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 Max T_C = +25°C
30V	1.7mΩ @ V_{GS} = 10V	100A
	2.4mΩ @ V_{GS} = 4.5V	80A

Features and Benefits

- Rated to +175°C—Ideal for High Ambient Temperature Environments
- Low $R_{DS(ON)}$ – Minimizes On-State Losses
- Excellent Q_{gd} x $R_{DS(ON)}$ Product (FOM)
- Advanced Technology for DC-DC Converters
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- 100% Unclamped Inductive Switching – Ensures More Reliability

Description and Applications

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

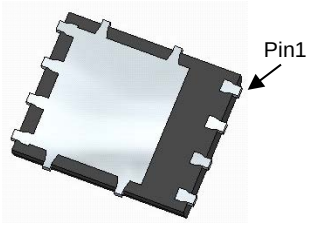
- Backlighting
- Power Management Functions
- DC-DC Converters

Mechanical Data

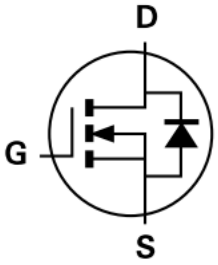
- Case: PowerDI®5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish — Matte Tin Annealed over Copper Lead-frame. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.097 grams (Approximate)

PowerDI5060-8

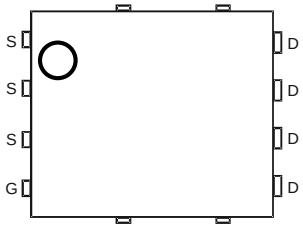
Top View



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}	30	V
Gate-Source Voltage		V_{GSS}	±16	V
Continuous Drain Current, V_{GS} = 10V (Note 6)	T_A = +25°C	I_D	30	A
	T_A = +100°C		23	
Continuous Drain Current, V_{GS} = 10V (Note 7)	T_C = +25°C	I_D	100	A
	T_C = +100°C		80	
Maximum Continuous Body Diode Forward Current (Note 6)		I_S	2.8	A
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)		I_{DM}	400	A
Pulsed Body Diode Forward Current (380µs Pulse, Duty Cycle = 1%)		I_{SM}	400	A
Avalanche Current, L=0.1mH (Note 8)		I_{AS}	65	A
Avalanche Energy, L=0.1mH (Note 8)		E_{AS}	215	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	1.3	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	94	°C/W
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	2.4	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	52	°C/W
Total Power Dissipation (Note 7)	T_C = +25°C	P_D	113	W
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	1.1	°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 9)						
Drain-Source Breakdown Voltage	BV_{DSS}	30	—	—	V	V_{GS} = 0V, I_D = 250μA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	V_{DS} = 24V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±16V, V_{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	1.0	—	3.0	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	1.3	1.7	mΩ	V_{GS} = 10V, I_D = 20A
		—	1.9	2.4		V_{GS} = 4.5V, I_D = 20A
Diode Forward Voltage	V_{SD}	—	0.7	1.0	V	V_{GS} = 0V, I_S = 2A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	5741	—	pF	V_{DS} = 15V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	2119	—		
Reverse Transfer Capacitance	C_{rss}	—	424	—		
Gate Resistance	R_g	—	1.5	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = 10V)	Q_g	—	90	—	nC	V_{DD} = 15V, I_D = 20A
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	45	—		
Gate-Source Charge	Q_{gs}	—	11.6	—		
Gate-Drain Charge	Q_{gd}	—	21.6	—		
Turn-On Delay Time	$t_{D(ON)}$	—	6.9	—	ns	V_{DD} = 15V, V_{GS} = 10V, R_g = 3Ω, I_D = 20A
Turn-On Rise Time	t_R	—	16.5	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	49.6	—		
Turn-Off Fall Time	t_F	—	34.5	—		
Reverse Recovery Time	t_{RR}	—	32.5	—	ns	I_F = 15A, dI/dt = 500A/μs
Reverse Recovery Charge	Q_{RR}	—	55	—	nC	I_F = 15A, dI/dt = 500A/μs

Notes:
5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
7. Thermal resistance from junction to soldering point (on the exposed drain pad).
8. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.

