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

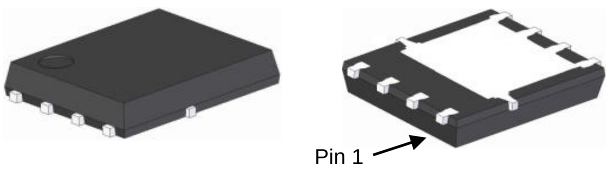
BV_{DSS}	$R_{DS(ON)}$	I_D $T_C = +25°C$
60V	1.6mΩ @ V_{GS} = 10V	215A

Description and Applications

This new generation N-channel enhancement mode MOSFET is designed to minimize $R_{DS(ON)}$ yet maintain superior switching performance. This device is ideal for use in power management and load switch.

- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

PowerDI5060-8 (Type K)



Top View

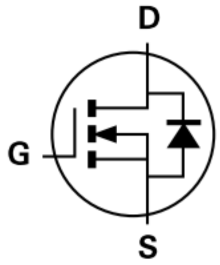
Bottom View

Features

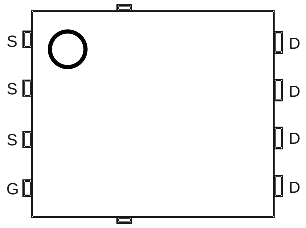
- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- High-Conversion Efficiency
- Low $R_{DS(ON)}$ – Minimizes on State Losses
- Low Input Capacitance
- Fast Switching Speed
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**

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: See Diagram Below
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.097 grams (Approximate)



Internal Schematic



Top View
Pin Configuration

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Drain-Source Voltage		V_{DSS}	60	V
Gate-Source Voltage		V_{GSS}	±20	V
Continuous Drain Current, V_{GS} = 10V (Note 6)	T_C = +25°C	I_D	215	A
	T_C = +100°C		150	
Maximum Continuous Body Diode Forward Current (Note 6)		I_S	215	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I_{DM}	860	A
Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%)		I_{SM}	860	A
Avalanche Current, L = 1mH		I_{AS}	35.8	A
Avalanche Energy, L = 1mH		E_{AS}	640.8	mJ

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	3.2	W
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\theta JA}$	47	°C/W
Total Power Dissipation (Note 6)	T_C = +25°C	P_D	167	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	0.9	°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}	60	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 48V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	2	—	4	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	1.1	1.6	mΩ	V_{GS} = 10V, I_D = 30A
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 20A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	8306	—	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	2735	—		
Reverse Transfer Capacitance	C_{rss}	—	184	—		
Gate Resistance	R_g	—	3.0	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge	Q_g	—	130.6	—	nC	V_{DS} = 30V, I_D = 30A, V_{GS} = 10V
Gate-Source Charge	Q_{gs}	—	30.4	—		
Gate-Drain Charge	Q_{gd}	—	28.1	—		
Turn-On Delay Time	$t_{D(ON)}$	—	11.3	—	ns	V_{DD} = 30V, V_{GS} = 10V, I_D = 30A, R_g = 3Ω
Turn-On Rise Time	t_R	—	28.5	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	86.2	—		
Turn-Off Fall Time	t_F	—	47.6	—		
Body Diode Reverse Recovery Time	t_{RR}	—	70.4	—	ns	I_F = 30A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	127	—	nC	

Notes: 5. Device mounted on FR-4 substrate PCB, 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.

