



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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企业微信二维码



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Product Summary

BV _{DSS}	R _{DS(ON)} Max	I _D T _C = +25°C
-40V	13mΩ @ V _{GS} = -10V	-69A
	23mΩ @ V _{GS} = -4.5V	-52A

Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low On-Resistance
- Fast Switching Speed

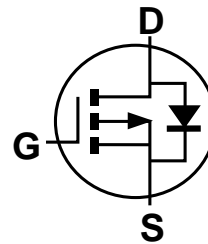
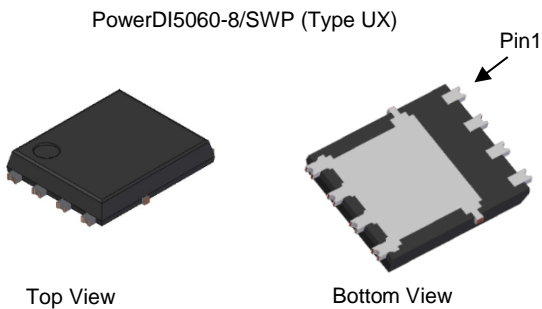
Description and Applications

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:

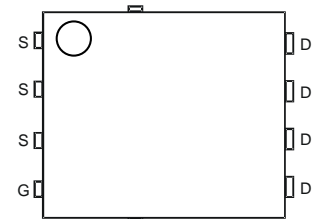
- Reverse polarity protections
- BLDC motor controls
- Power-management functions

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 Connections: See Diagram
- Terminals: Finish – 100% Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208^③
- 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}	-40	V
Gate-Source Voltage			V _{GSS}	±20	V
Continuous Drain Current V _{GS} = -10V (Note 7)	Steady State	T _C = +25°C T _C = +100°C	I _D	-69 -49	A
Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)			I _{DM}	-277	A
Maximum Body Diode Continuous Current (Note 7)			I _S	-69	A
Pulsed Source Current (10μs Pulse, Duty Cycle = 1%)			I _{SM}	-277	A
Avalanche Current (Note 8) L = 1mH			I _{AS}	-22	A
Avalanche Energy (Note 8) L = 1mH			E _{AS}	260	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	1.5	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State		R _{θJA}	98	°C/W
Total Power Dissipation (Note 6)	T _A = +25°C		P _D	3.3	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State		R _{θJA}	45	°C/W
Thermal Resistance, Junction to Case (Note 7)			R _{θJC}	1.6	°C/W
Operating and Storage Temperature Range			T _J , T _{STG}	-55 to +175	°C

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
 - Thermal resistance from junction to soldering point (on the exposed drain pad).
 - I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°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}	-40	—	—	V	V _{GS} = 0V, I _D = -250μA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	-1	μA	V _{DS} = -40V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	V _{GS(TH)}	-1	-1.8	-3	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	9	13	mΩ	V _{GS} = -10V, I _D = -10A
		—	12.4	23		V _{GS} = -4.5V, I _D = -8A
Diode Forward Voltage	V _{SD}	—	-0.70	-1.2	V	V _{GS} = 0V, I _S = -1A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C _{iss}	—	4763	—	pF	V _{DS} = -20V, V _{GS} = 0V f = 1MHz
Output Capacitance	C _{oss}	—	539	—		
Reverse Transfer Capacitance	C _{rss}	—	403	—		
Gate Resistance	R _g	—	7.4	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = -4.5V)	Q _g	—	39	—	nC	V _{DS} = -20V, I _D = -10A
Total Gate Charge (V _{GS} = -10V)	Q _g	—	87	—		
Gate-Source Charge	Q _{gs}	—	12.5	—		
Gate-Drain Charge	Q _{gd}	—	15	—		
Turn-On Delay Time	t _{D(ON)}	—	6.2	—	ns	V _{GS} = -10V, V _{DD} = -20V, R _G = 3Ω, I _D = -10A
Turn-On Rise Time	t _r	—	4.8	—		
Turn-Off Delay Time	t _{D(OFF)}	—	126	—		
Turn-Off Fall Time	t _f	—	57	—		
Reverse Recovery Time	t _{RR}	—	27	—	ns	I _F = -10A, di/dt = -100A/μs
Reverse Recovery Charge	Q _{RR}	—	21	—	nC	I _F = -10A, di/dt = -100A/μs

