

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max $T_C = +25^\circ\text{C}$
30V	1.7m Ω @ $V_{GS} = 10\text{V}$	100A
	2.4m Ω @ $V_{GS} = 4.5\text{V}$	80A

Features and Benefits

- Rated to $+175^\circ\text{C}$ —Ideal for High Ambient Temperature Environments
- 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
- Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- Halogen- and Antimony-Free. "Green" Device (Note 3)**
- The DMTH31M7LPSQ is suitable for automotive applications requiring specific change control; is AEC-Q101 qualified, PPAP capable, and manufactured in IATF16949:2016 certified facilities.**

Description and Applications

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

- Backlighting
- Power Management Functions
- DC-DC Converters

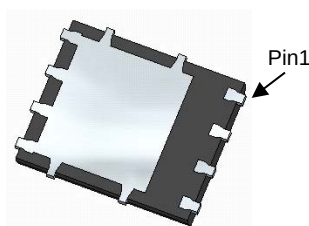
Mechanical Data

- 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 Indicator: See Diagram
- Terminals: Finish — Matte Tin Annealed over Copper Lead-frame. Solderable per MIL-STD-202, Method 208 
- Weight: 0.097 grams (Approximate)

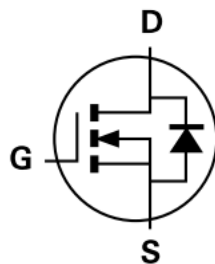
PowerDI5060-8



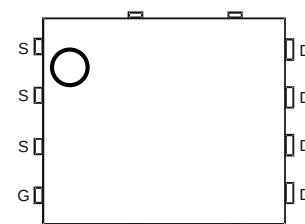
Top View



Bottom View



Internal Schematic



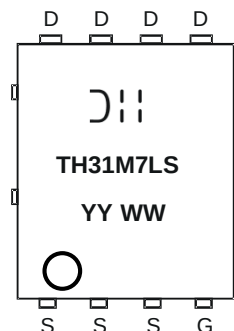
Top View
Pin Configuration

Ordering Information (Note 4)

Part Number	Case	Packaging
DMTH31M7LPSQ-13	PowerDI5060-8	2,500/Tape & Reel

- Notes:
- EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
 - See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 - For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



D|| = Manufacturer's Marking
 TH31M7LS = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 19 = 2019)
 WW = Week (01 to 53)

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}	± 16	V
Continuous Drain Current, $V_{GS} = 10\text{V}$ (Note 6)	$T_A = +25^\circ\text{C}$	I_D	30	A
	$T_A = +100^\circ\text{C}$		23	
Continuous Drain Current, $V_{GS} = 10\text{V}$ (Note 7)	$T_C = +25^\circ\text{C}$	I_D	100	A
	$T_C = +100^\circ\text{C}$		80	
Maximum Continuous Body Diode Forward Current (Note 6)		I_S	2.8	A
Pulsed Drain Current (380 μs Pulse, Duty Cycle = 1%)		I_{DM}	400	A
Pulsed Body Diode Forward Current (380 μs Pulse, Duty Cycle = 1%)		I_{SM}	400	A
Avalanche Current, $L=0.1\text{mH}$ (Note 8)		I_{AS}	65	A
Avalanche Energy, $L=0.1\text{mH}$ (Note 8)		E_{AS}	215	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	P_D	1.3	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	94	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	2.4	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	52	$^\circ\text{C/W}$
Total Power Dissipation (Note 7)	$T_C = +25^\circ\text{C}$	P_D	113	W
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	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
OFF CHARACTERISTICS (Note 9)						
Drain-Source Breakdown Voltage	BV_{DSS}	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	$V_{DS} = 24V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 16V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	1.0	—	3.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	1.3	1.7	m Ω	$V_{GS} = 10V, I_D = 20A$
		—	1.9	2.4		$V_{GS} = 4.5V, I_D = 20A$
Diode Forward Voltage	V_{SD}	—	0.7	1.0	V	$V_{GS} = 0V, I_S = 2A$
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	5741	—	pF	$V_{DS} = 15V, V_{GS} = 0V, f = 1.0MHz$
Output Capacitance	C_{oss}	—	2119	—		
Reverse Transfer Capacitance	C_{rss}	—	424	—		
Gate Resistance	R_g	—	1.5	—	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz$
Total Gate Charge ($V_{GS} = 10V$)	Q_g	—	90	—	nC	$V_{DD} = 15V, I_D = 20A$
Total Gate Charge ($V_{GS} = 4.5V$)	Q_g	—	45	—		
Gate-Source Charge	Q_{gs}	—	11.6	—		
Gate-Drain Charge	Q_{gd}	—	21.6	—		
Turn-On Delay Time	$t_{D(ON)}$	—	6.9	—	ns	$V_{DD} = 15V, V_{GS} = 10V, R_g = 3\Omega, I_D = 20A$
Turn-On Rise Time	t_R	—	16.5	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	49.6	—		
Turn-Off Fall Time	t_F	—	34.5	—		
Reverse Recovery Time	t_{RR}	—	32.5	—	ns	$I_F = 15A, dI/dt = 500A/\mu s$
Reverse Recovery Charge	Q_{RR}	—	55	—	nC	$I_F = 15A, dI/dt = 500A/\mu s$

