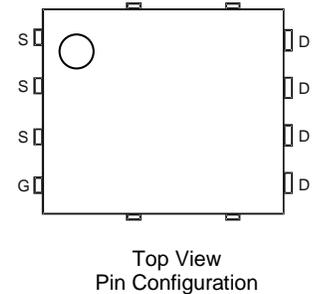
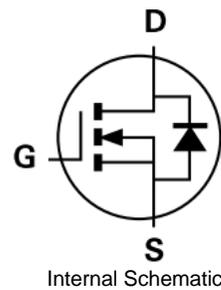
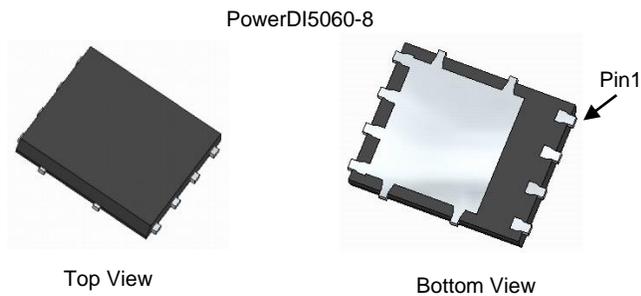
- Brushless DC motor controls
- DC-DC converters
- Load switches

Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching, Test in Production – 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 (E3)
- Weight: 0.097 grams (Approximate)



Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	40	V
Gate-Source Voltage	V_{GSS}	± 20	V
Continuous Drain Current, $V_{GS} = 10\text{V}$ (Note 5)	I_D	$T_A = +25^\circ\text{C}$	14.4
		$T_A = +100^\circ\text{C}$	10.2
Continuous Drain Current, $V_{GS} = 10\text{V}$ (Note 6)	I_D	$T_C = +25^\circ\text{C}$	64.8
		$T_C = +100^\circ\text{C}$	45.8
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)	I_{DM}	110	A
Maximum Continuous Body Diode Forward Current (Note 6)	I_S	55.5	A
Avalanche Current, $L = 0.1\text{mH}$	I_{AS}	22.7	A
Avalanche Energy, $L = 0.1\text{mH}$	E_{AS}	25.7	mJ

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P_D	$T_A = +25^\circ\text{C}$	2.99
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\theta JA}$	50.4
Total Power Dissipation (Note 6)	P_D	$T_C = +25^\circ\text{C}$	55.5
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	2.7
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +175	$^\circ\text{C}$

Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	40	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	$V_{DS} = 32\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	1.6	3	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	7.3	8.8	m Ω	$V_{GS} = 10\text{V}, I_D = 10\text{A}$
		—	10	13		$V_{GS} = 5\text{V}, I_D = 10\text{A}$
Diode Forward Voltage	V_{SD}	—	0.8	1.0	V	$V_{GS} = 0\text{V}, I_S = 10\text{A}$
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	1088	—	pF	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Output Capacitance	C_{oss}	—	322	—		
Reverse Transfer Capacitance	C_{rss}	—	27	—		
Gate Resistance	R_g	—	2.6	—	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge ($V_{GS} = 4.5\text{V}$)	Q_g	—	7.4	—	nC	$V_{DS} = 20\text{V}, I_D = 10\text{A}$
Total Gate Charge ($V_{GS} = 10\text{V}$)	Q_g	—	15.3	—		
Gate-Source Charge	Q_{gs}	—	2.4	—		
Gate-Drain Charge	Q_{gd}	—	3.4	—		
Turn-On Delay Time	$t_{D(ON)}$	—	4.3	—	ns	$V_{DD} = 20\text{V}, V_{GS} = 10\text{V}, I_D = 10\text{A}, R_G = 6\Omega$
Turn-On Rise Time	t_R	—	7.5	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	16.7	—		
Turn-Off Fall Time	t_F	—	5.8	—		
Body Diode Reverse Recovery Time	t_{RR}	—	20.2	—	ns	$I_F = 10\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{RR}	—	8.9	—	nC	

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
 - Thermal resistance from junction to soldering point (on the exposed drain pad).
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

