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
60V	35mΩ @ V_{GS} = 10V	33A
	44mΩ @ V_{GS} = 4.5V	29A

Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low $R_{DS(ON)}$ – Minimizes On State Losses
- Low Input Capacitance
- Wettable Flank for Improved Optical Inspections

Description and Applications

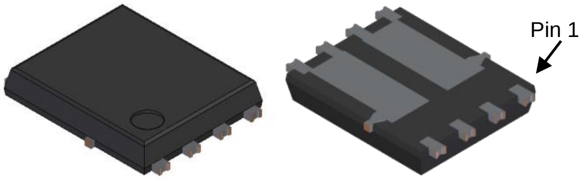
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Backlighting
- Power management functions
- DC-DC converters

Mechanical Data

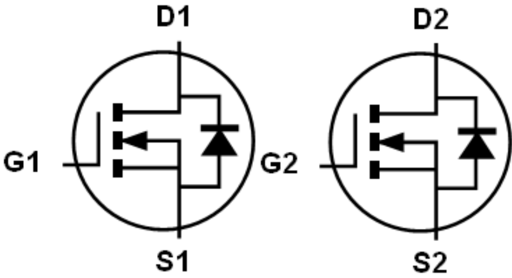
- Package: PowerDI®5060-8
- Package Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 ⓔ3
- Weight: 0.097 grams (Approximate)

PowerDI5060-8 (SWP) (Type R)

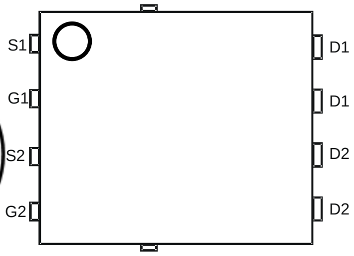


Top View

Bottom View



Equivalent Circuit



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 T_C = +100°C	I_D	33 21	A
Maximum Body Diode Forward Current (Note 6)		I_S	33	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I_{DM}	132	A
Pulsed Source Current (10µs Pulse, Duty Cycle = 1%)		I_{SM}	132	A
Avalanche Current, L = 1mH		I_{AS}	21.4	A
Avalanche Energy, L = 1mH		E_{AS}	230	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\theta JA}$	62	°C/W
Total Power Dissipation	T_A = +25°C	P_D	2.4	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	2.2	°C/W
Total Power Dissipation	T_C = +25°C	P_D	68	W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	°C

Electrical Characteristics N-Channel (@T_C = +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} = 60V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	24	35	mΩ	V_{GS} = 10V, I_D = 15A
		—	33	44		V_{GS} = 4.5V, I_D = 10A
Diode Forward Voltage	V_{SD}	—	0.75	1.2	V	V_{GS} = 0V, I_S = 2.6A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	879	—	pF	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	227	—		
Reverse Transfer Capacitance	C_{rss}	—	17	—		
Gate Resistance	R_G	—	2.4	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = 6V)	Q_g	—	10	—	nC	V_{DS} = 30V, I_D = 20A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	16	—		
Gate-Source Charge	Q_{gs}	—	2	—		
Gate-Drain Charge	Q_{gd}	—	4.9	—		
Turn-On Delay Time	$t_{D(ON)}$	—	3.8	—	ns	V_{DD} = 30V, V_{GS} = 10V, R_G = 4.7Ω, I_D = 20A
Turn-On Rise Time	t_R	—	7.7	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	19.5	—		
Turn-Off Fall Time	t_F	—	5.8	—		
Body Diode Reverse Recovery Time	t_{RR}	—	28	—	ns	I_F = 20A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	28	—	nC	I_F = 20A, di/dt = 100A/µs

Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate; measured with 1 channel active.
6. Thermal resistance from junction to solder point (on the exposed drain pin); measured with 1 channel active.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