- 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 $T_J = +25^\circ\text{C}$.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

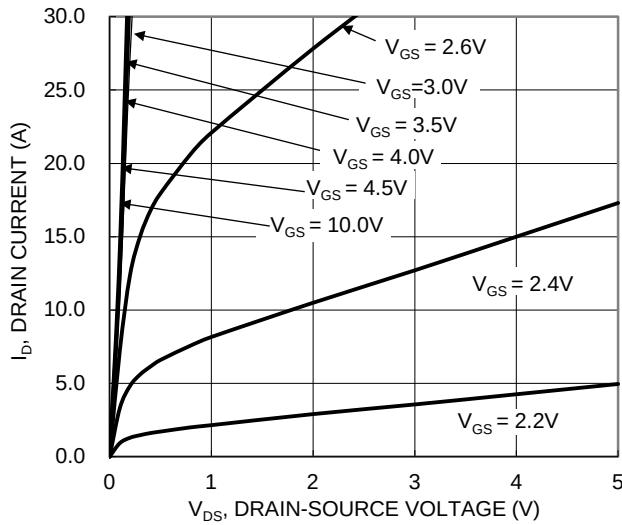


Figure 1. Typical Output Characteristic

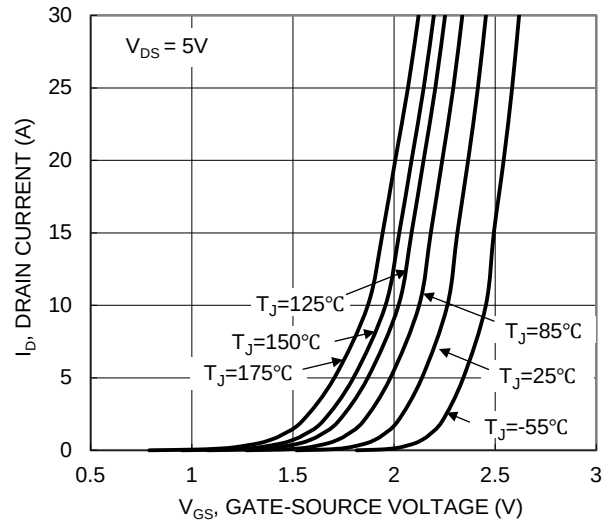


Figure 2. Typical Transfer Characteristic

