



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



企业QQ二维码

### Product Summary

BV <sub>DSS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub> max T <sub>C</sub> = +25°C
40V	15mΩ @ V <sub>GS</sub> = 10V	43.6A
	25mΩ @ V <sub>GS</sub> = 4.5V	33A

### Description and Applications

This MOSFET is designed to minimize the on-state resistance (R<sub>DS(on)</sub>) and yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

- Backlighting
- Power Management Functions
- DC-DC Converters

### Features and Benefits

- 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<sub>DS(on)</sub> – Minimizes On State Losses
- Low Input Capacitance
- Fast Switching Speed

### Mechanical Data

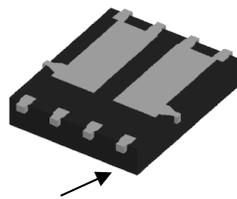
- Case: PowerDI<sup>®</sup>5060-8 (Type C)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish—Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208<sup>③</sup>
- Weight: 0.097 grams (Approximate)

#### Site 1:

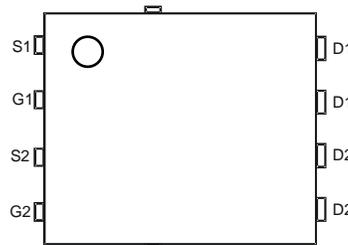
PowerDI5060-8 (Type C)



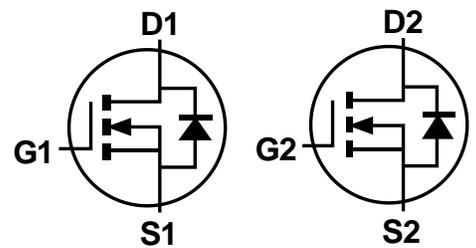
Top View



Bottom View  
Pin1



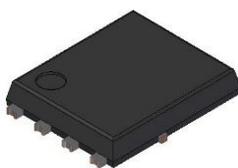
Pin Out  
Top View



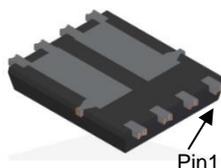
Equivalent Circuit

#### Site 2:

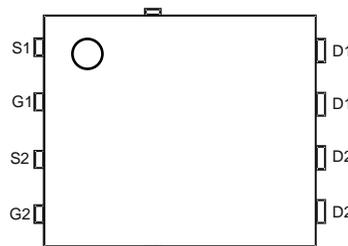
PowerDI5060-8/SWP (Type UXD)



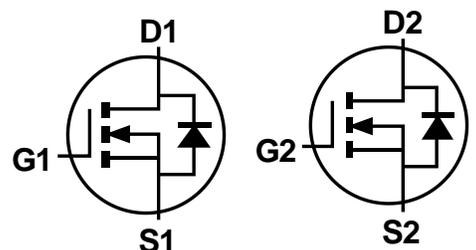
Top View



Bottom View  
Pin1



Pin Out  
Top View



Equivalent Circuit

**Maximum Ratings** (@  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic		Symbol	Value	Unit	
Drain-Source Voltage		$V_{DSS}$	40	V	
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V	
Continuous Drain Current (Note 5)		$I_D$	$T_C = +25^\circ\text{C}$	43.6	A
			$T_C = +100^\circ\text{C}$	30.8	
Continuous Drain Current (Note 6)	Steady State	$I_D$	$T_A = +25^\circ\text{C}$	10.6	A
			$T_A = +100^\circ\text{C}$	7.5	
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)		$I_{DM}$	174	A	
Maximum Continuous Body Diode Forward Current (Note 6)		$I_S$	36	A	
Avalanche Current, $L = 0.3\text{mH}$		$I_{AS}$	11.7	A	
Avalanche Energy, $L = 0.3\text{mH}$		$E_{AS}$	20.5	mJ	

**Thermal Characteristics**

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	$P_D$	2.4	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	62.6	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)	$T_C = +25^\circ\text{C}$	$P_D$	42.8	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	3.5	$^\circ\text{C/W}$
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to +175	$^\circ\text{C}$