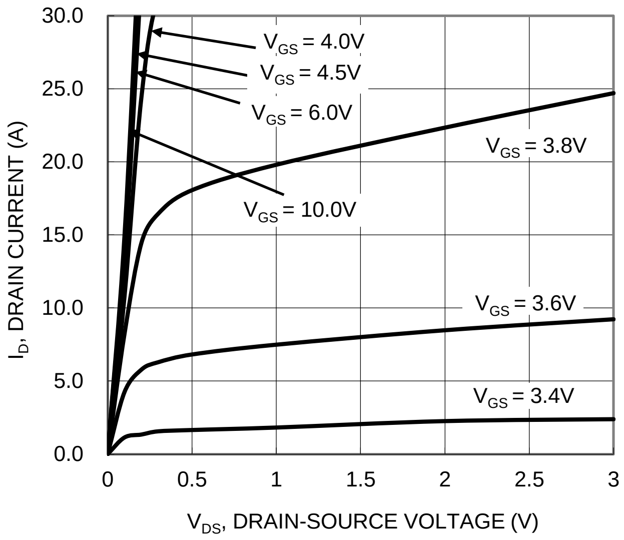


Figure 1. Typical Output Characteristic

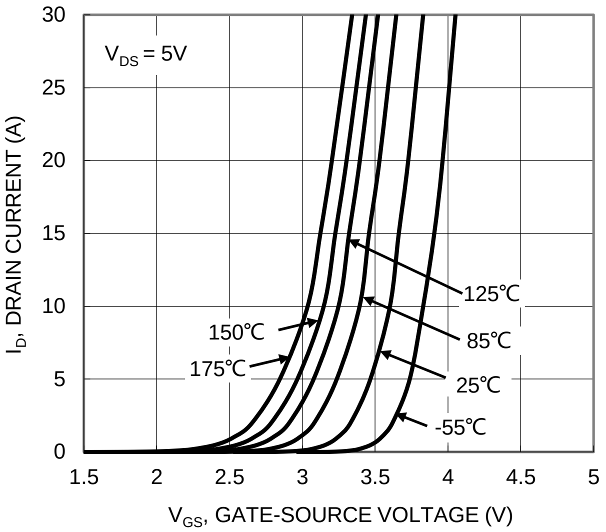


Figure 2. Typical Transfer Characteristic

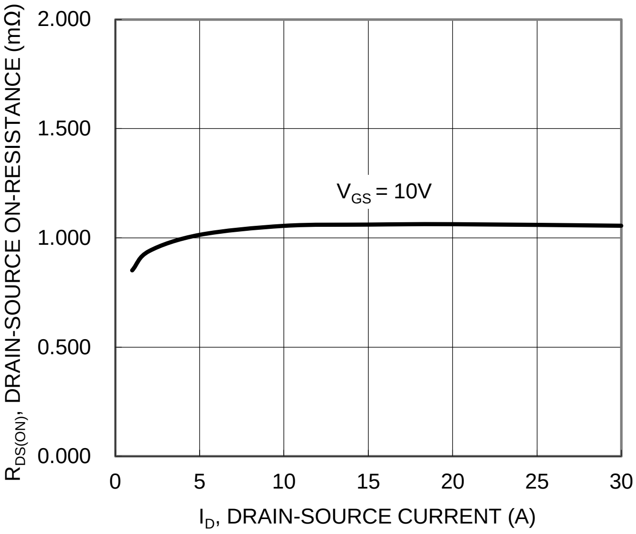


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