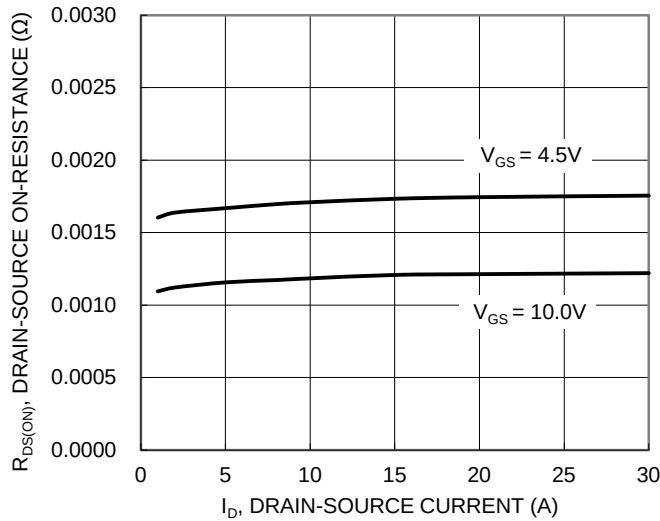


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

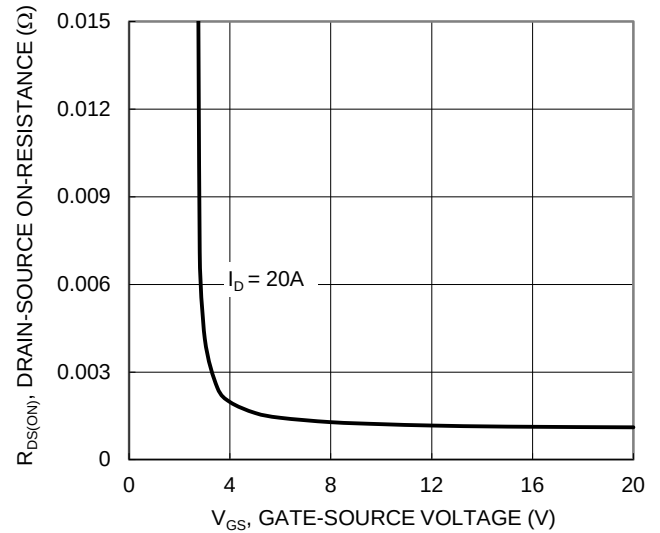


Figure 4. Typical Transfer Characteristic

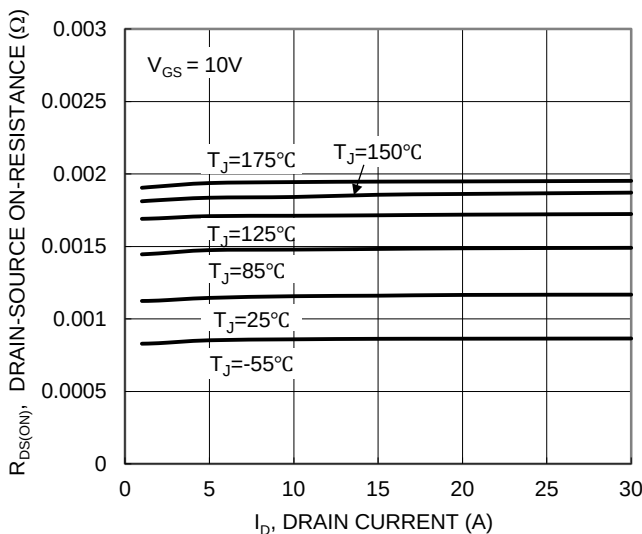


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

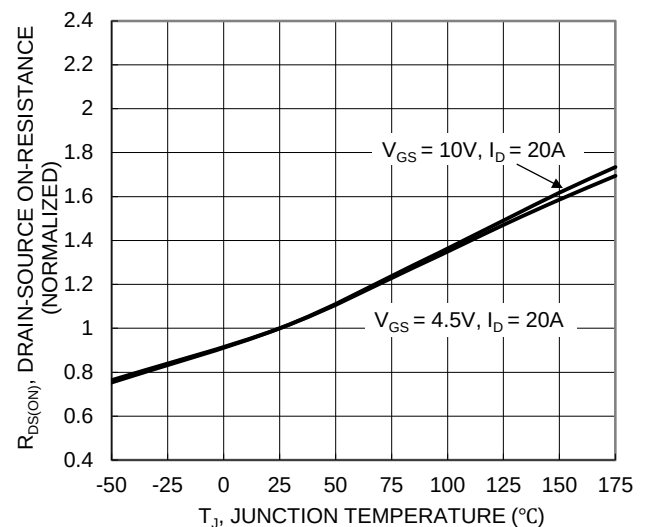