**Electrical Characteristics** (@  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	40	—	—	V	$V_{GS} = 0V, I_D = 1\text{mA}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 32V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	1	1.3	3	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(on)}$	—	11.8	15	m $\Omega$	$V_{GS} = 10V, I_D = 20A$
		—	17.9	25		$V_{GS} = 4.5V, I_D = 15A$
Diode Forward Voltage	$V_{SD}$	—	0.9	1.2	V	$V_{GS} = 0V, I_S = 20A$
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	$C_{iss}$	—	733	—	pF	$V_{DS} = 20V, V_{GS} = 0V, f = 1\text{MHz}$
Output Capacitance	$C_{oss}$	—	235	—	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	24	—	pF	
Gate Resistance	$R_g$	—	1.3	—	$\Omega$	$V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$
Total Gate Charge ( $V_{GS} = 4.5V$ )	$Q_g$	—	5.2	—	nC	$V_{DS} = 20V, I_D = 20A$
Total Gate Charge ( $V_{GS} = 10V$ )	$Q_g$	—	10.2	—	nC	
Gate-Source Charge	$Q_{gs}$	—	1.5	—	nC	
Gate-Drain Charge	$Q_{gd}$	—	3.1	—	nC	
Turn-On Delay Time	$t_{D(on)}$	—	3.5	—	ns	$V_{DD} = 20V, V_{GS} = 10V, R_G = 1.6\Omega, I_D = 20A$
Turn-On Rise Time	$t_R$	—	5.7	—	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	8.7	—	ns	
Turn-Off Fall Time	$t_F$	—	1.8	—	ns	
Body Diode Reverse Recovery Time	$t_{RR}$	—	11.9	—	ns	
Body Diode Reverse Recovery Charge	$Q_{RR}$	—	9.28	—	nC	$I_F = 15A, di/dt = 400A/\mu\text{s}$