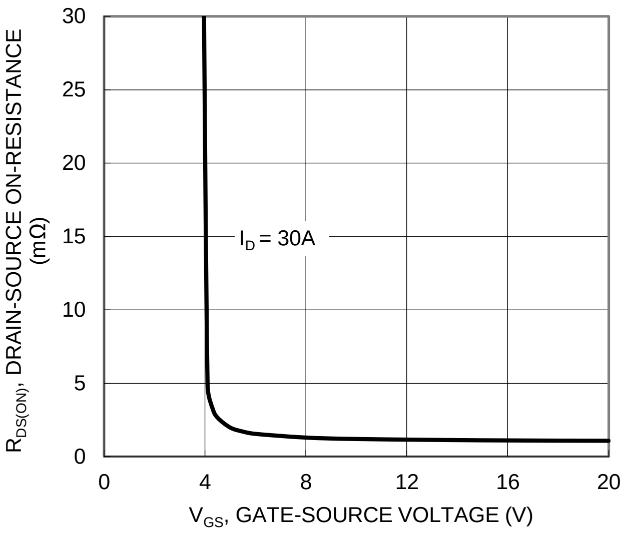


Figure 4. Typical Transfer Characteristic

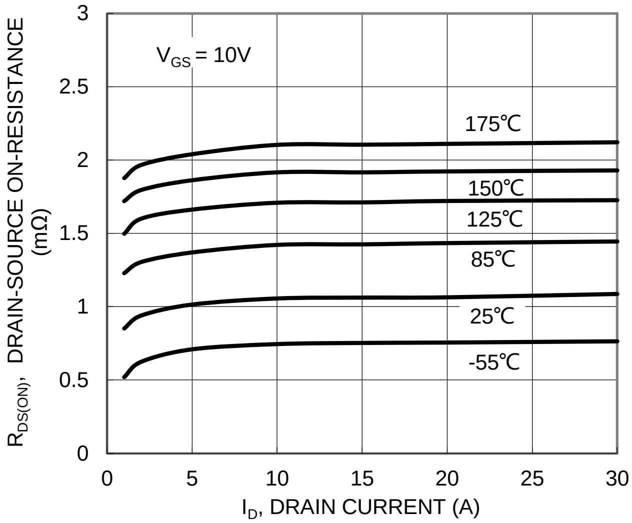


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

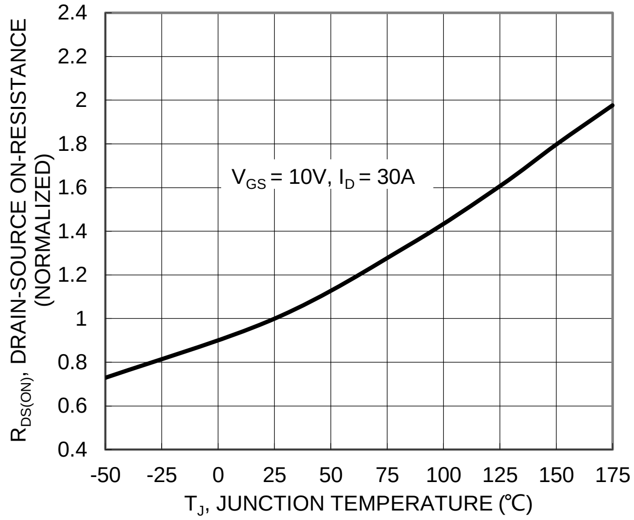


Figure 6. On-Resistance Variation with Temperature

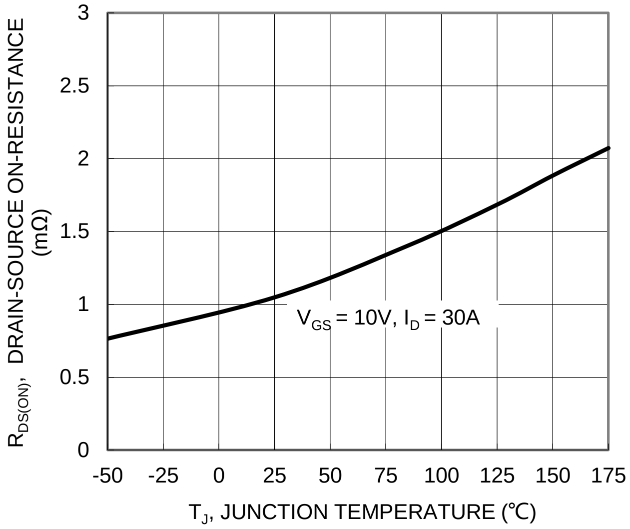