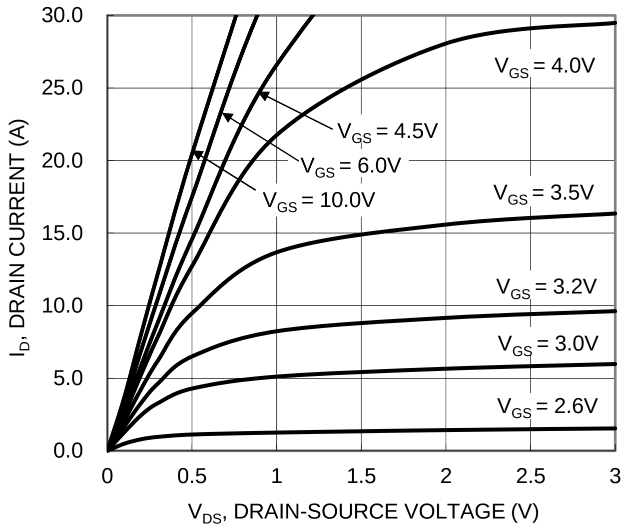


Figure 1. Typical Output Characteristic

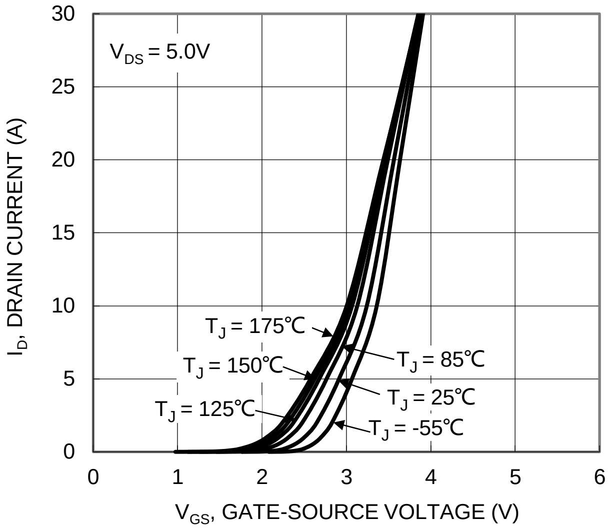


Figure 2. Typical Transfer Characteristic

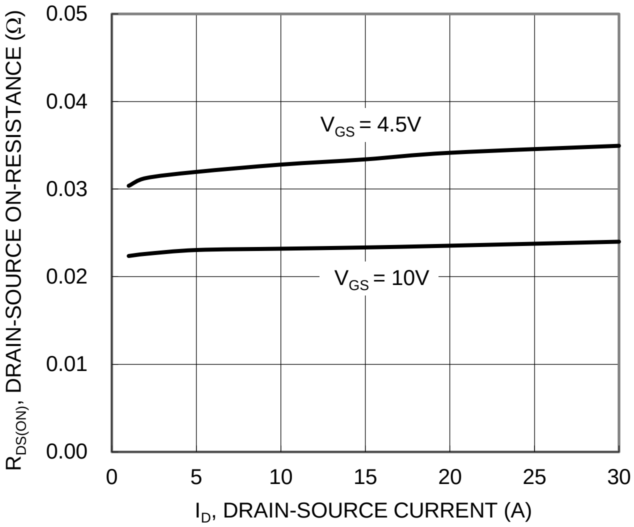


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

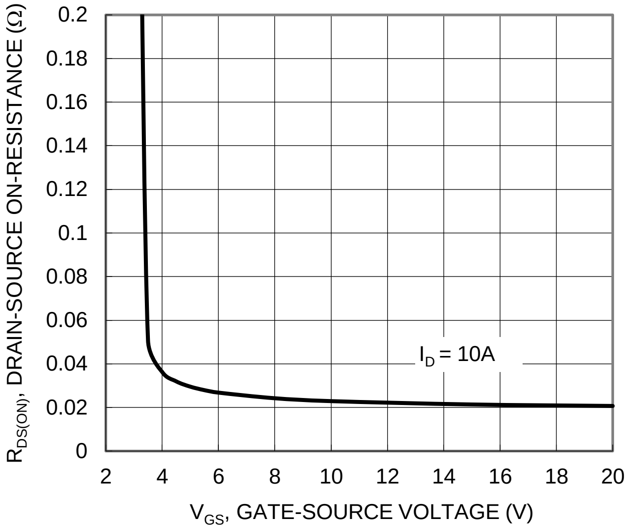


Figure 4. Typical Transfer Characteristic

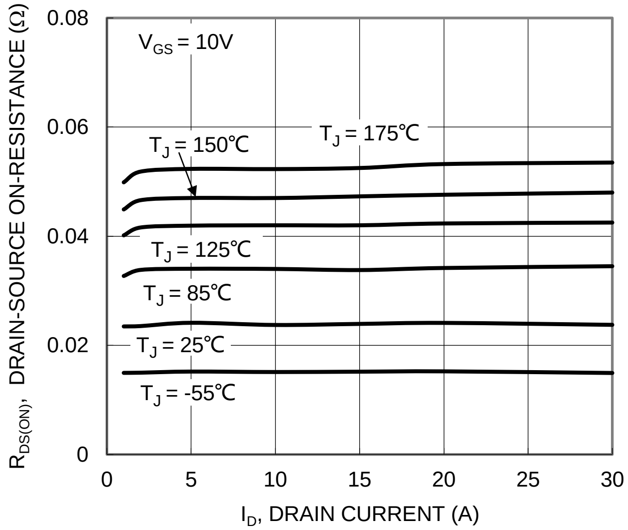