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

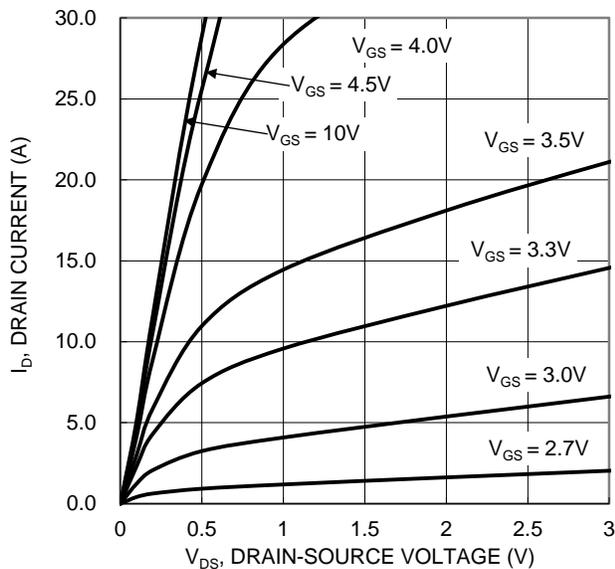


Figure 1. Typical Output Characteristic

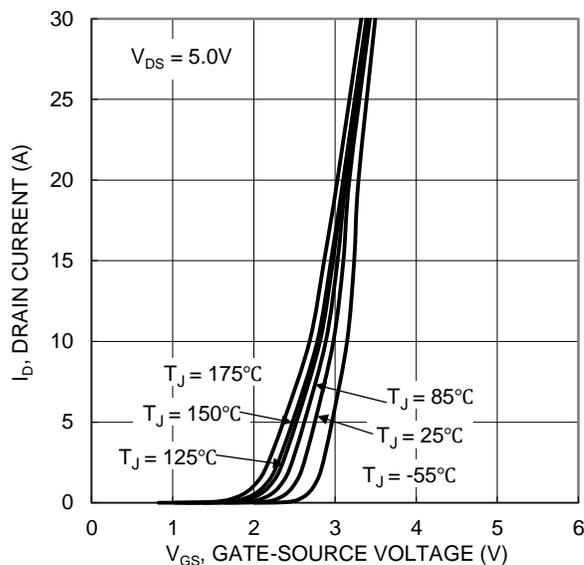


Figure 2. Typical Transfer Characteristic

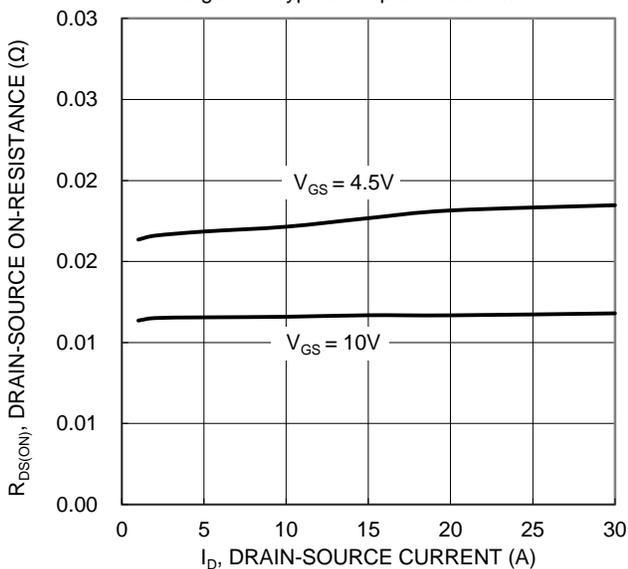


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

