



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	$I_D$ Max $T_C = +25^\circ C$
30V	3.8m $\Omega$ @ $V_{GS} = 10V$	145A
	6m $\Omega$ @ $V_{GS} = 4.5V$	115A

## Features and Benefits

- Low  $R_{DS(ON)}$  – Minimizes On-State Losses
- Excellent  $Q_{gd} \times R_{DS(ON)}$  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

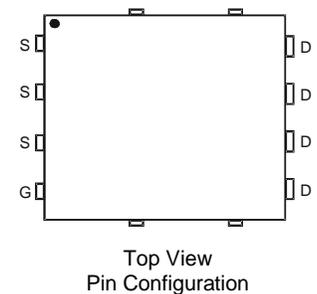
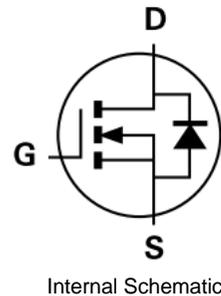
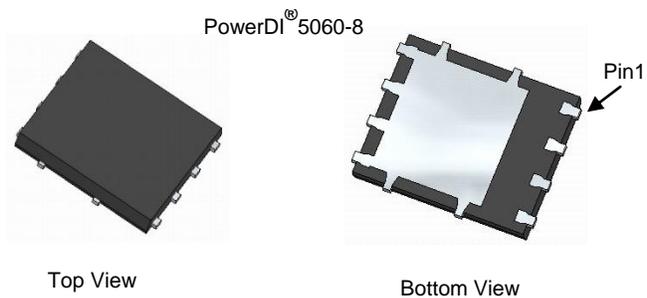
## Description and Applications

This MOSFET is designed to minimize the on-state resistance ( $R_{DS(ON)}$ ), yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

- Backlighting
- Power Management Functions
- DC-DC Converters

## Mechanical Data

- Case: POWERDI<sup>®</sup> 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 Leadframe. Solderable per MIL-STD-202, Method 208 <sup>Ⓔ</sup>
- Weight: 0.097 grams (Approximate)



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

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	+20 -16	V
Continuous Drain Current, $V_{GS} = 10\text{V}$ (Note 5)	$I_D$	$T_A = +25^\circ\text{C}$	22
		$T_A = +70^\circ\text{C}$	18
Continuous Drain Current, $V_{GS} = 10\text{V}$	$I_D$	$T_C = +25^\circ\text{C}$	145
		$T_C = +70^\circ\text{C}$	120
Maximum Continuous Body Diode Forward Current (Note 5)	$I_S$	3	A
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)	$I_{DM}$	180	A
Avalanche Current, $L=0.3\text{mH}$	$I_{AS}$	27	A
Avalanche Energy, $L=0.3\text{mH}$	$E_{AS}$	110	mJ

**Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Total Power Dissipation	$P_D$	$T_A = +25^\circ\text{C}$ (Note 5)	3.2
		$T_C = +25^\circ\text{C}$	136
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	47
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.1	$^\circ\text{C/W}$
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 6)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	30	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = +20\text{V}, V_{DS} = 0\text{V}$ $V_{GS} = -16\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 6)</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	3.3	3.8	m $\Omega$	$V_{GS} = 10\text{V}, I_D = 20\text{A}$
		—	5	6		$V_{GS} = 4.5\text{V}, I_D = 7\text{A}$
Diode Forward Voltage	$V_{SD}$	—	0.70	1	V	$V_{GS} = 0\text{V}, I_S = 1\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 7)</b>						
Input Capacitance	$C_{iss}$	—	2370	—	pF	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Output Capacitance	$C_{oss}$	—	1360	—		
Reverse Transfer Capacitance	$C_{rss}$	—	240	—		
Gate Resistance	$R_g$	—	0.7	—	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge ( $V_{GS} = 10\text{V}$ )	$Q_g$	—	43.7	—	nC	$V_{DS} = 15\text{V}, I_D = 20\text{A}$
Gate-Source Charge	$Q_{gs}$	—	6.9	—		
Gate-Drain Charge	$Q_{gd}$	—	8	—		
Turn-On Delay Time	$t_{D(ON)}$	—	6.2	—	ns	$V_{DD} = 15\text{V}, V_{GS} = 10\text{V}, R_G = 3\Omega, R_L = 0.75\Omega$
Turn-On Rise Time	$t_R$	—	4.2	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	21	—		
Turn-Off Fall Time	$t_F$	—	8	—		
Body Diode Reverse Recovery Time	$t_{RR}$	—	25	—	ns	$I_F = 15\text{A}, di/dt = 500\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	$Q_{RR}$	—	37	—		