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

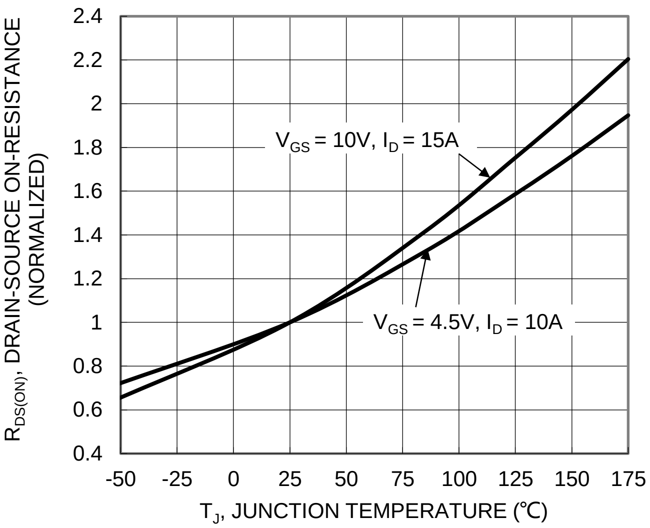


Figure 6. On-Resistance Variation with Temperature

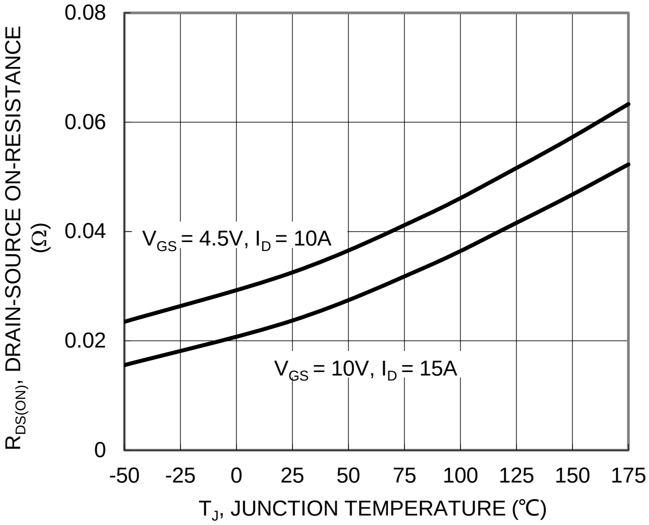


Figure 7. On-Resistance Variation with Temperature

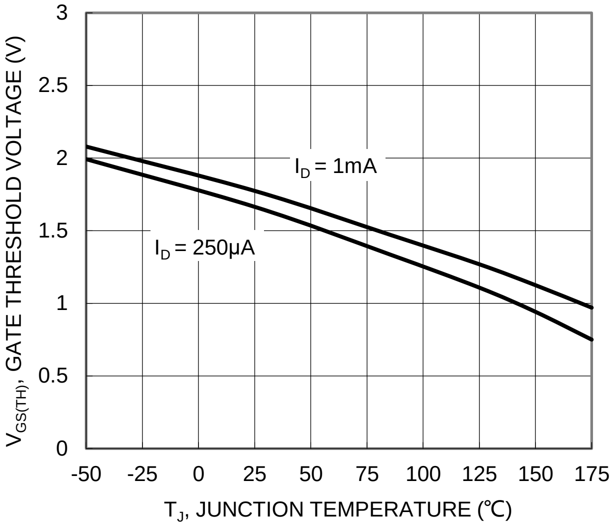


Figure 8. Gate Threshold Variation vs. Junction Temperature

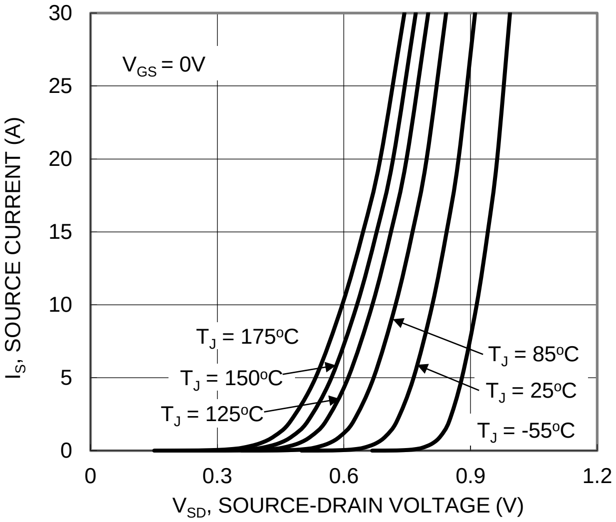


Figure 9. Diode Forward Voltage vs. Current