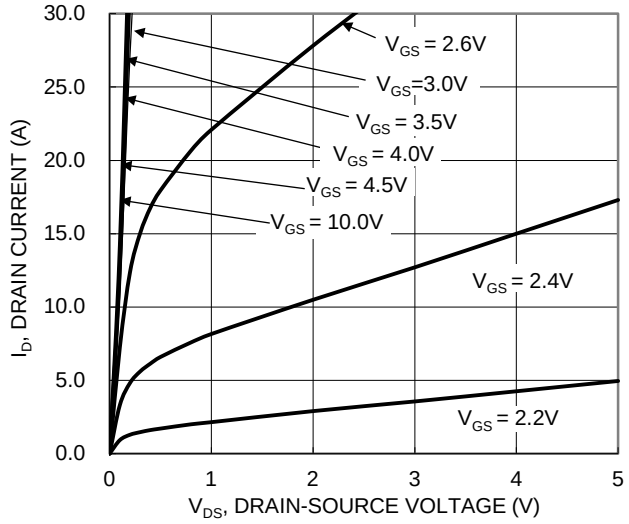


Figure 1. Typical Output Characteristic

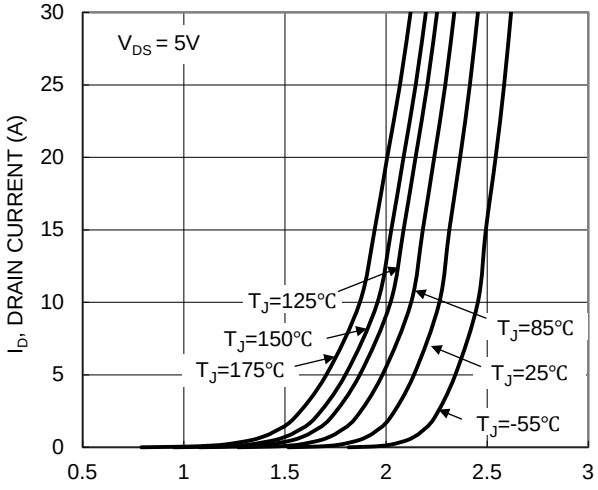


Figure 2. Typical Transfer Characteristic

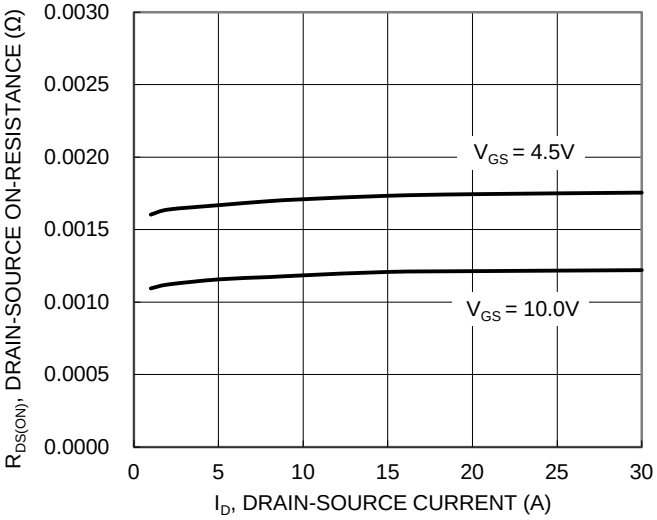


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

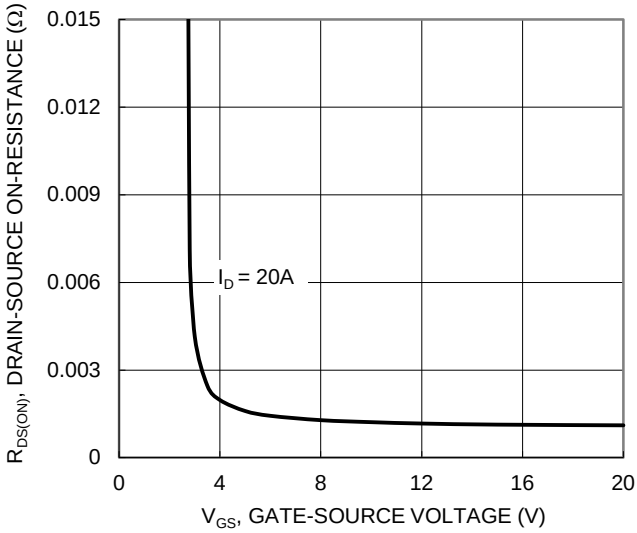


Figure 4. Typical Transfer Characteristic