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

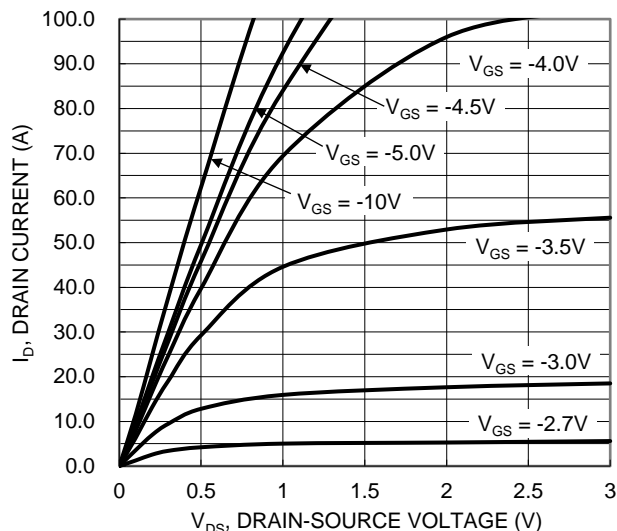


Figure 1. Typical Output Characteristic

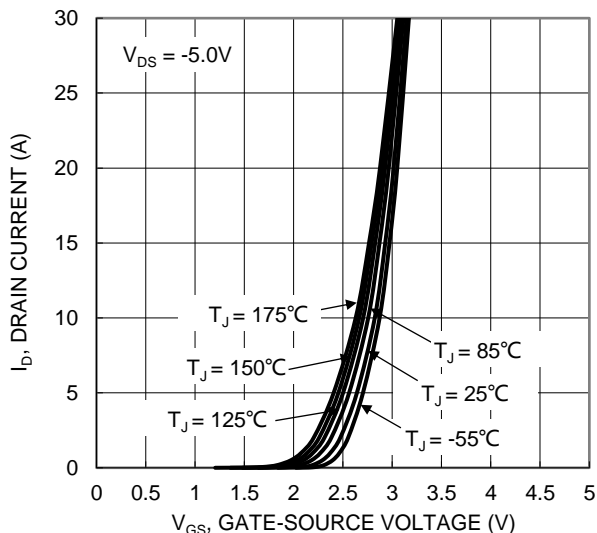


Figure 2. Typical Transfer Characteristic

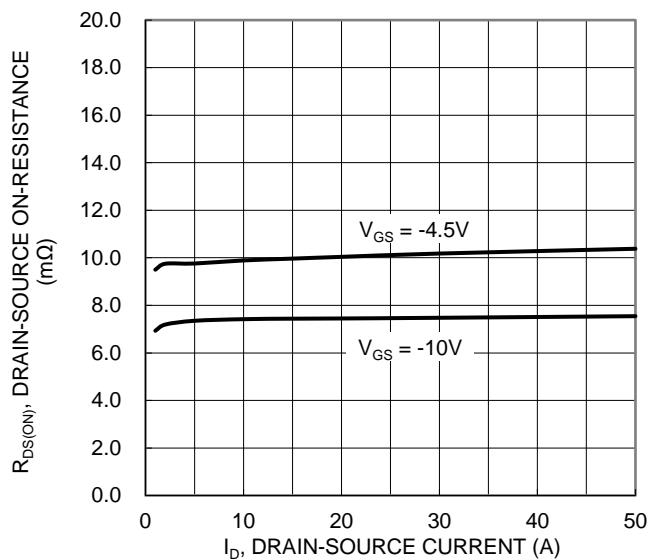


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

