



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	$I_D$ $T_c = +25^\circ C$
100V	23m $\Omega$ @ $V_{GS} = 10V$	45A
	30m $\Omega$ @ $V_{GS} = 6V$	38A

## Description

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:

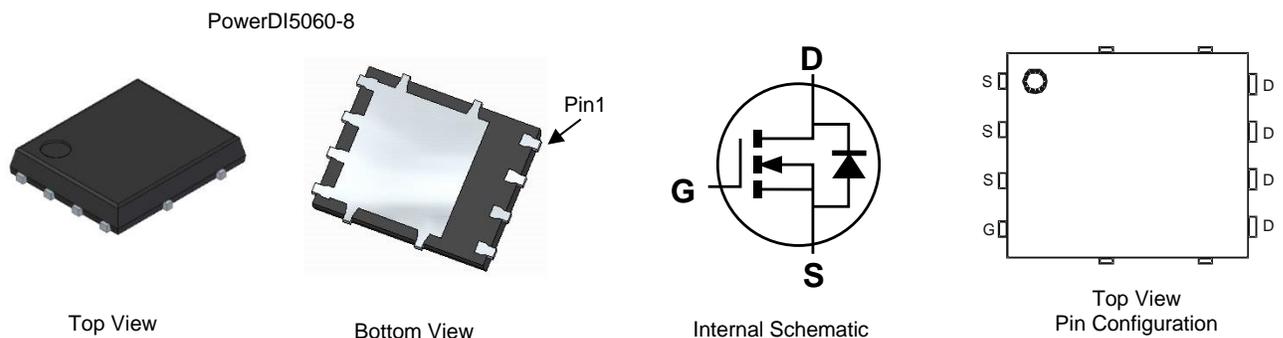
- Synchronous rectifiers
- DC-DC converters
- Primary side switching

## 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
- Fast Switching Speed

## Mechanical Data

- Package: PowerDI<sup>®</sup>5060-8
- Package 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
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 
- Weight: 0.097 grams (Approximate)



### Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	100	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Continuous Drain Current, V <sub>GS</sub> = 10V (Note 5)	I <sub>D</sub>	T <sub>A</sub> = +25°C	9.3
		T <sub>A</sub> = +100°C	6.6
Continuous Drain Current, V <sub>GS</sub> = 10V (Note 6)	I <sub>D</sub>	T <sub>C</sub> = +25°C	45
		T <sub>C</sub> = +100°C	32
Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)	I <sub>DM</sub>	90	A
Maximum Continuous Body Diode Forward Current (Note 6)	I <sub>S</sub>	45	A
Pulsed Body Diode Forward Current (10μs Pulse, Duty Cycle = 1%)	I <sub>SM</sub>	90	A
Avalanche Current (Note 7), L=0.1mH	I <sub>AS</sub>	15.8	A
Avalanche Energy (Note 7), L=0.1mH	E <sub>AS</sub>	12.5	mJ
Avalanche Current (Note 7), L=3mH	I <sub>AS</sub>	8	A
Avalanche Energy (Note 7), L=3mH	E <sub>AS</sub>	96	mJ

### Thermal Characteristics

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P <sub>D</sub>	3.2	W
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	46	°C/W
Total Power Dissipation (Note 6)	P <sub>D</sub>	79	W
Thermal Resistance, Junction to Case (Note 6)	R <sub>θJC</sub>	1.9	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +175	°C

- Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with 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.

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 7)						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	100	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1	μA	V <sub>DS</sub> = 80V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b> (Note 7)						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1	—	3	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	18	23	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A
		—	21	30		V <sub>GS</sub> = 6V, I <sub>D</sub> = 12.5A
Diode Forward Voltage	V <sub>SD</sub>	—	0.9	1.3	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 20A
<b>DYNAMIC CHARACTERISTICS</b> (Note 8)						
Input Capacitance	C <sub>iss</sub>	—	1477	—	pF	V <sub>DS</sub> = 50V, V <sub>GS</sub> = 0V f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	263	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	20	—		
Gate Resistance	R <sub>g</sub>	—	1.3	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge	Q <sub>g</sub>	—	21	—	nC	V <sub>DD</sub> = 50V, I <sub>D</sub> = 20A, V <sub>GS</sub> = 10V
Gate-Source Charge	Q <sub>gs</sub>	—	5.7	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	3.8	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	6.3	—	ns	V <sub>DD</sub> = 50V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A, R <sub>g</sub> = 6Ω
Turn-On Rise Time	t <sub>r</sub>	—	9.4	—		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	16.7	—		
Turn-Off Fall Time	t <sub>f</sub>	—	8.2	—		
Reverse Recovery Time	t <sub>RR</sub>	—	38.7	—	ns	I <sub>F</sub> = 20A, di/dt = 100A/μs
Reverse Recovery Charge	Q <sub>RR</sub>	—	53.7	—	nC	