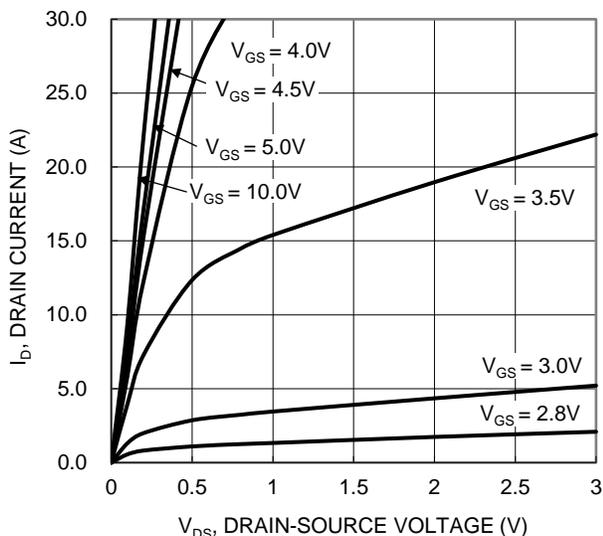


Figure 1. Typical Output Characteristic

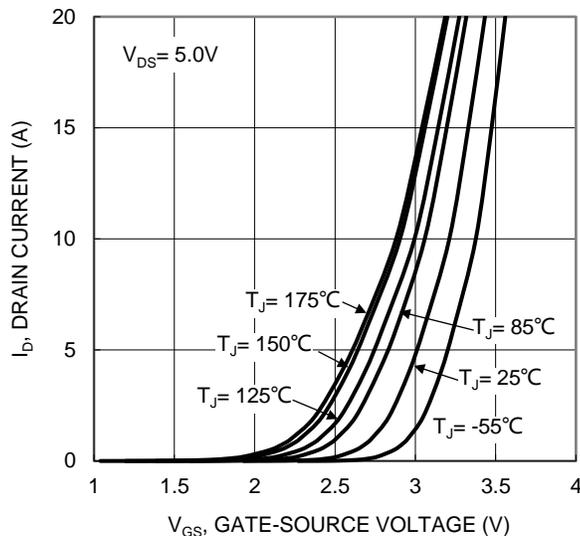


Figure 2. Typical Transfer Characteristic

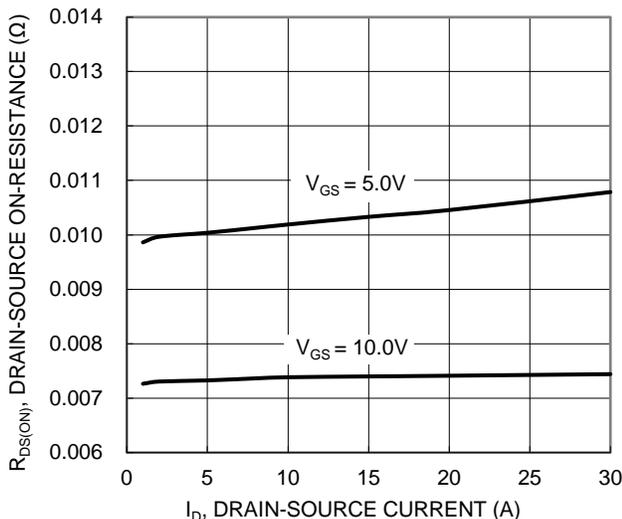


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

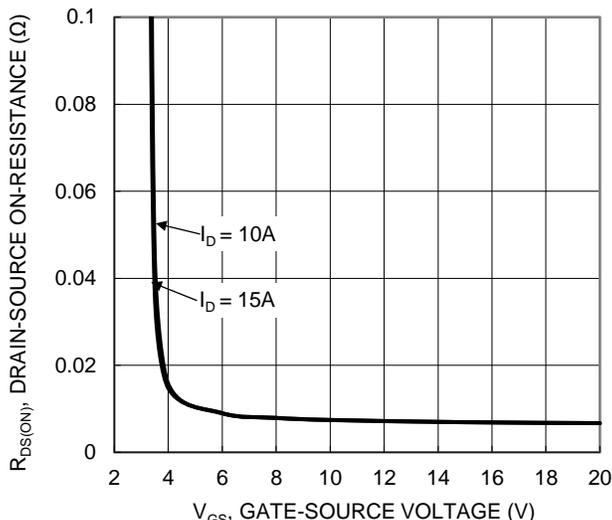


Figure 4. Typical Transfer Characteristic