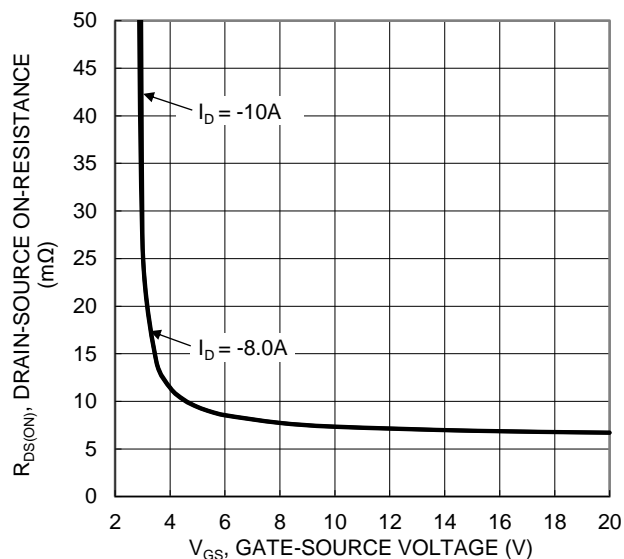


Figure 4. Typical Transfer Characteristic

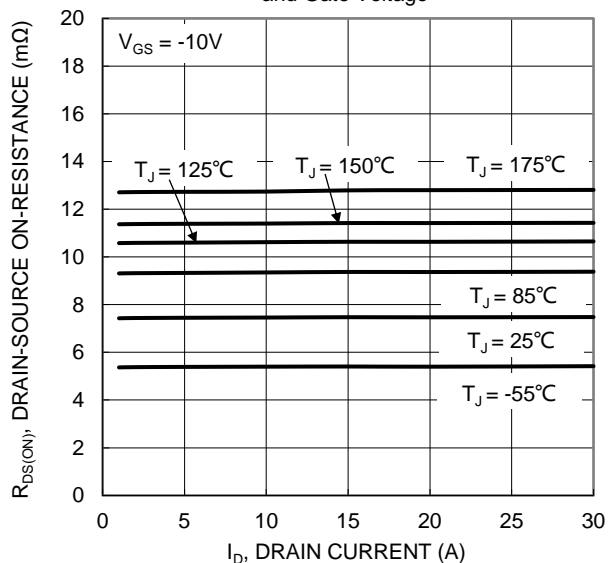


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

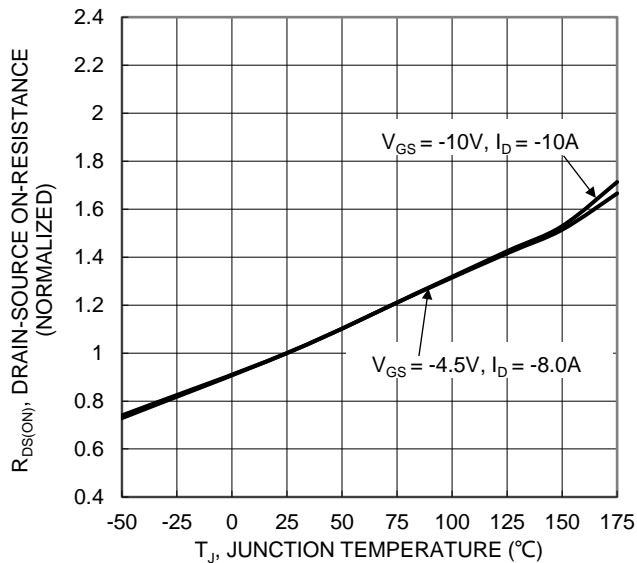


Figure 6. On-Resistance Variation with Temperature