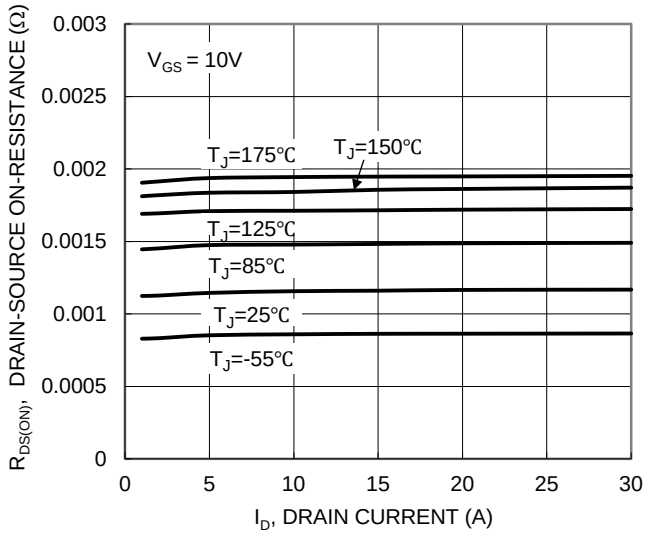


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

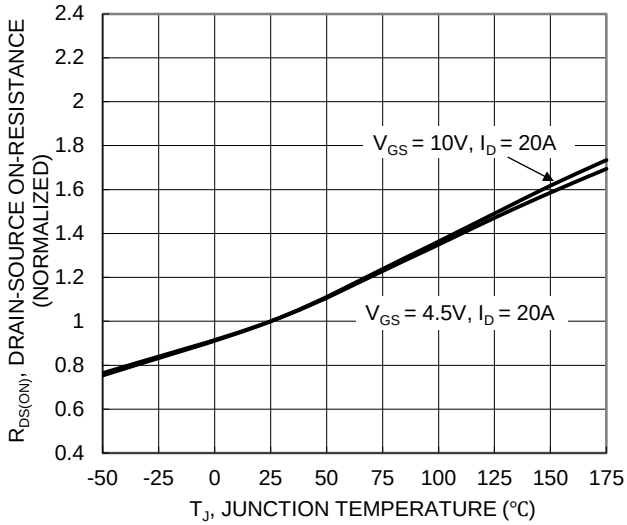


Figure 6. On-Resistance Variation with Temperature

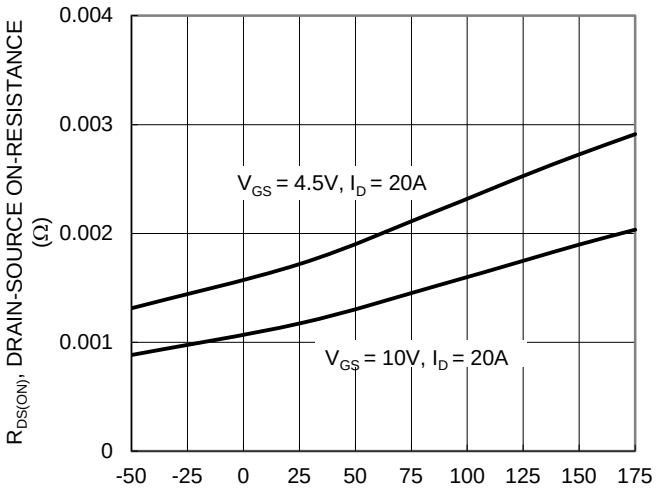


Figure 7. On-Resistance Variation with Temperature

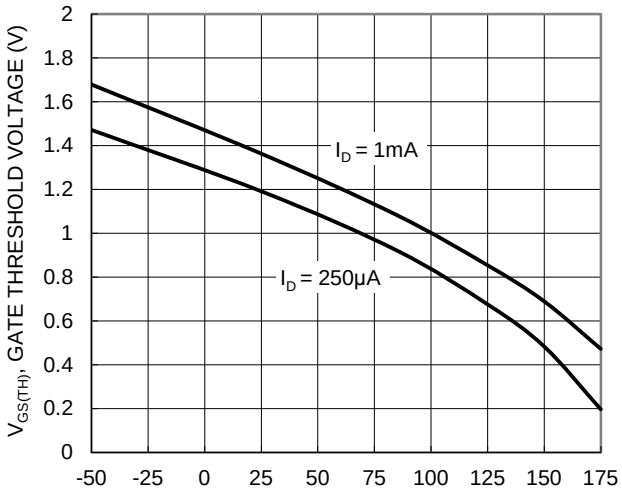