- Notes:
- $R_{\theta JA}$  is determined with the device mounted on FR-4 substrate PC board, 2oz copper, with 1in. square copper plate.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

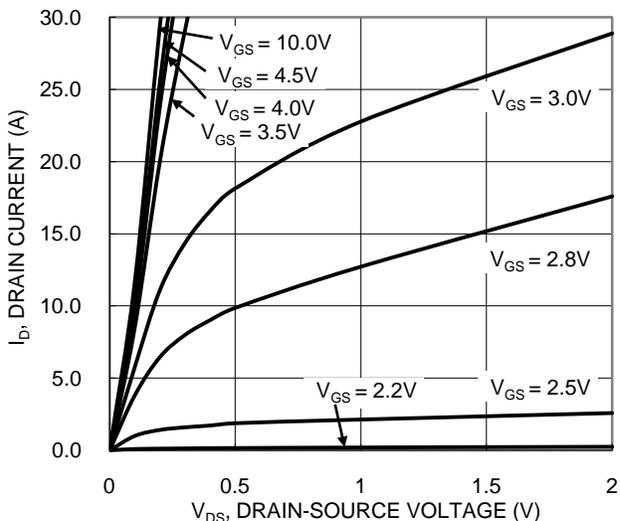


Figure 1. Typical Output Characteristic

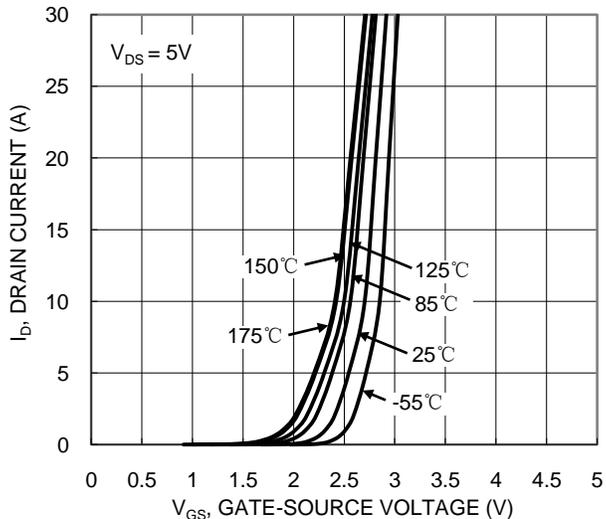