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

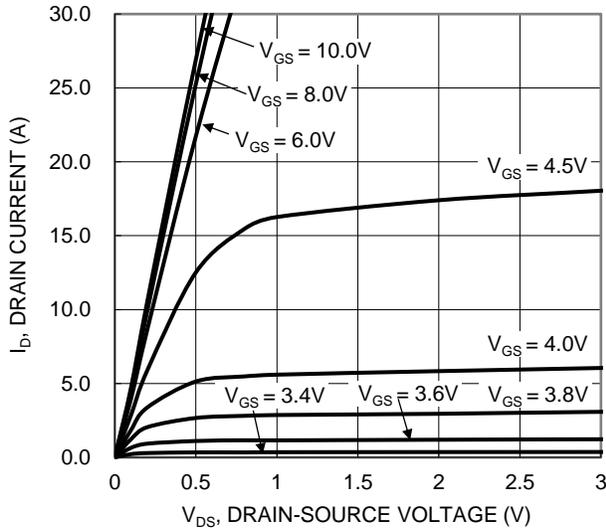


Figure 1. Typical Output Characteristic

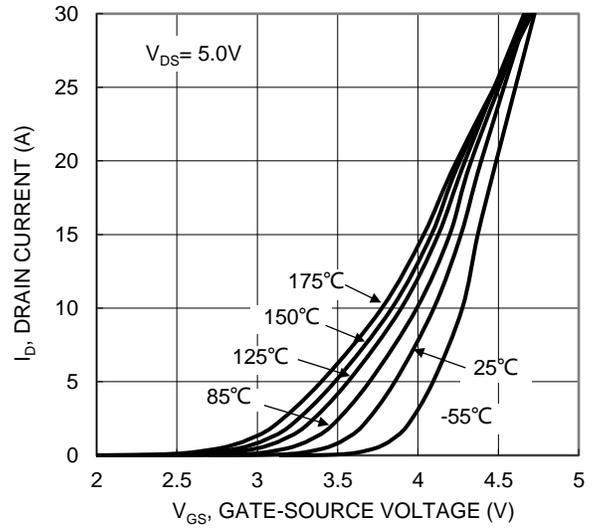


Figure 2. Typical Transfer Characteristic

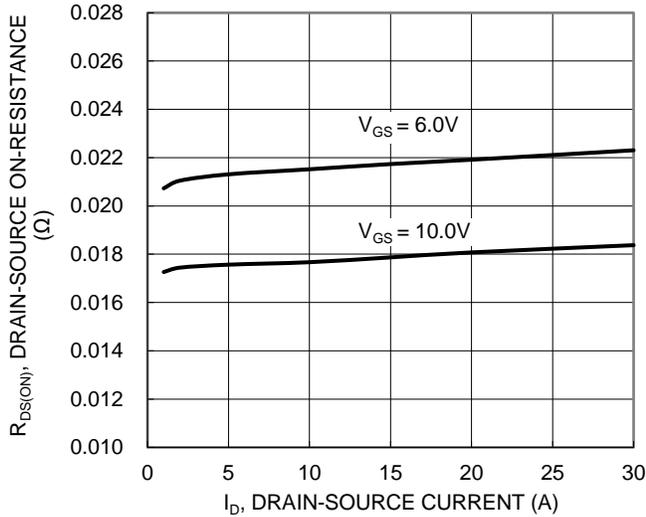