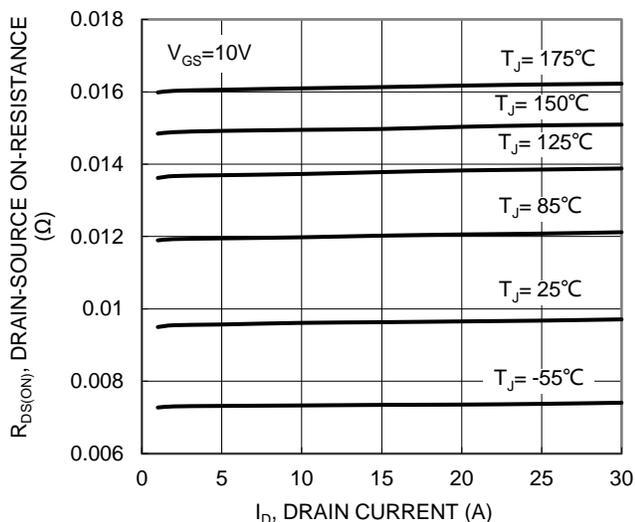


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

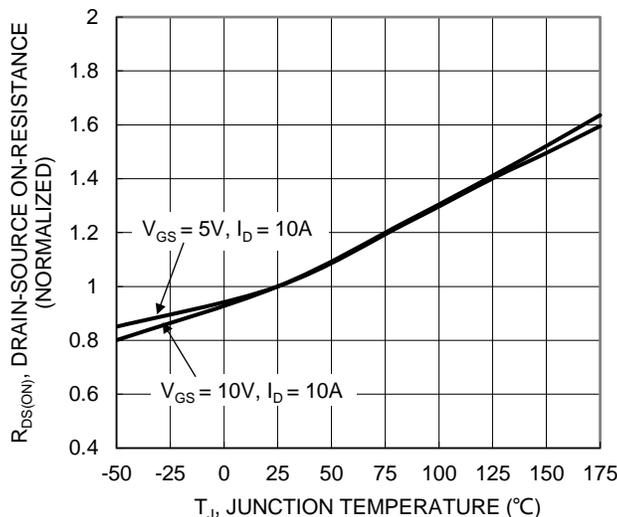


Figure 6. On-Resistance Variation with Temperature

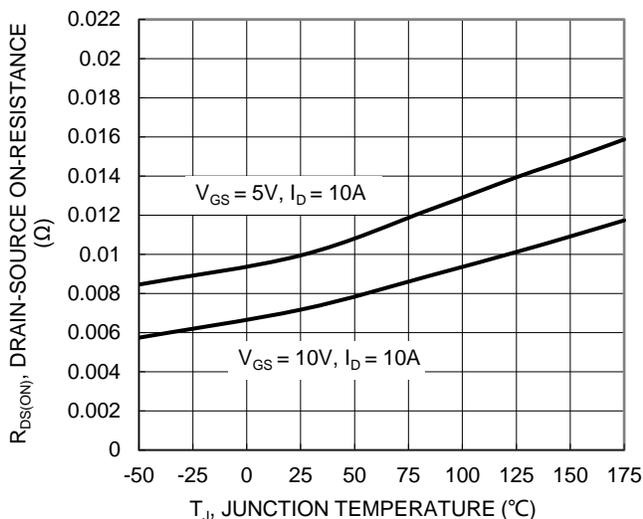


Figure 7. On-Resistance Variation with Temperature

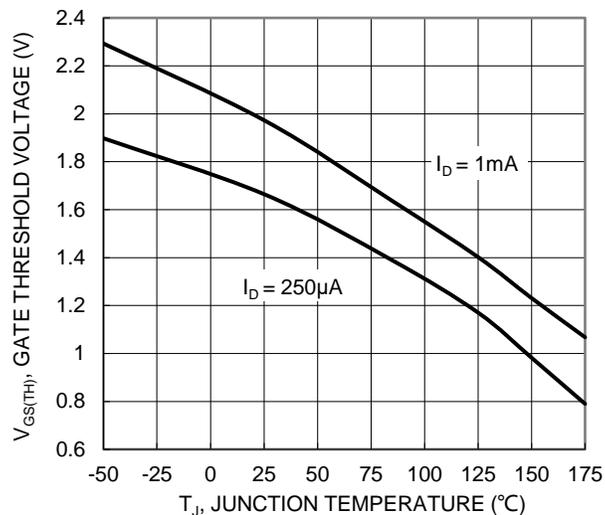