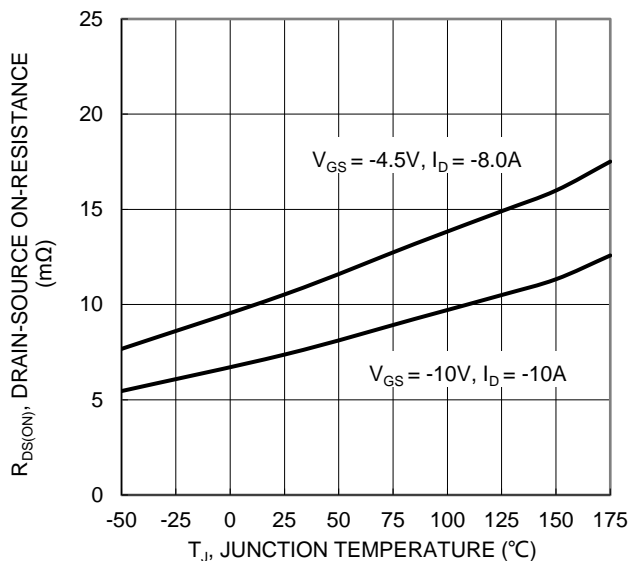


Figure 7. On-Resistance Variation with Temperature

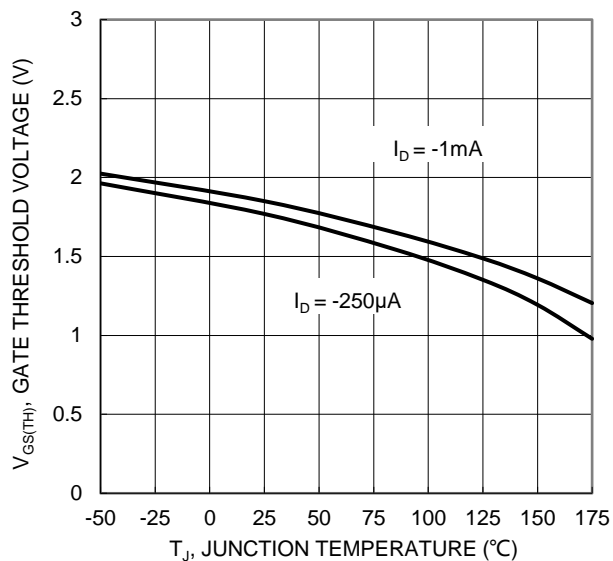


Figure 8. Gate Threshold Variation vs. Junction Temperature

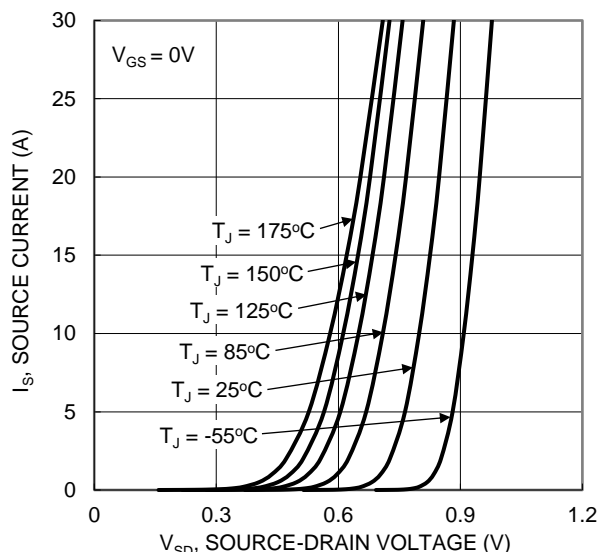


Figure 9. Diode Forward Voltage vs. Current