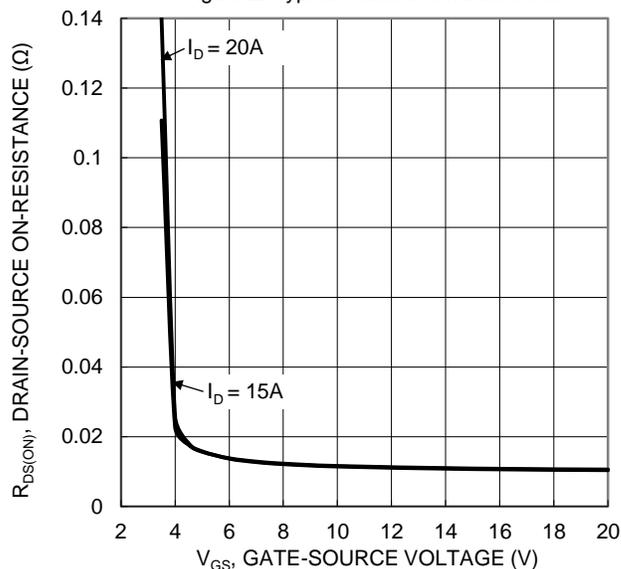


Figure 4. Typical Transfer Characteristic

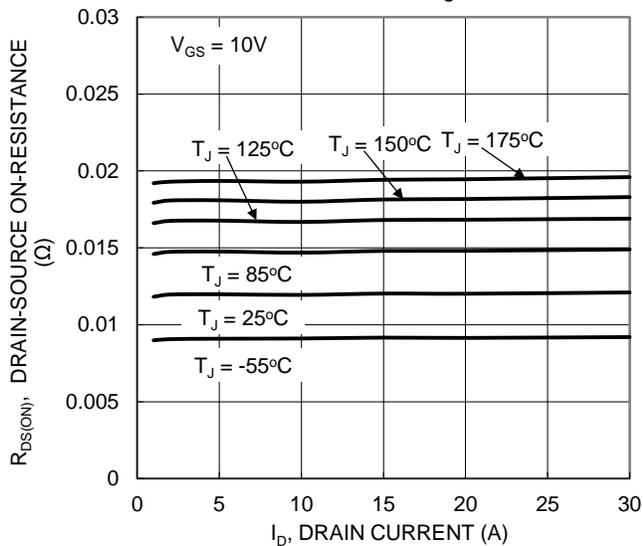


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

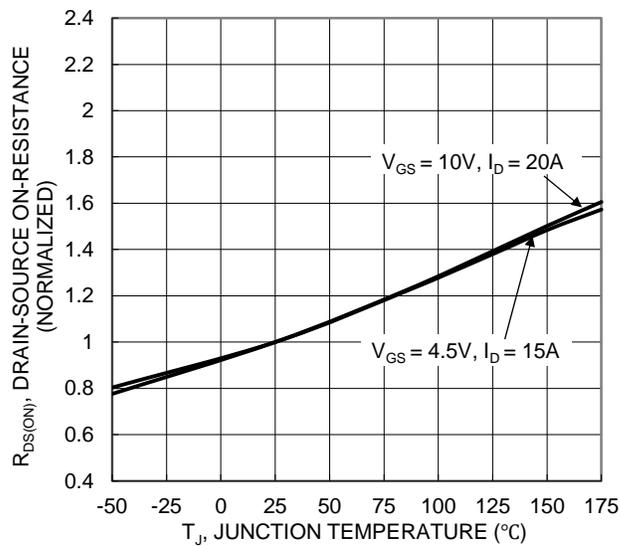


Figure 6. On-Resistance Variation with Temperature

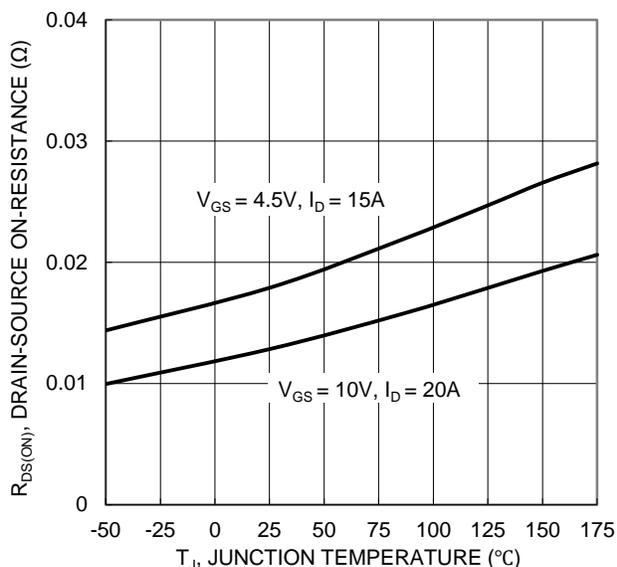