Figure 2. Typical Transfer Characteristic

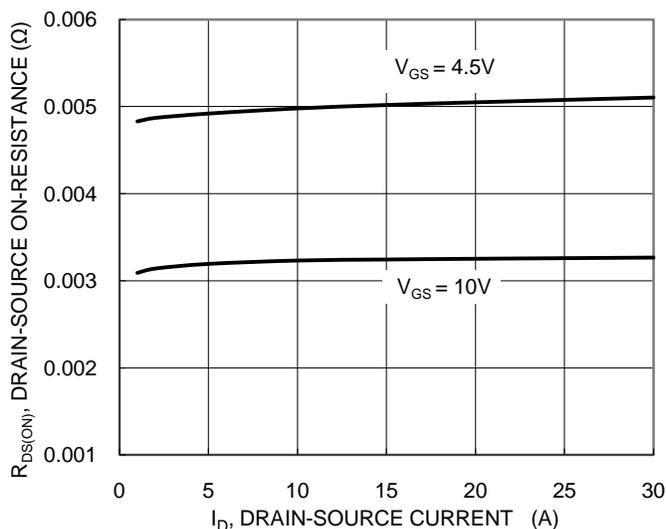


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

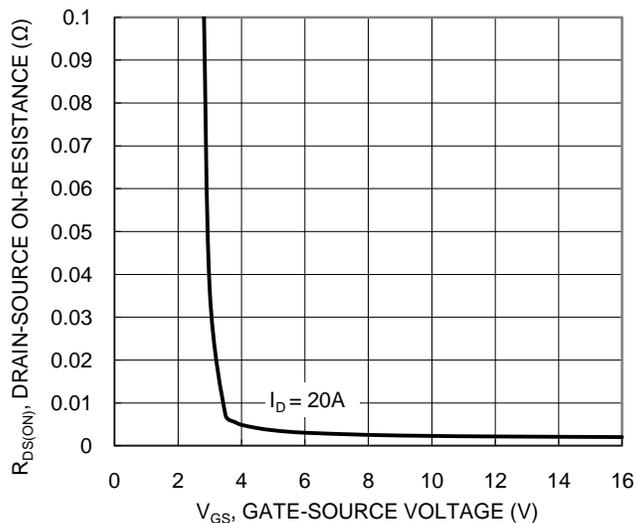


Figure 4. Typical Transfer Characteristic

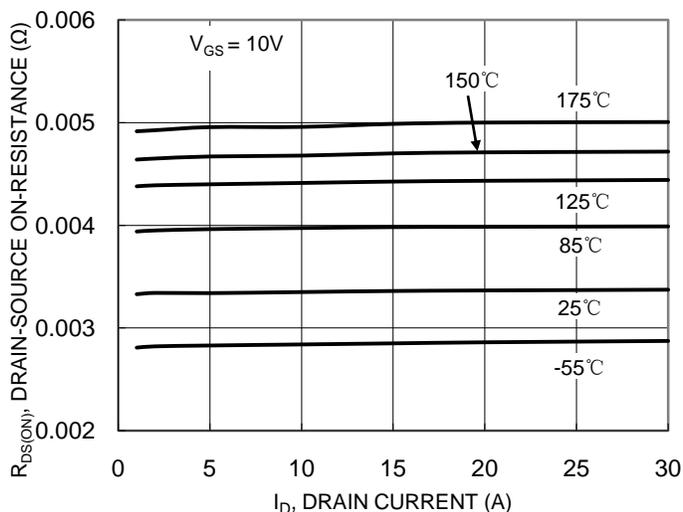


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

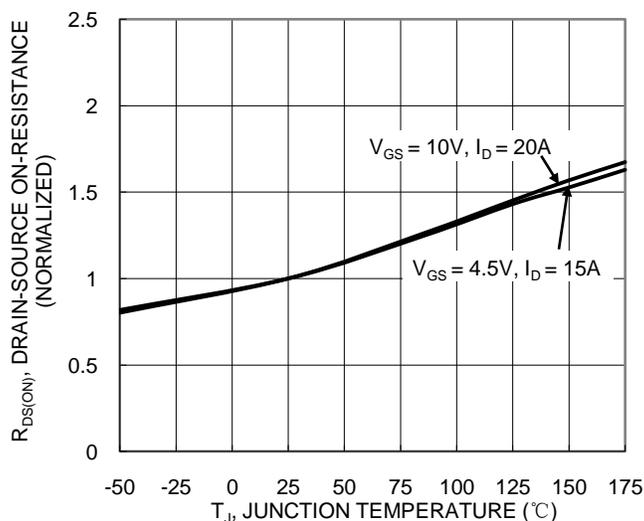