Figure 7. On-Resistance Variation with Temperature

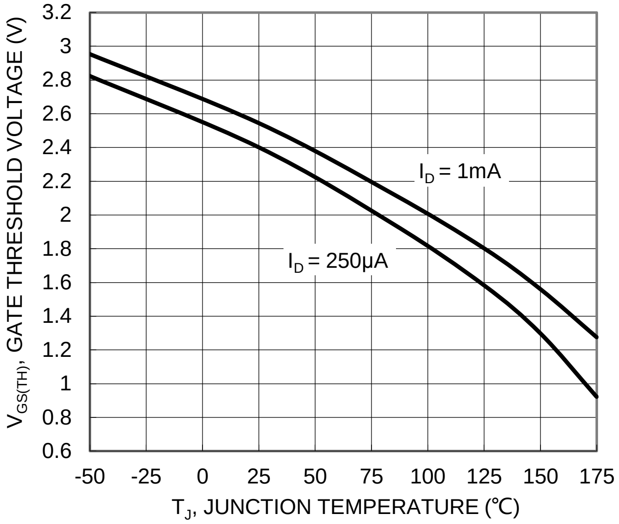


Figure 8. Gate Threshold Variation vs. Junction Temperature

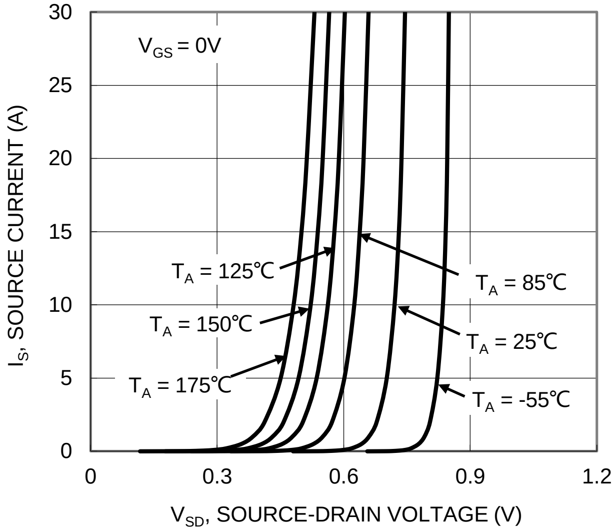


Figure 9. Diode Forward Voltage vs. Current

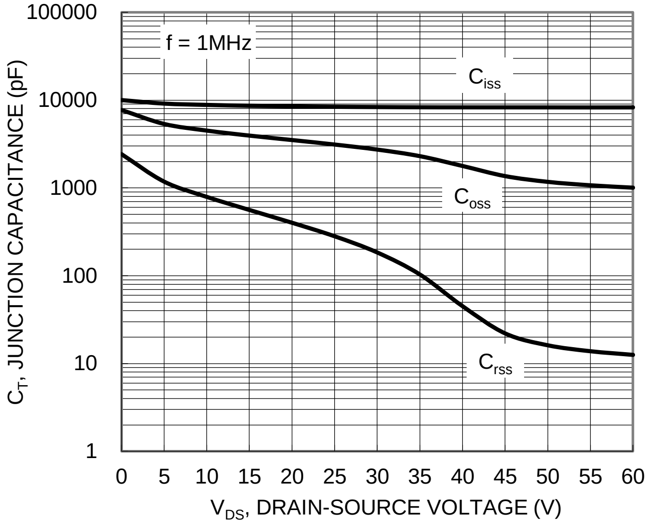