Figure 7. On-Resistance Variation with Temperature

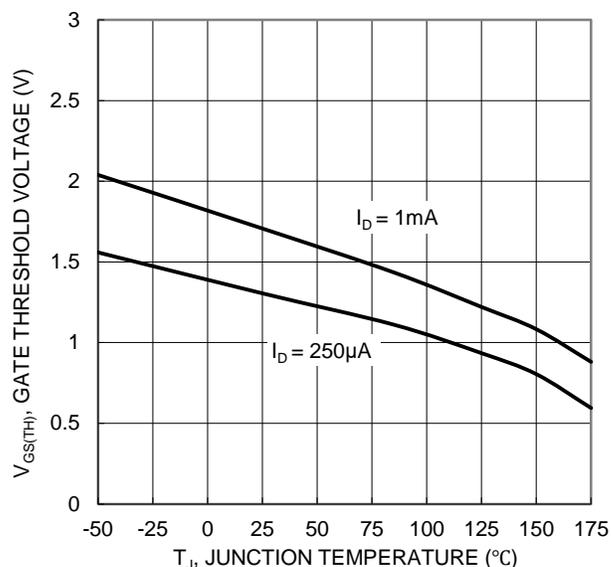


Figure 8. Gate Threshold Voltage vs. Junction Temperature

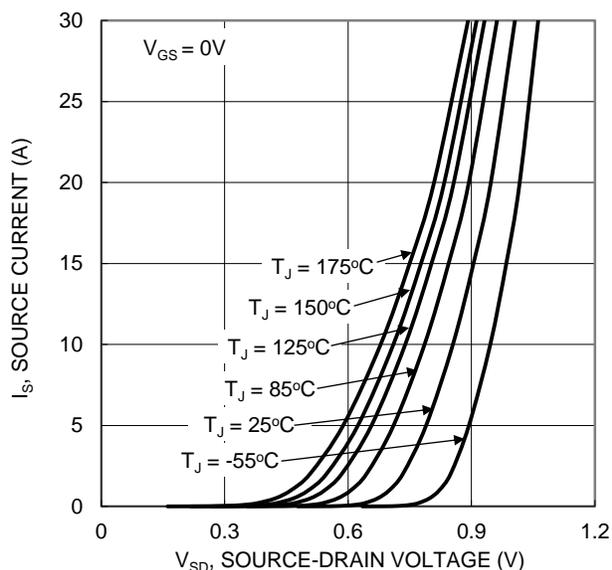


Figure 9. Diode Forward Voltage vs. Current

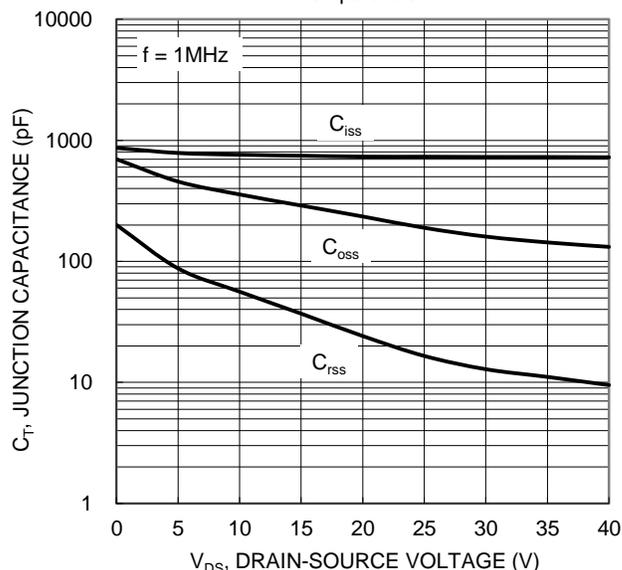