Figure 6. On-Resistance Variation with Junction Temperature

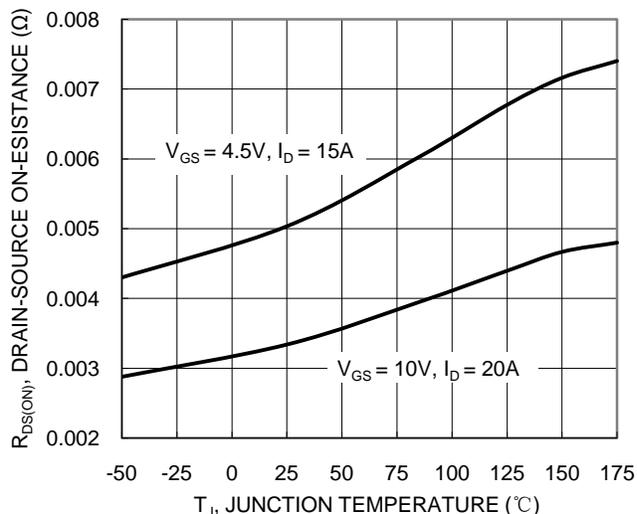


Figure 7. On-Resistance Variation with Junction Temperature

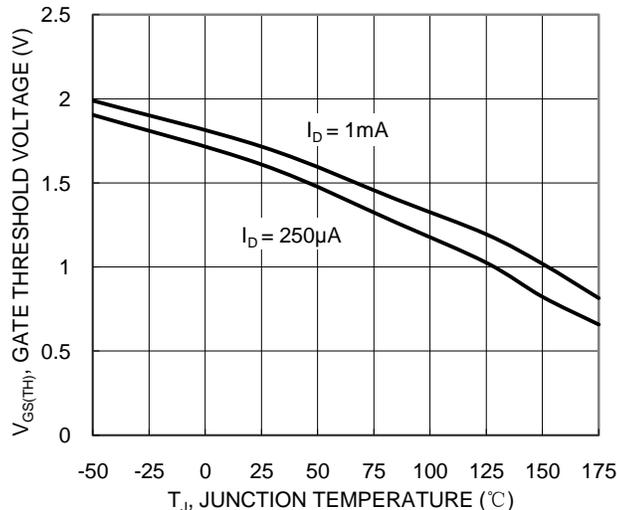


Figure 8. Gate Threshold Variation vs. Junction Temperature

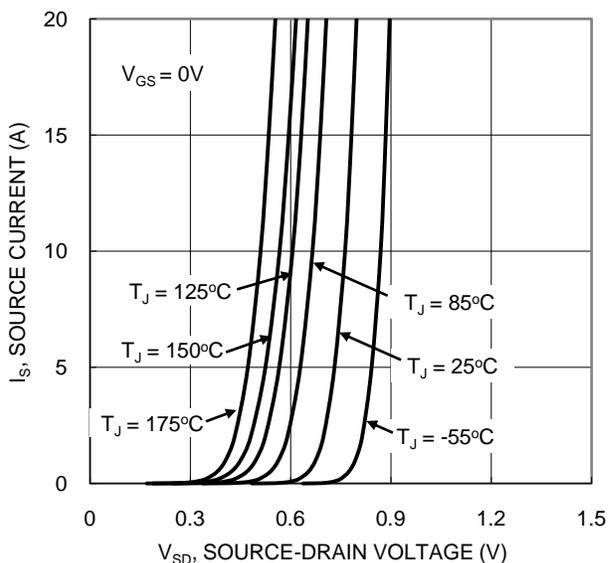