Figure 10. Typical Junction Capacitance

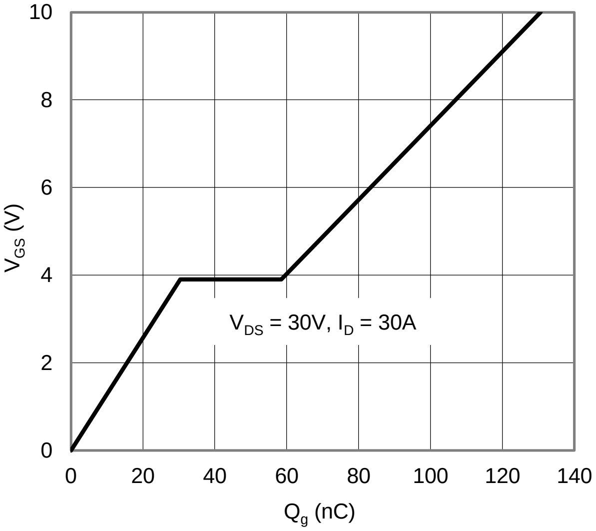


Figure 11. Gate Charge

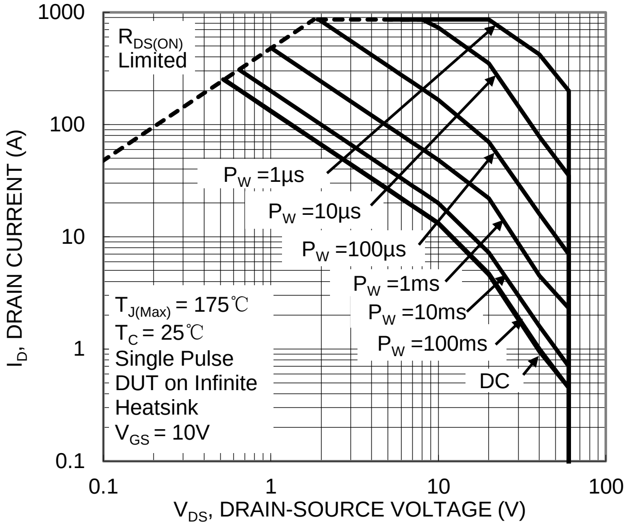


Figure 12. SOA, Safe Operation Area

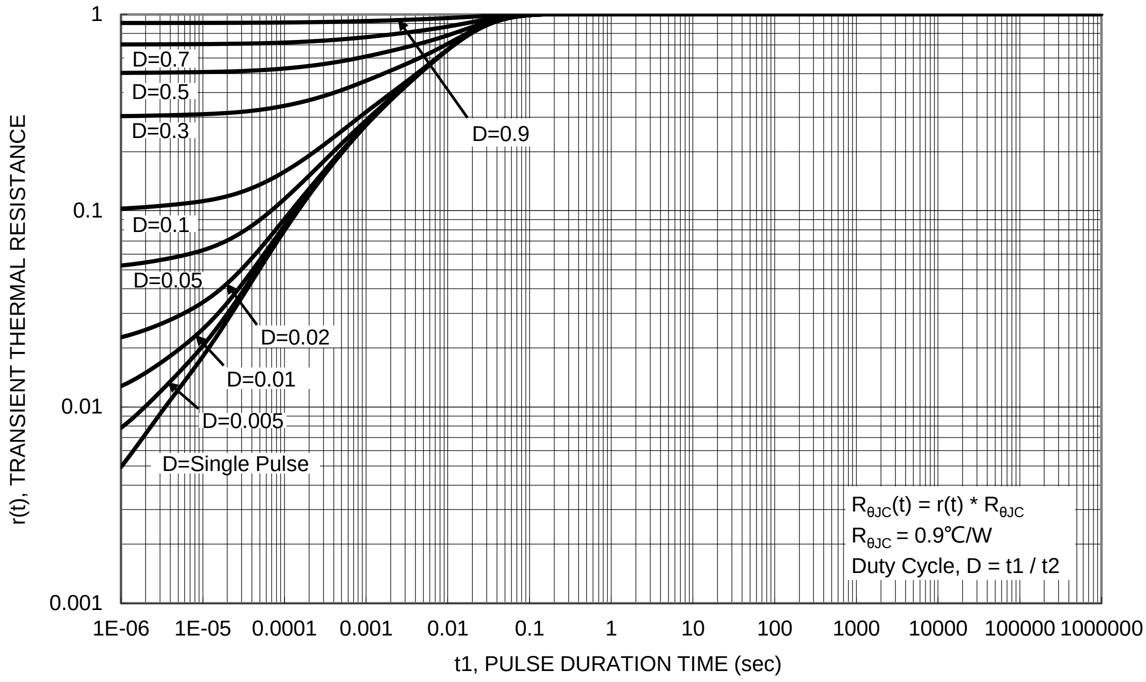
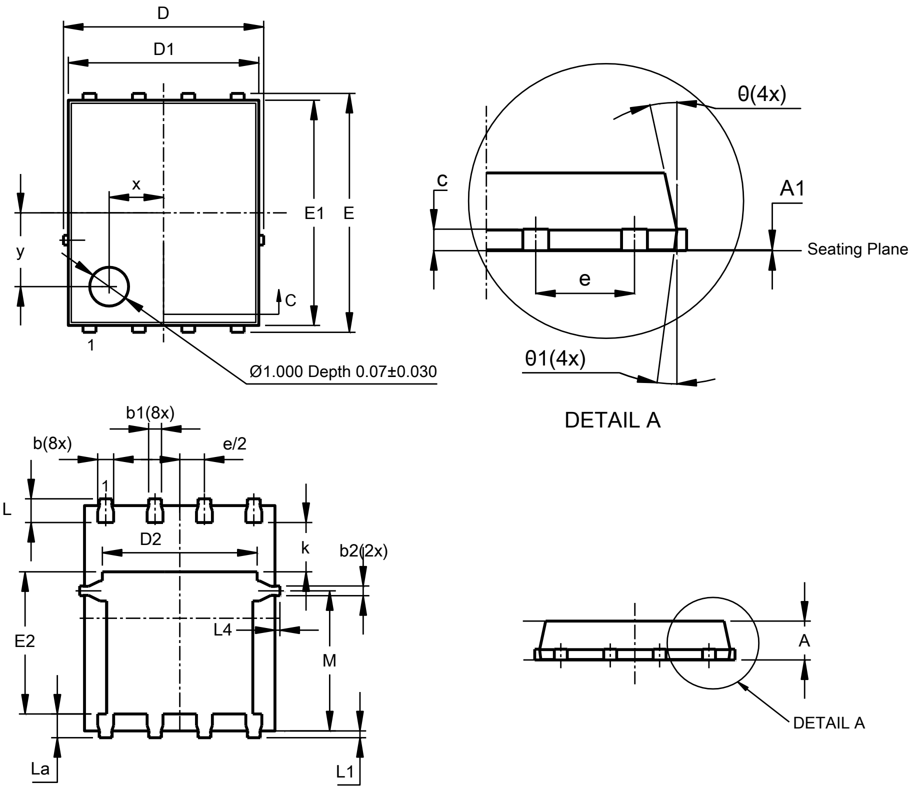