Figure 10. Typical Junction Capacitance

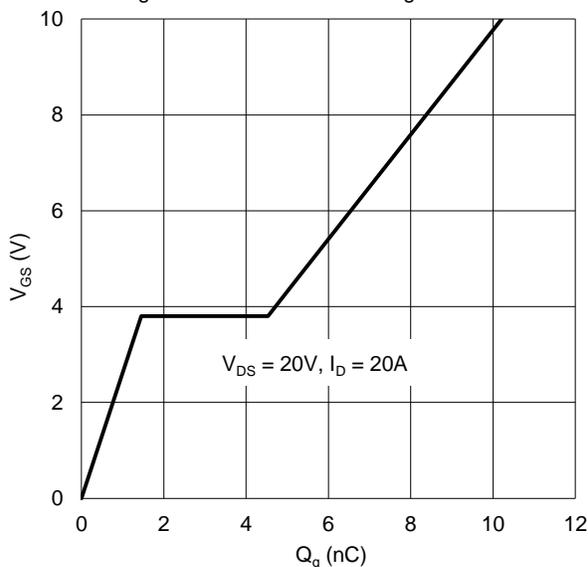


Figure 11. Gate Charge

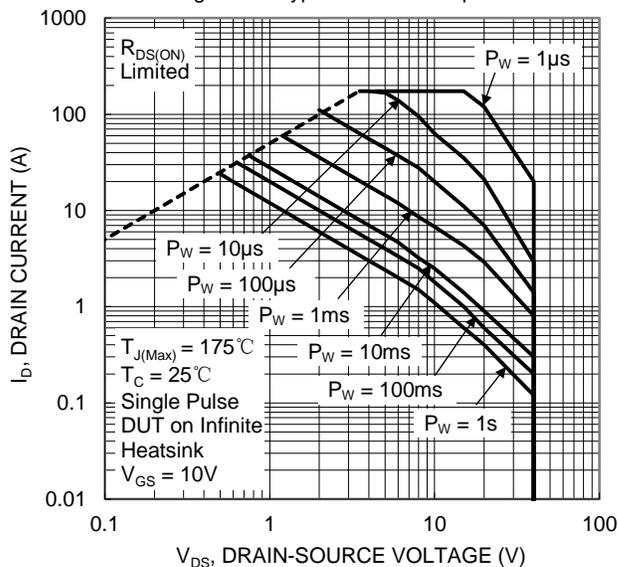


Figure 12. SOA, Safe Operation A

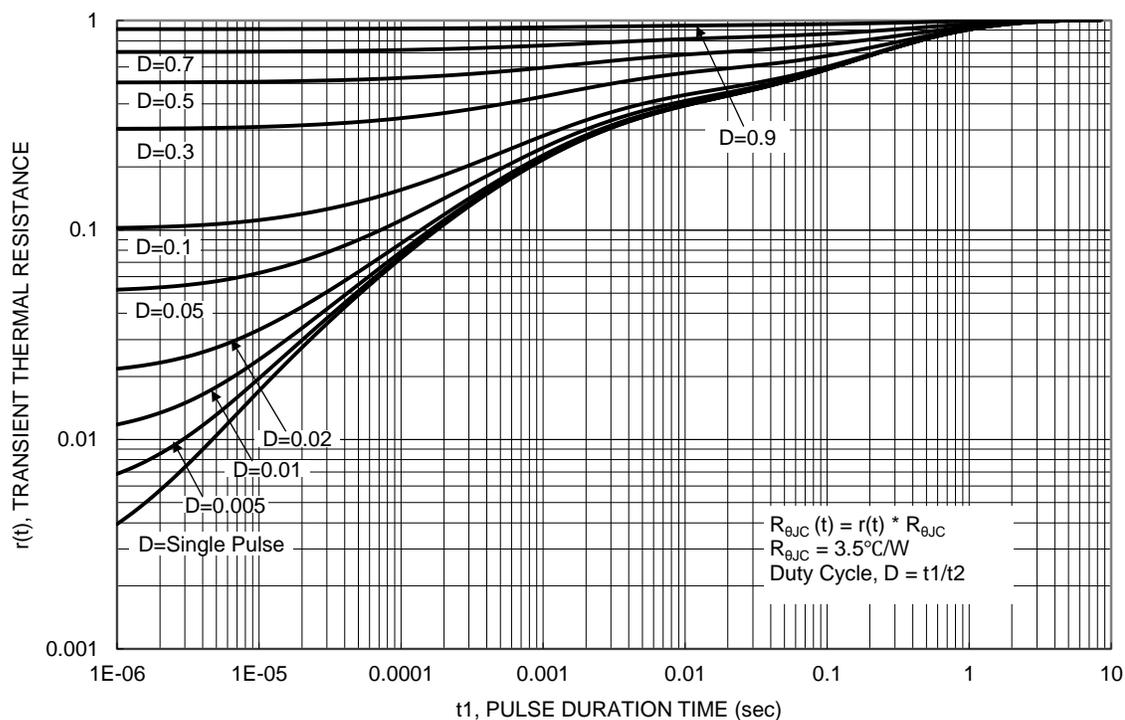
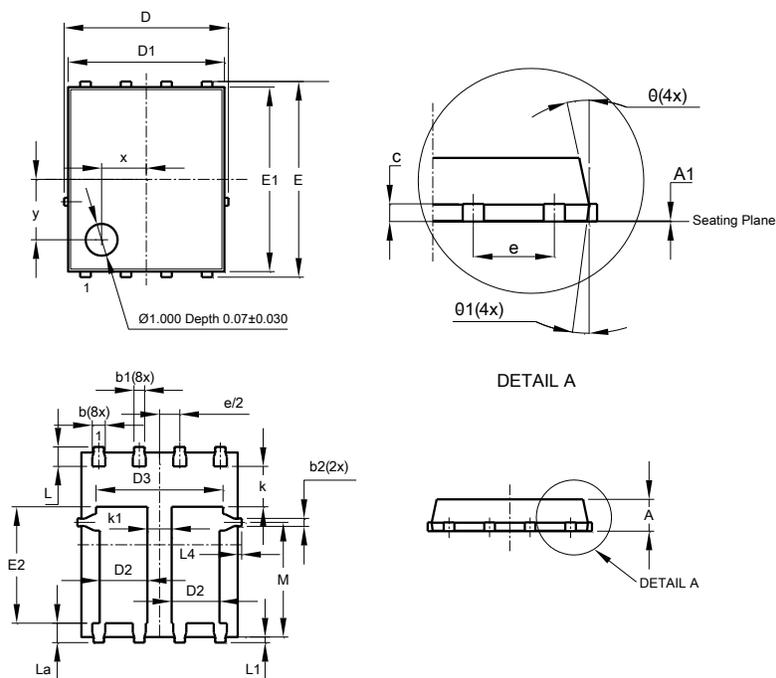


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

Site 1:

### PowerDI5060-8 (Type C)

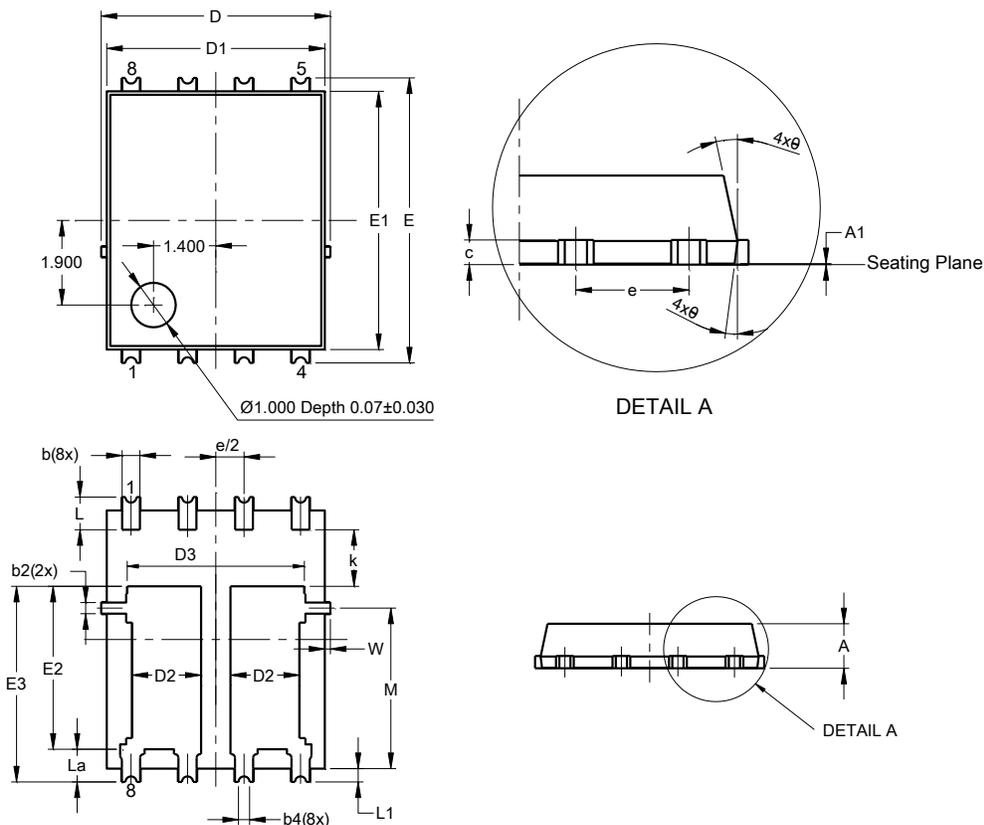


PowerDI5060-8 (Type C)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0	0.05	0.02
b	0.33	0.51	0.41
b1	0.300	0.366	0.333
b2	0.20	0.35	0.25
c	0.23	0.33	0.277
D	5.15 BSC		
D1	4.85	4.95	4.90
D2	1.40	1.60	1.50
D3	-	-	3.98
E	6.15 BSC		
E1	5.75	5.85	5.80
E2	3.56	3.76	3.66
e	1.27BSC		
k	-	-	1.27
k1	0.56	-	-
L	0.51	0.71	0.61
La	0.51	0.71	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°
<b>All Dimensions in mm</b>			

Package Outline Dimensions (continued)

Site 2:

PowerDI5060-8/SWP (Type UXD)

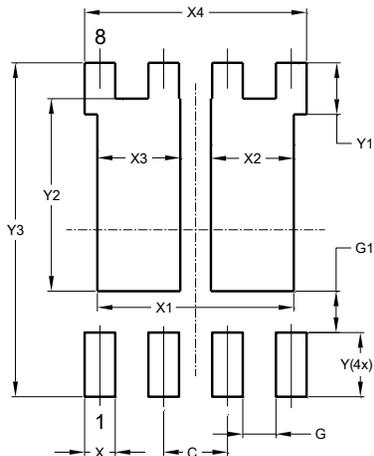


PowerDI5060-8/SWP (Type UXD)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	1.46	1.66	1.55
D3	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	1.27BSC		
k	1.05	--	--
L	0.635	0.835	0.735
La	0.635	0.835	0.735
L1	0.200	0.400	0.300
M	3.205	4.005	3.605
W	0.025	0.225	0.125
θ	10°	12°	11°
θ1	6°	8°	7°
All Dimensions in mm			

## Suggested Pad Layout

Site 1:

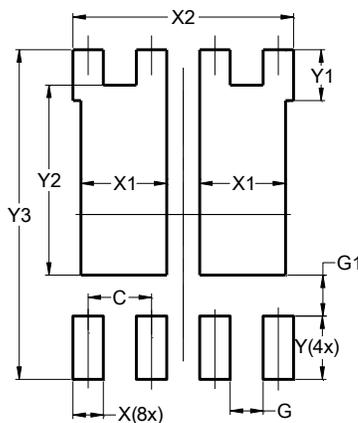
PowerDI5060-8 (Type C)



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

Site 2:

PowerDI5060-8/SWP (Type UXD)



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	1.720
X2	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610