Figure 9. Diode Forward Voltage vs. Current

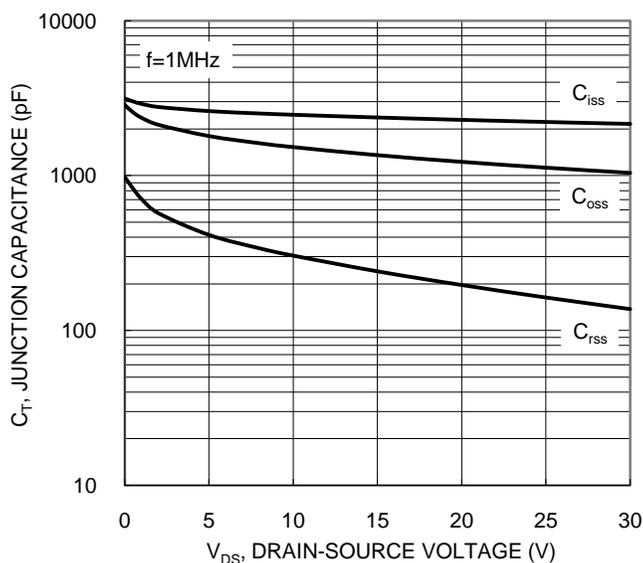


Figure 10. Typical Junction Capacitance

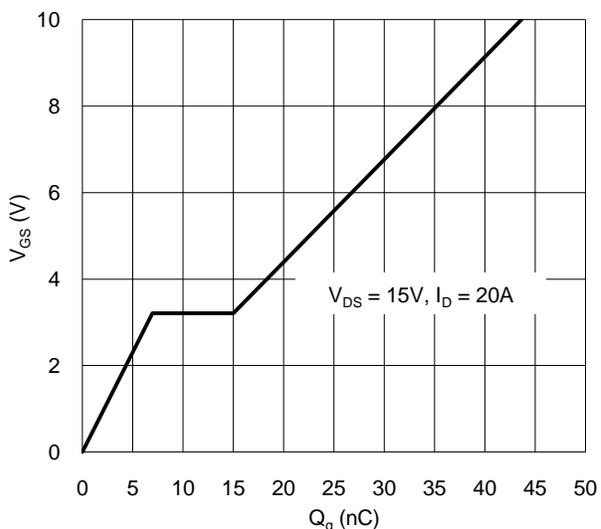


Figure 11. Gate Charge

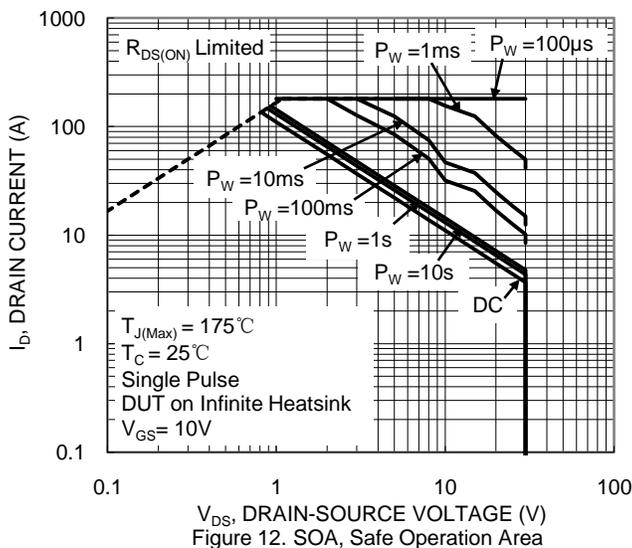


Figure 12. SOA, Safe Operation Area

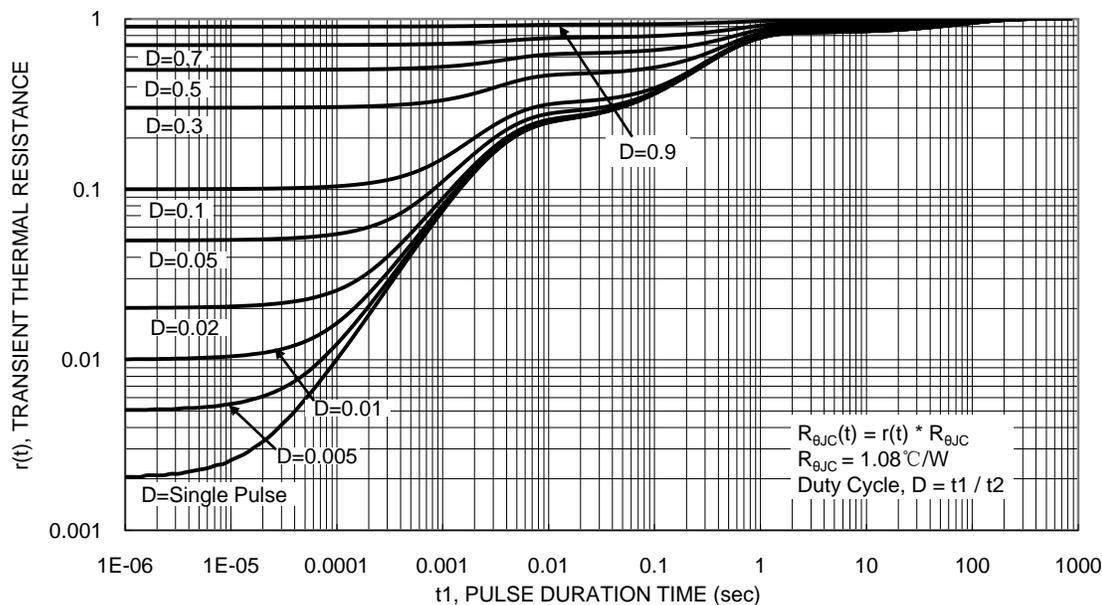
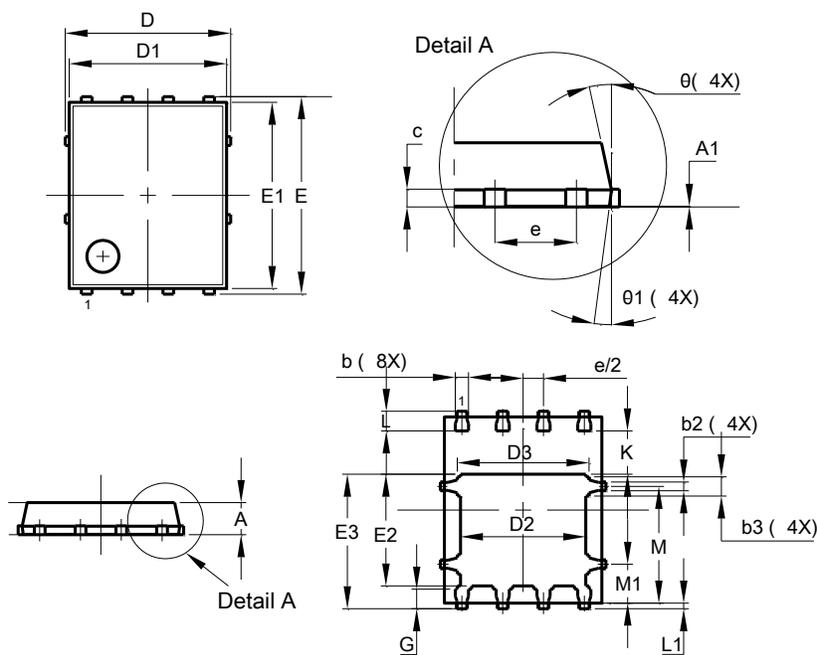


Figure 13. Transient Thermal Resistance

### Package Outline Dimensions

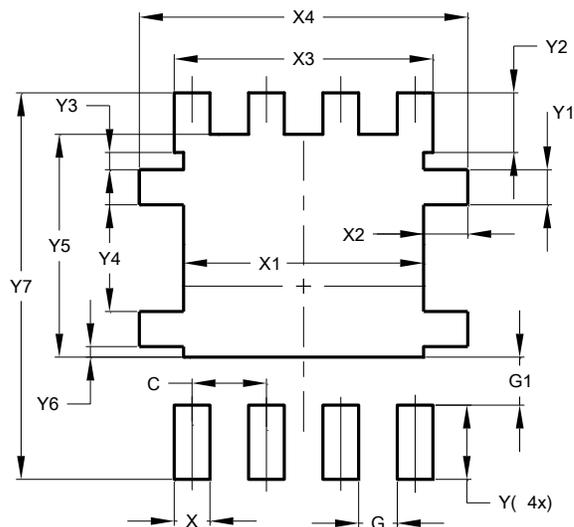
POWERDI<sup>®</sup> 5060-8



POWERDI <sup>®</sup> 5060-8			
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

POWERDI<sup>®</sup> 5060-8



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