Figure 8. Gate Threshold Variation vs. Junction Temperature

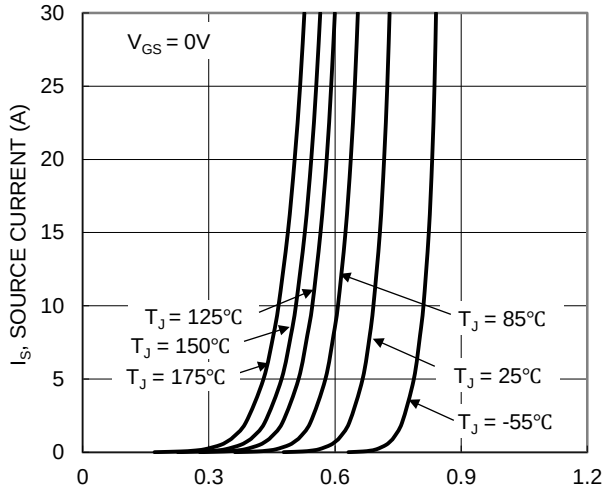


Figure 9. Diode Forward Voltage vs. Current

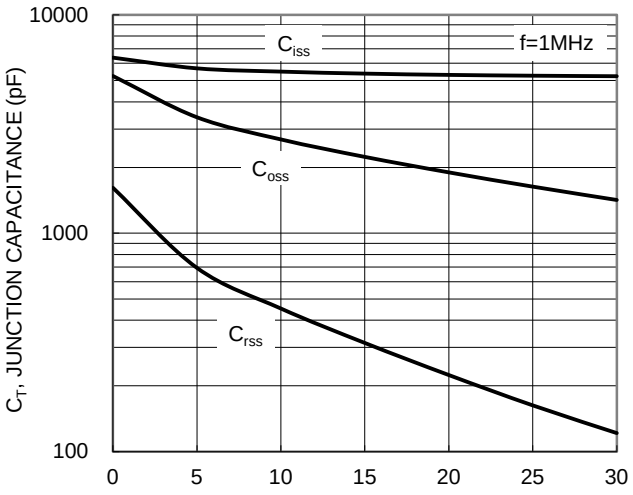


Figure 10. Typical Junction Capacitance

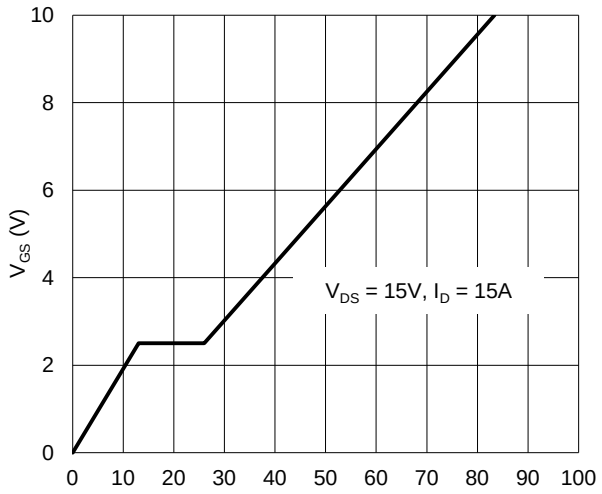


Figure 11. Gate Charge

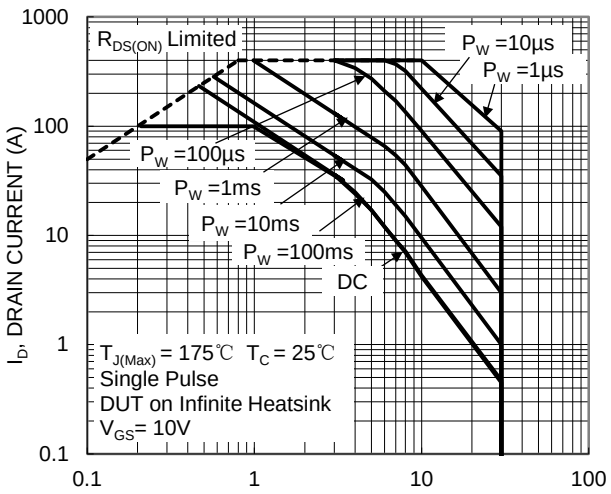