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

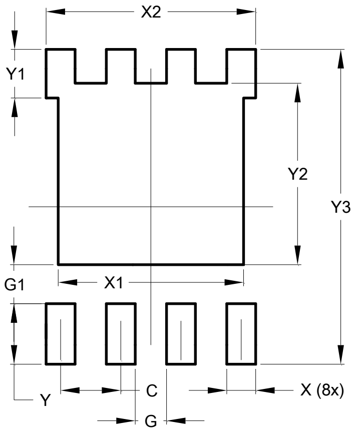
PowerDI5060-8 (Type K)



PowerDI5060-8 (Type K)			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.10	1.00
A1	0	0.05	0.02
b	0.33	0.51	0.41
b1	0.300	0.366	0.333
b2	0.20	0.35	0.25
c	0.23	0.33	0.277
D	5.15 BSC		
D1	4.85	4.95	4.90
D2	-	-	3.98
E	6.15 BSC		
E1	5.75	5.85	5.80
E2	3.56	3.725	3.66
e	1.27BSC		
k	-	-	1.27
L	0.51	0.71	0.61
La	0.51	0.675	0.61
L1	0.05	0.20	0.175
L4	-	-	0.125
M	3.50	3.71	3.605
x	-	-	1.400
y	-	-	1.900
θ	10°	12°	11°
θ1	6°	8°	7°
All Dimensions in mm			

Suggested Pad Layout

PowerDI5060-8 (Type K)



Dimensions	**Value (in mm)**
C	1.270
G	0.660
G1	0.820
X	0.610
X1	3.910
X2	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610