Figure 8. Gate Threshold Variation vs. Junction Temperature

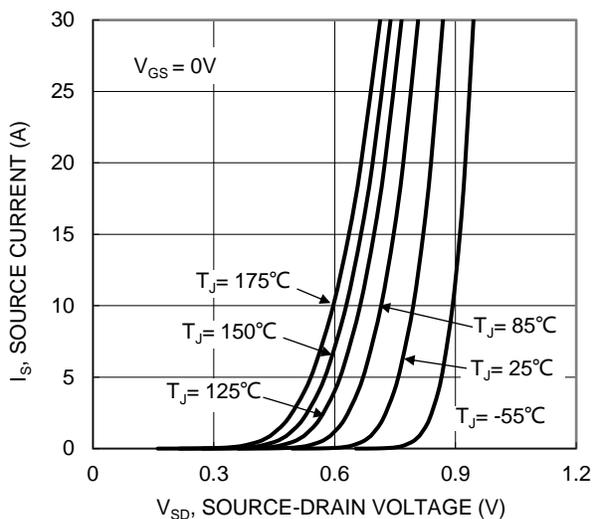


Figure 9. Diode Forward Voltage vs. Current

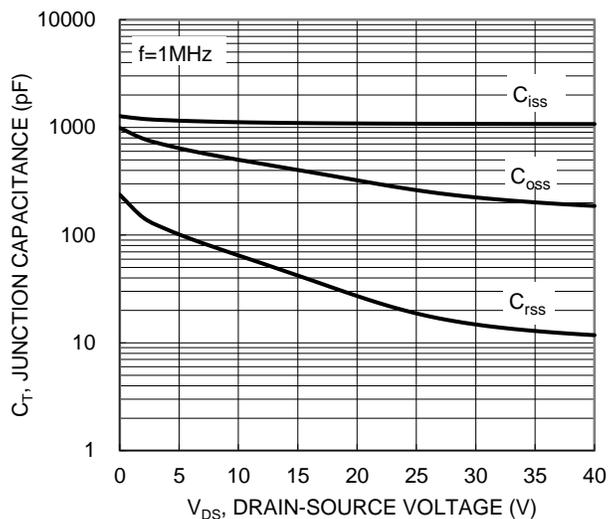


Figure 10. Typical Junction Capacitance

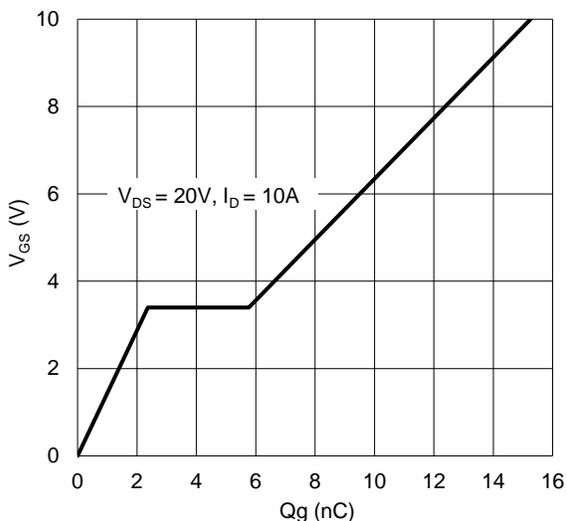


Figure 11. Gate Charge

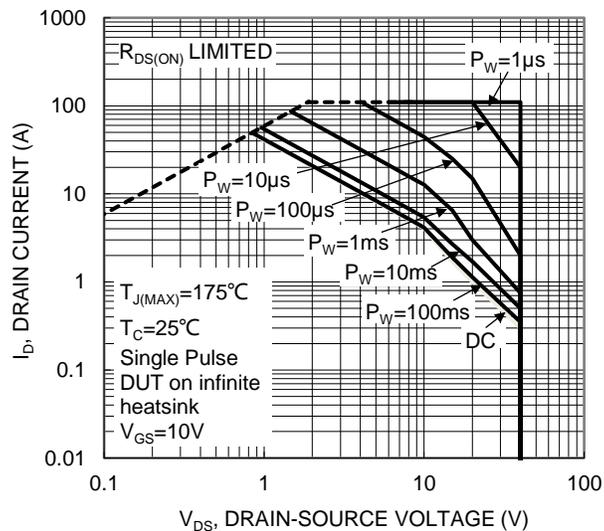