Figure 12. SOA, Safe Operation Area

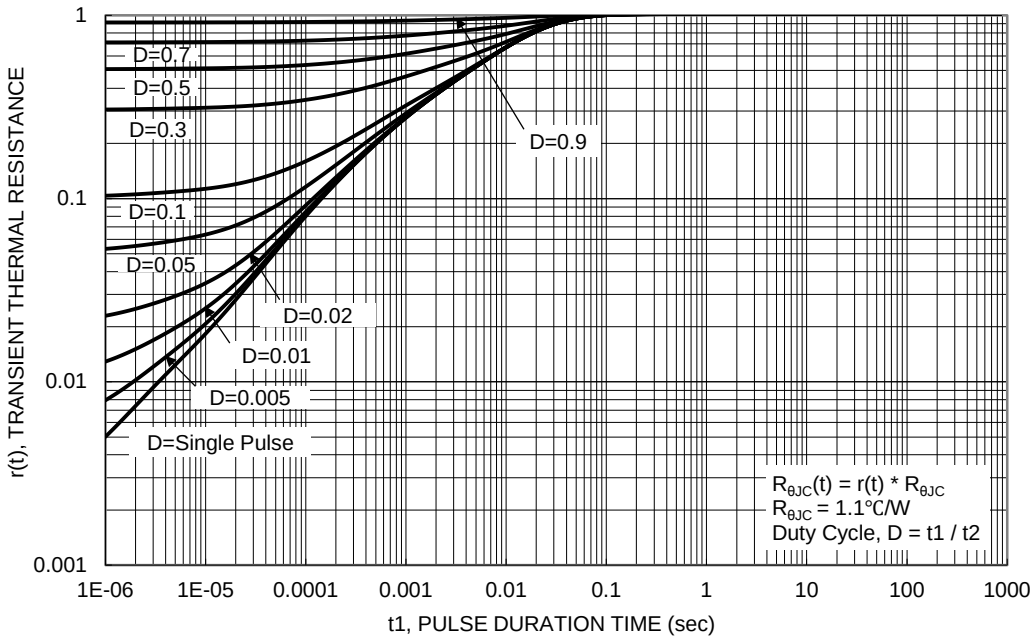
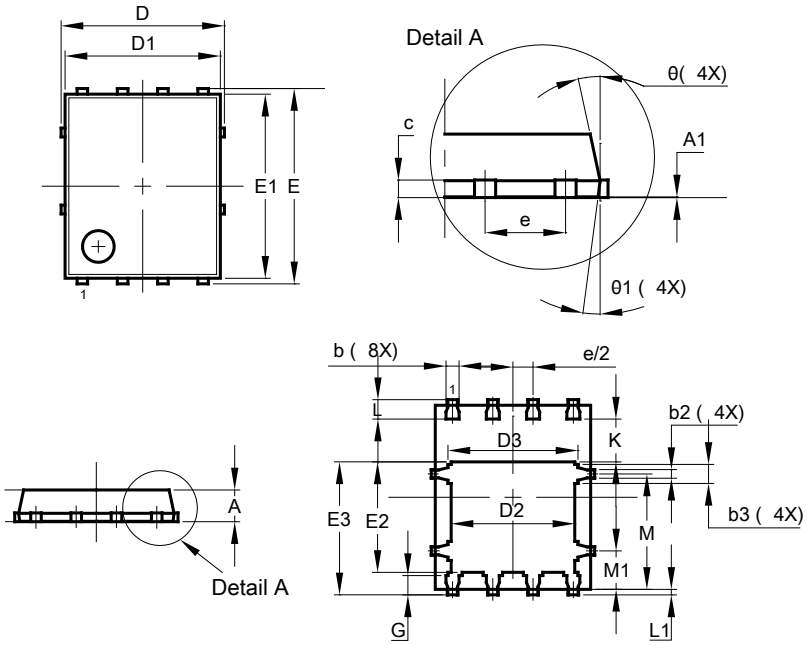


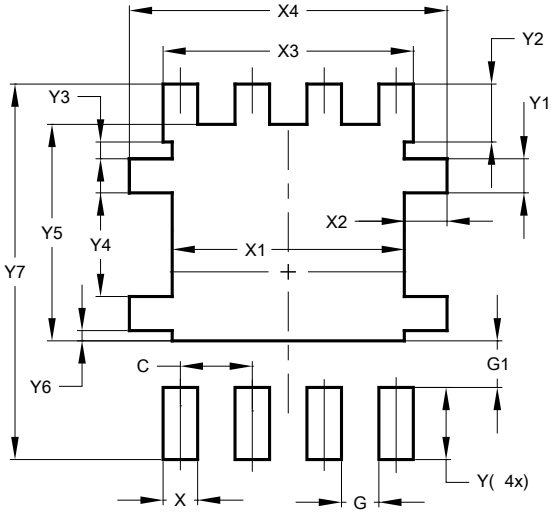
Figure 13. Transient Thermal Resistance

Package Outline Dimensions



PowerDI5060-8			
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



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