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

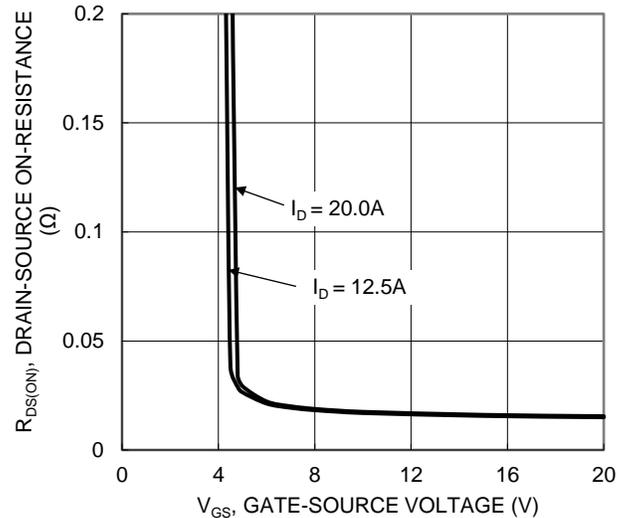


Figure 4. Typical Transfer Characteristic

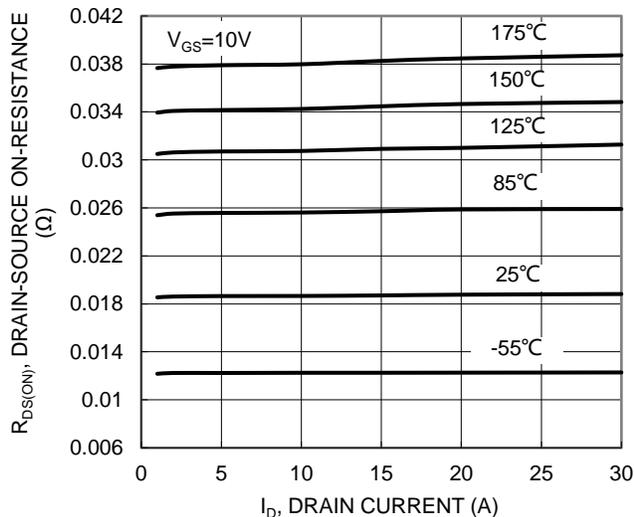


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

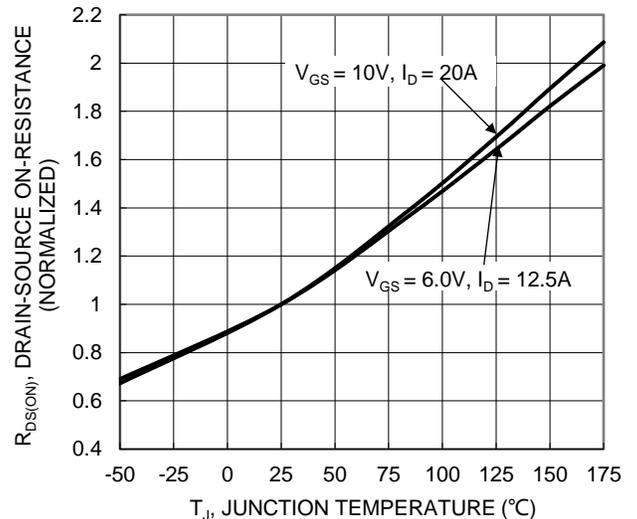