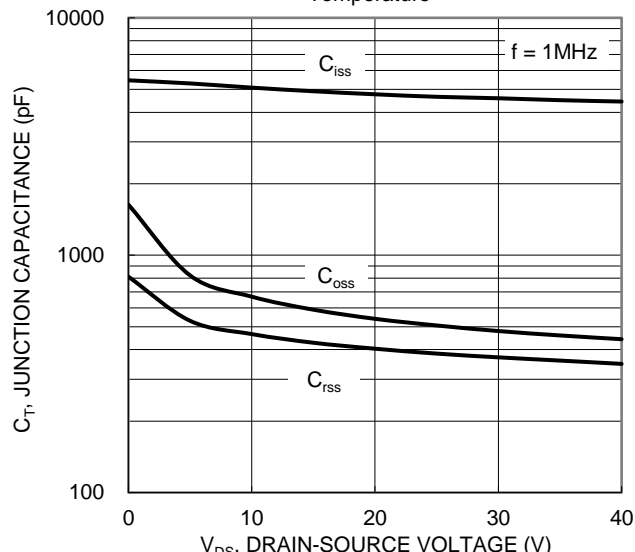


Figure 10. Typical Junction Capacitance

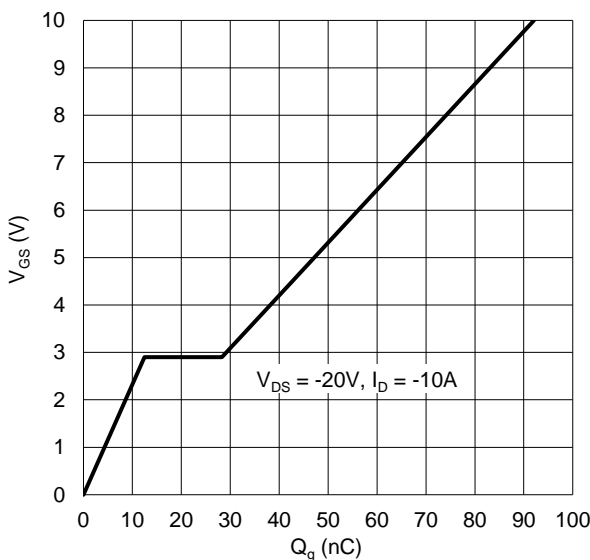


Figure 11. Gate Charge

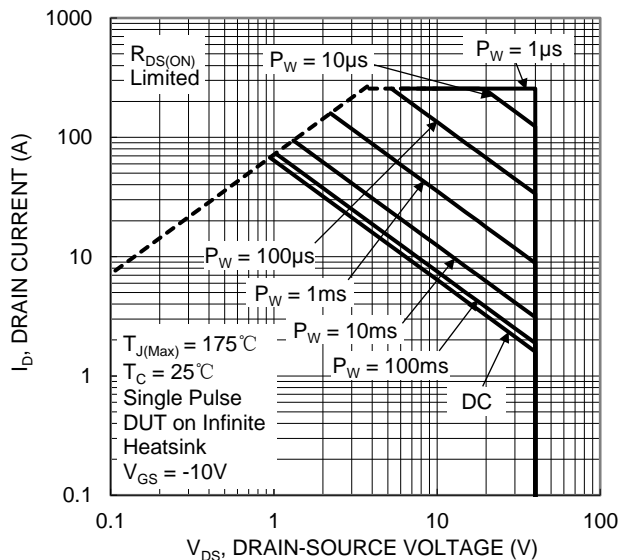


Figure 12. SOA, Safe Operation Area

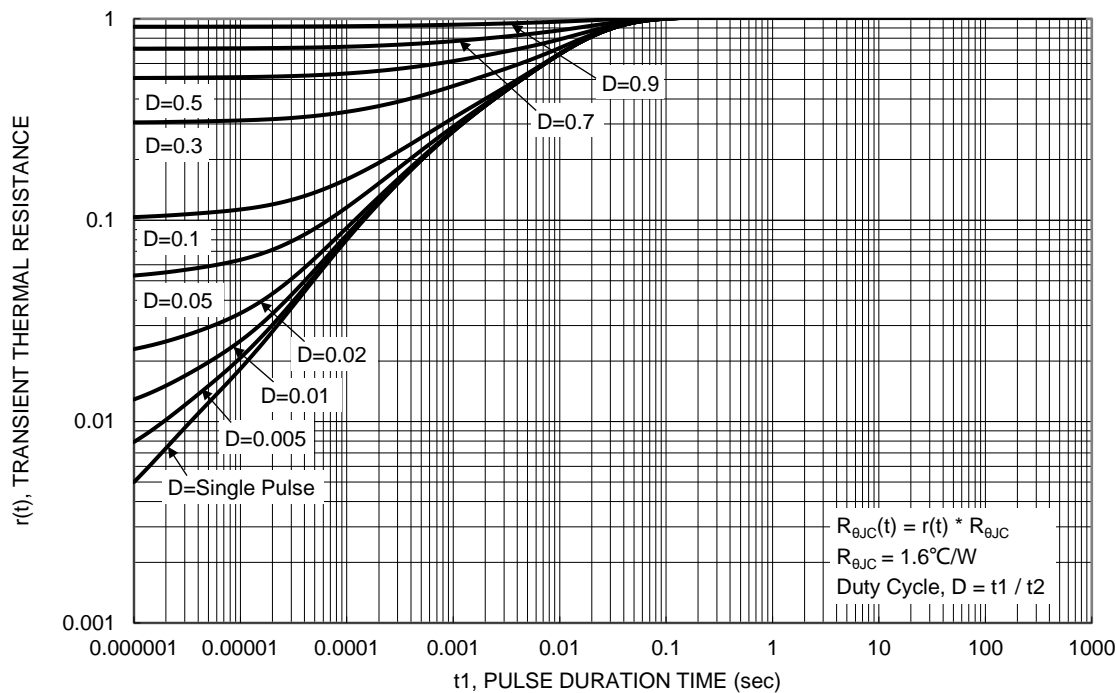
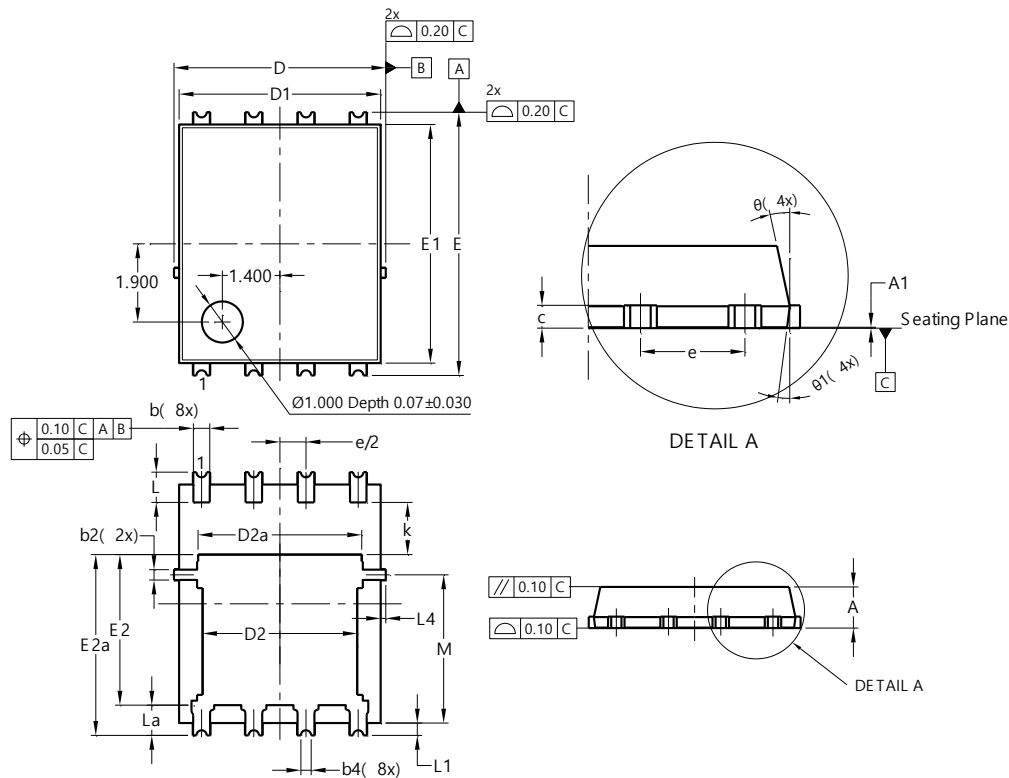


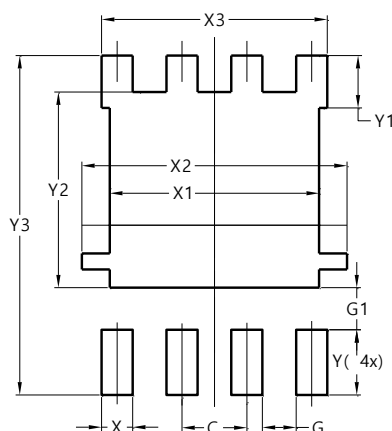
Figure 13. Transient Thermal Resistance

Package Outline Dimensions

PowerDI5060-8/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
L4	0.025	0.225	0.125
M	3.205	4.005	3.605
θ	10°	12°	11°
$\theta1$	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