Figure 12. SOA, Safe Operation Area

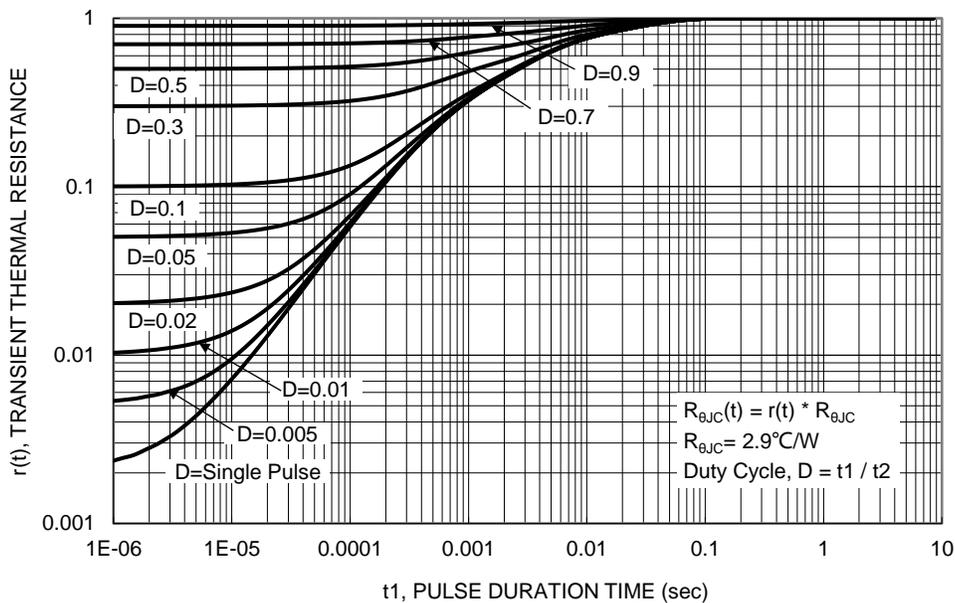
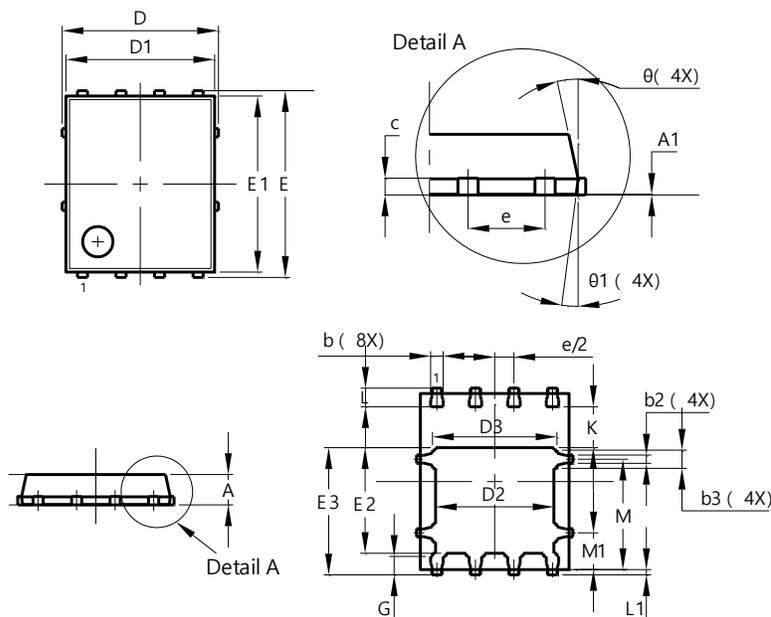


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

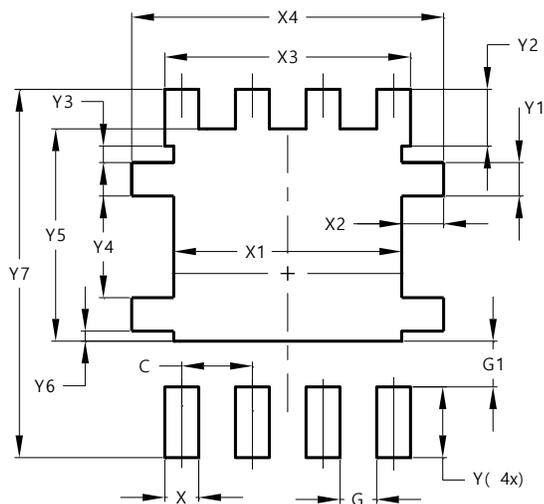
PowerDI5060-8



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°
$\theta 1$	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