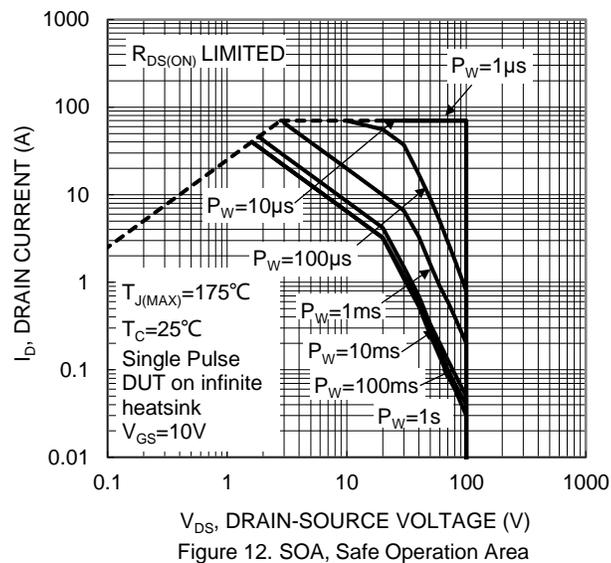
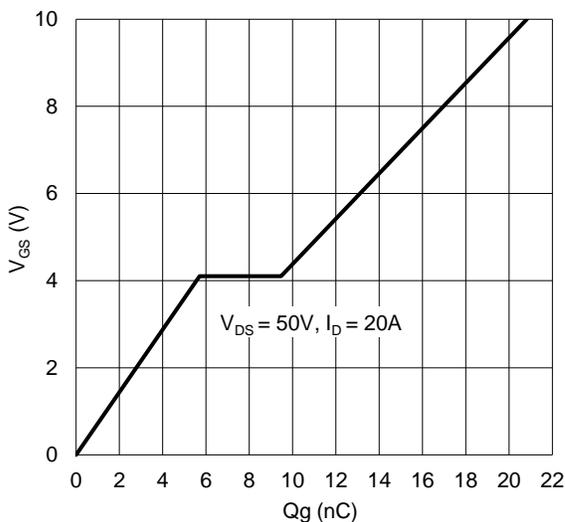
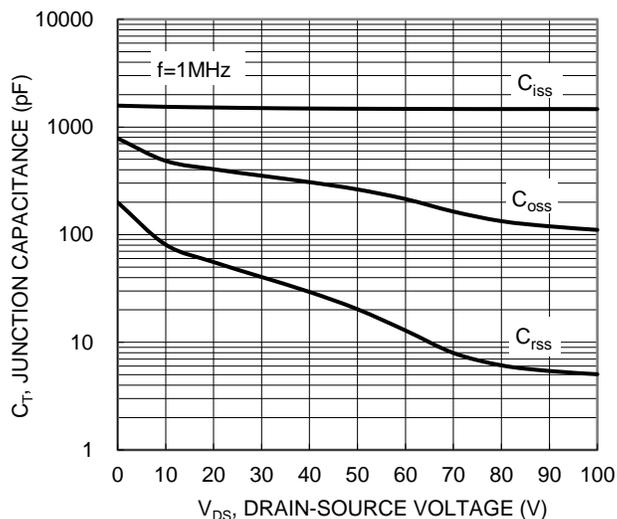
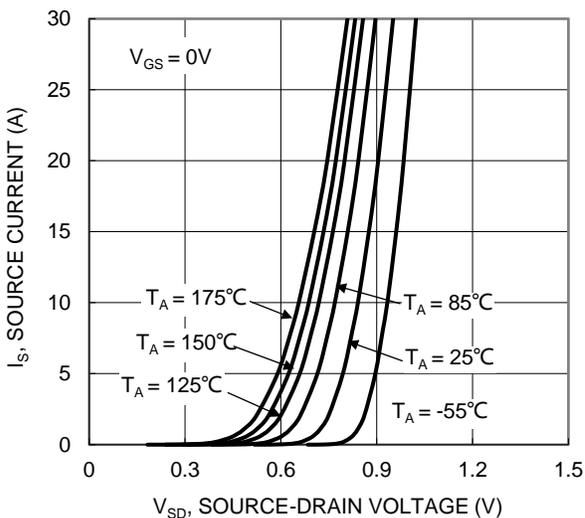
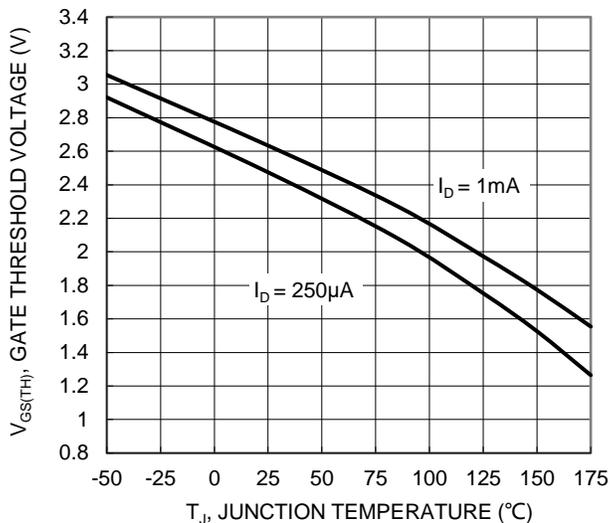
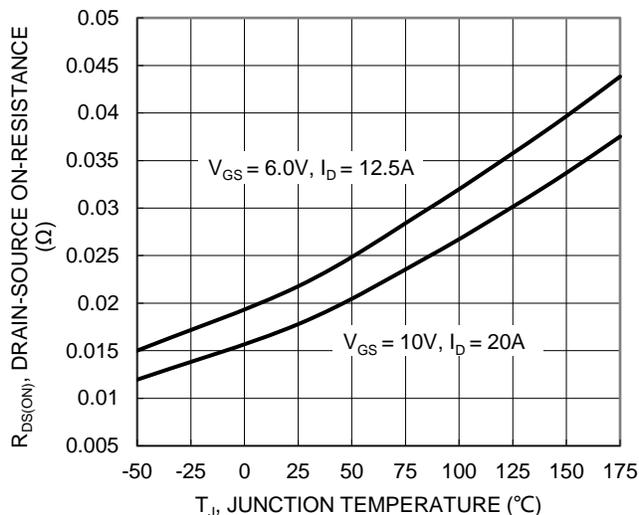