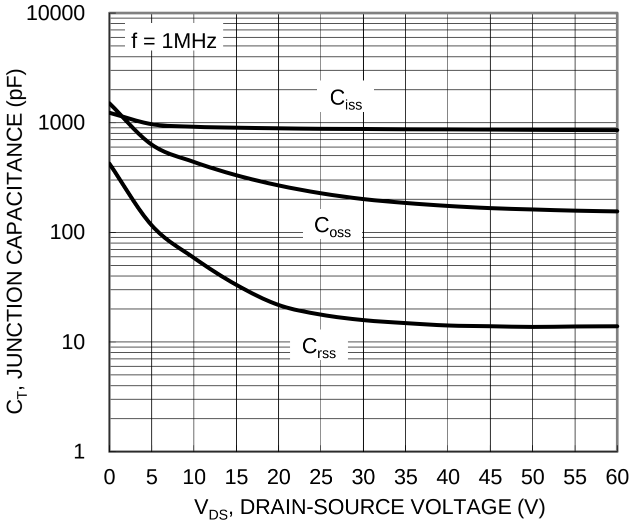


Figure 10. Typical Junction Capacitance

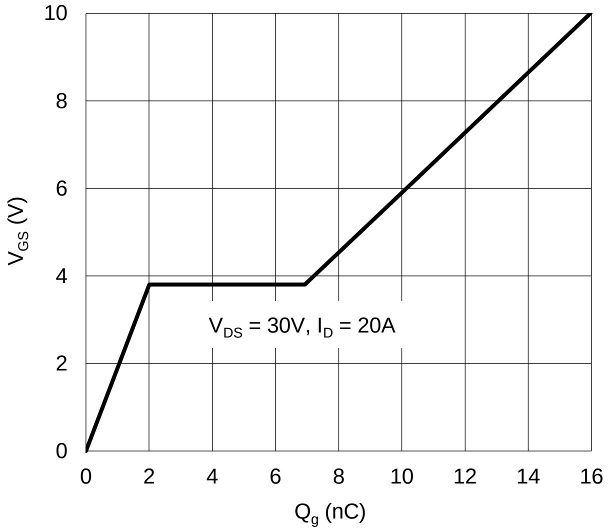


Figure 11. Gate Charge

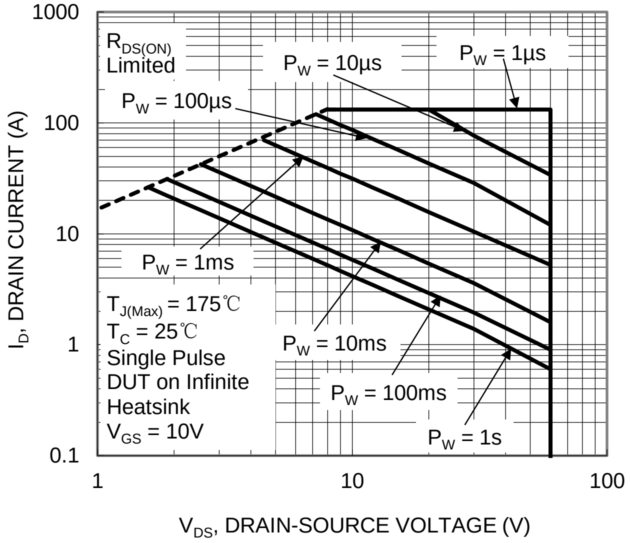


Figure 12. SOA, Safe Operation Area

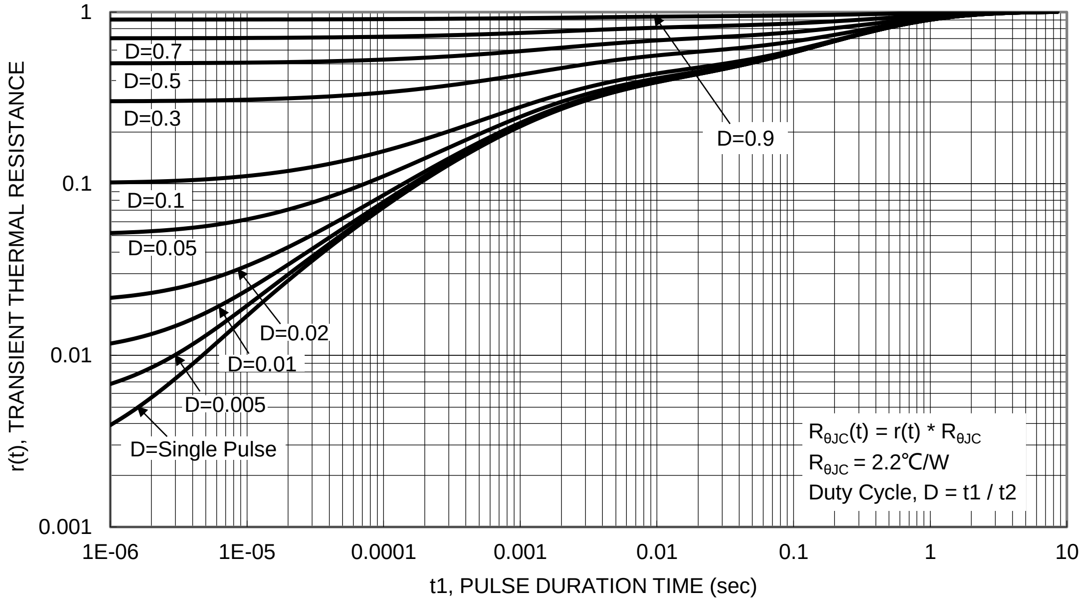


Figure 13. Transient Thermal Resistance

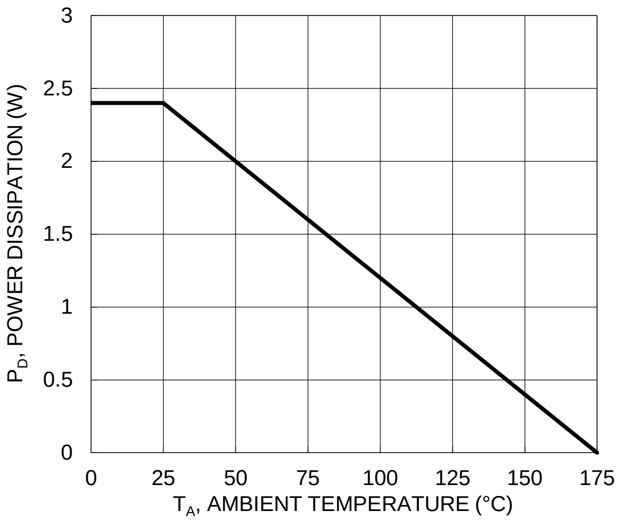


Figure 14. DC Power Derating