Figure 6. On-Resistance Variation with Temperature



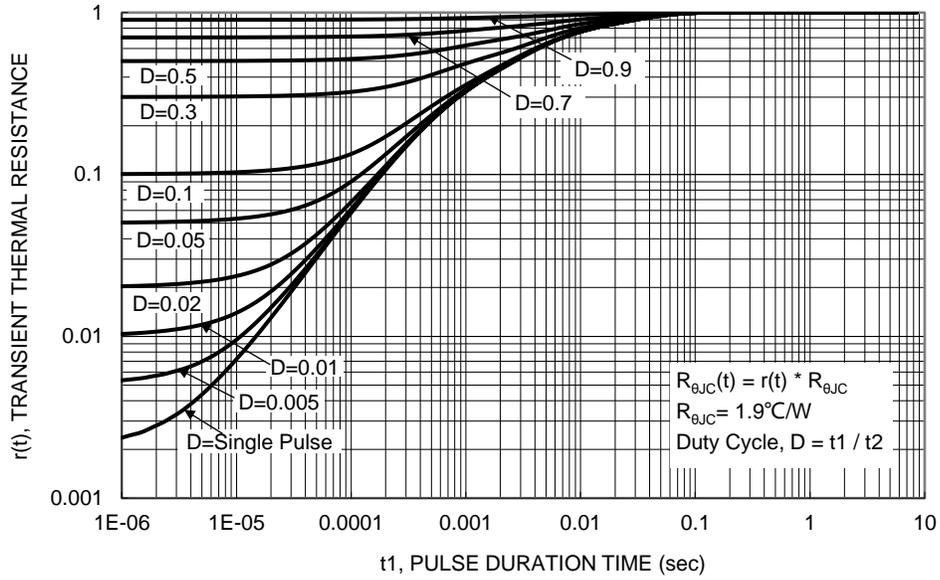
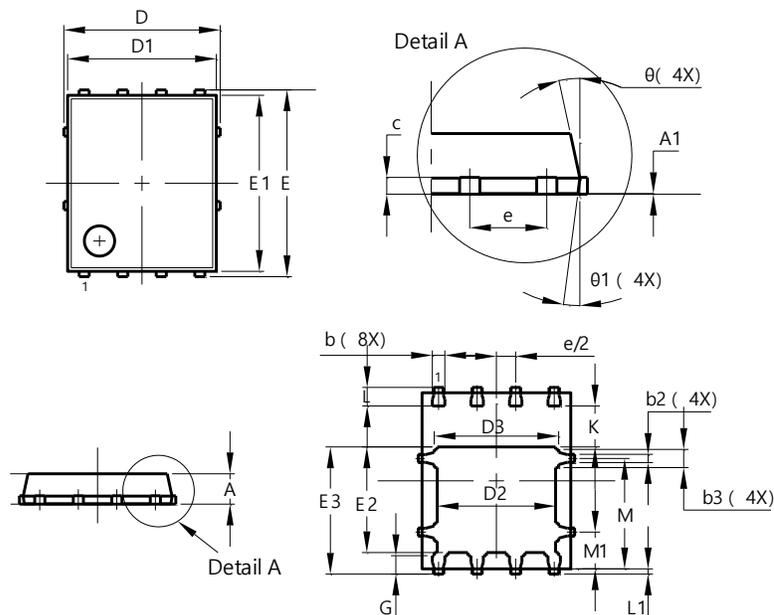


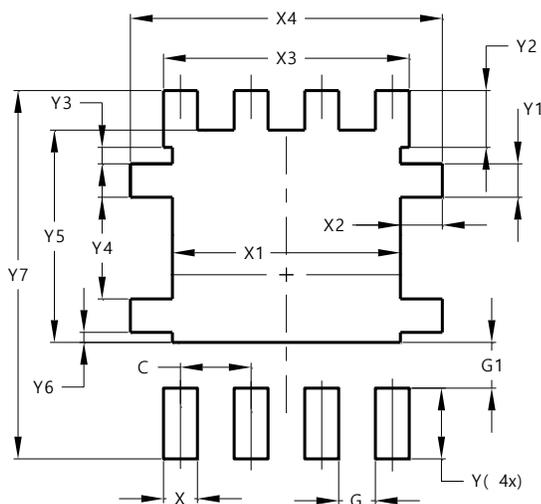
Figure 13. Transient Thermal Resistance

## 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
Ø	10°	12°	11°
Ø1	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