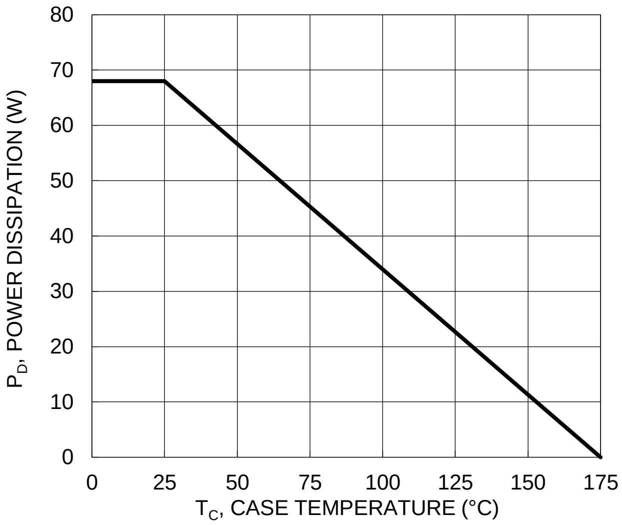


Figure 15. DC Power Derating

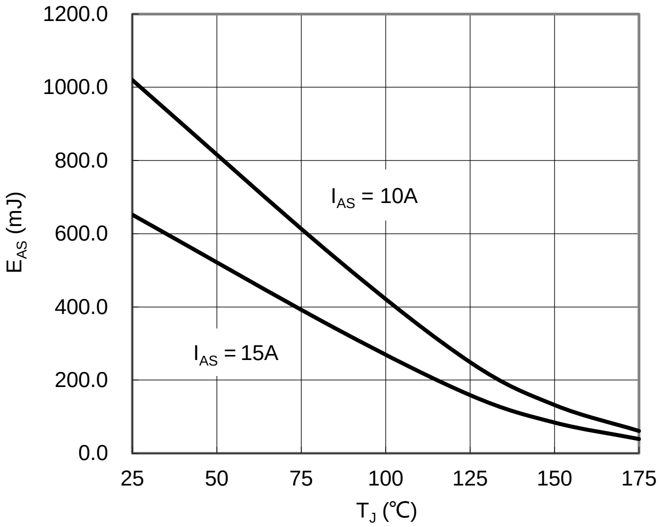
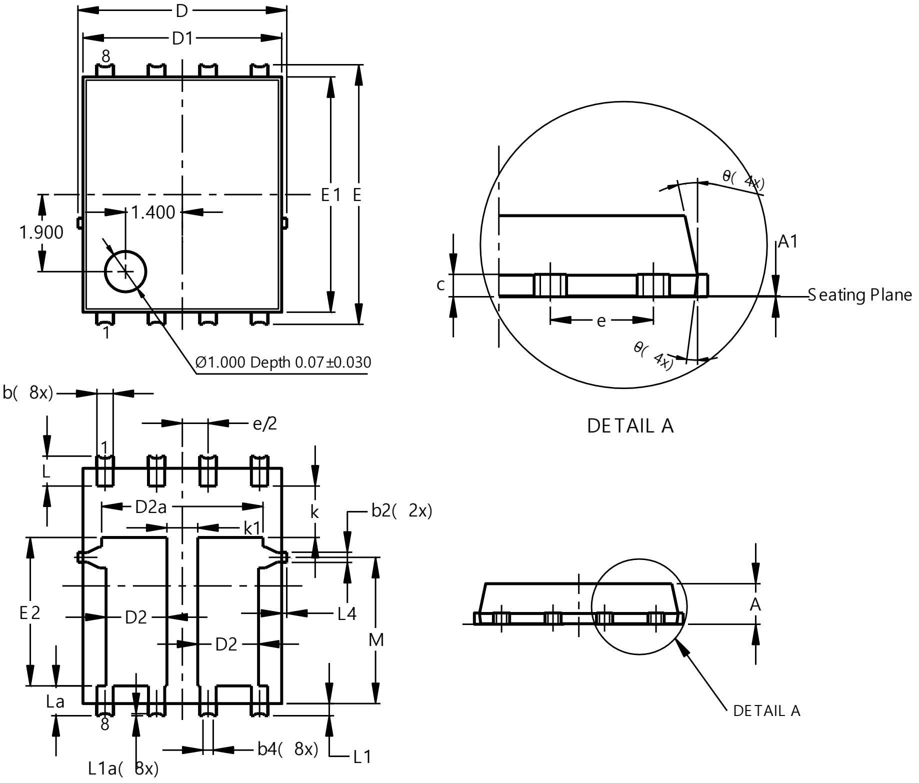


Figure 16. E_{AS} vs. T_J

Package Outline Dimensions

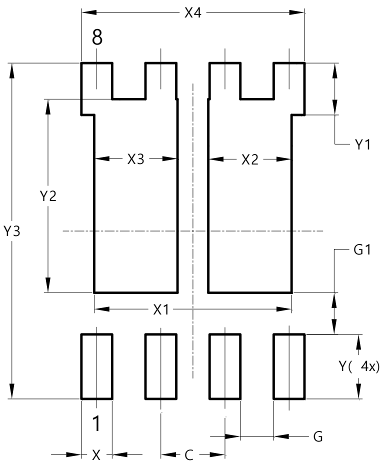
PowerDI5060-8 (SWP) (Type R)



PowerDI5060-8 (SWP) (Type R)			
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	1.40	1.60	1.50
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
e	1.27BSC		
k	1.05	--	--
k1	0.56	--	--
L	0.635	0.835	0.735
La	0.635	0.835	0.735
L1	0.200	0.400	0.300
L1a	0.050REF		
L4	0.025	0.225	0.125
M	3.205	4.005	3.605
θ	10°	12°	11°
θ1	6°	8°	7°
All Dimensions in mm			

Suggested Pad Layout

PowerDI5060-8 (SWP) (Type R)



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	3.910
X2	1.650
X3	1.650
X4	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610