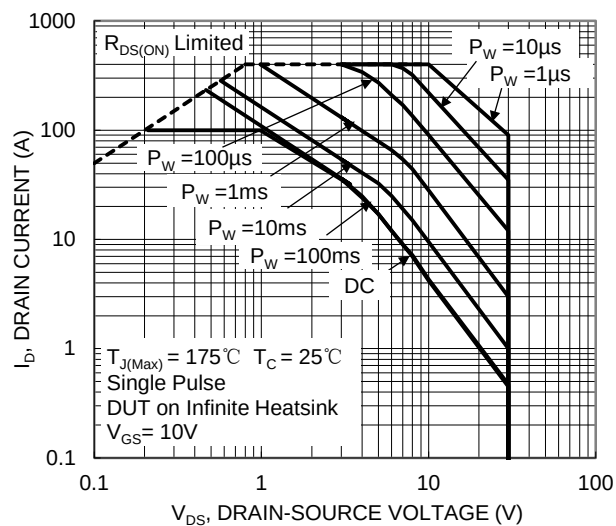
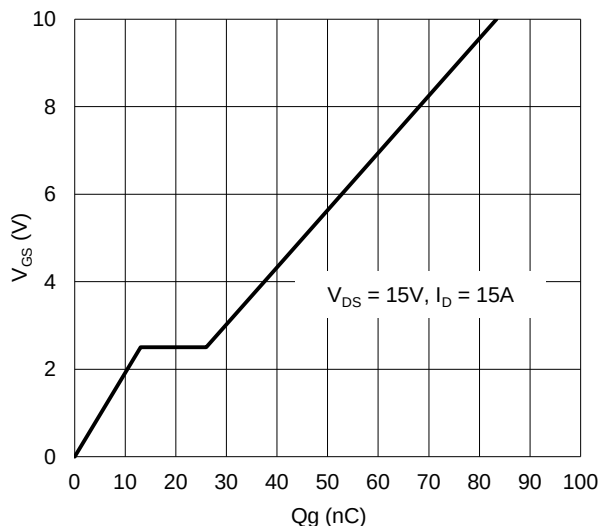
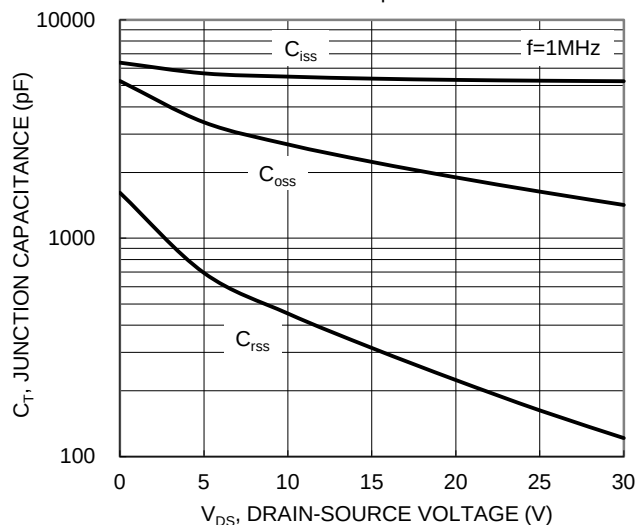
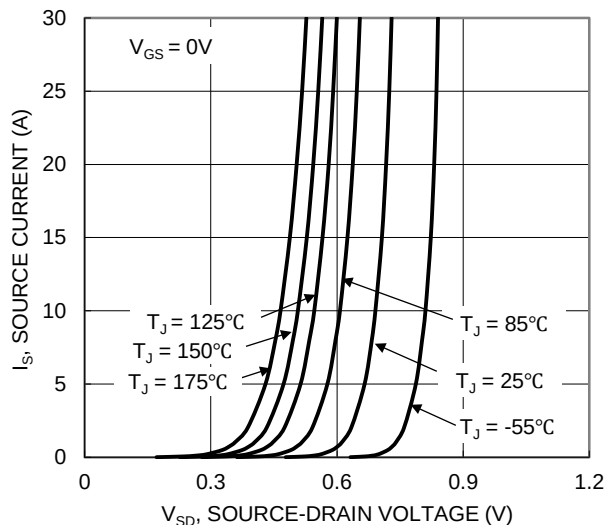
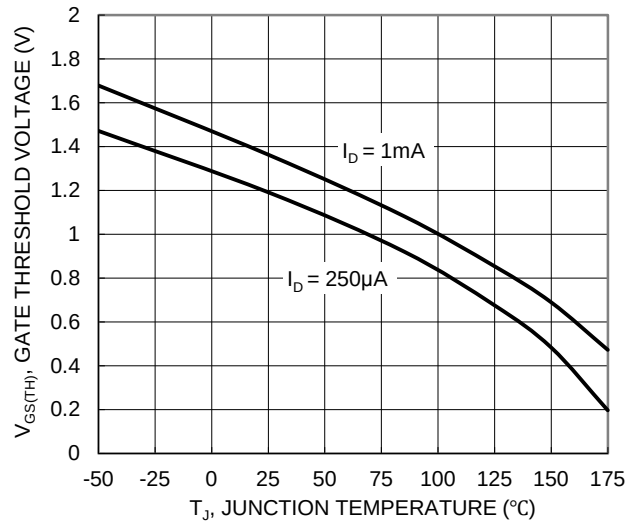
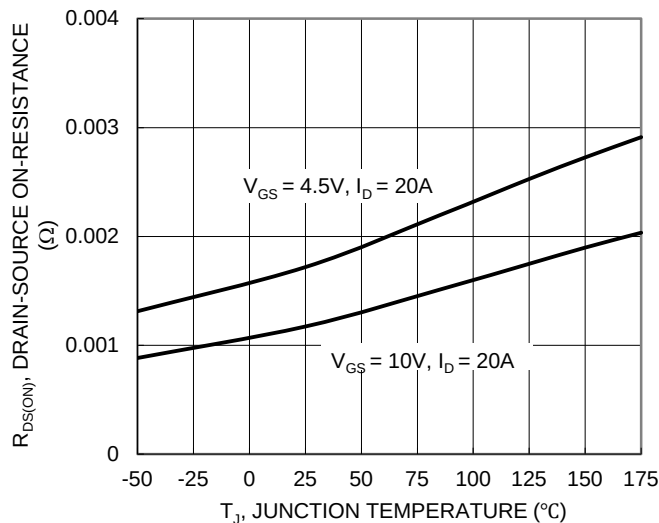


Figure 6. On-Resistance Variation with Temperature



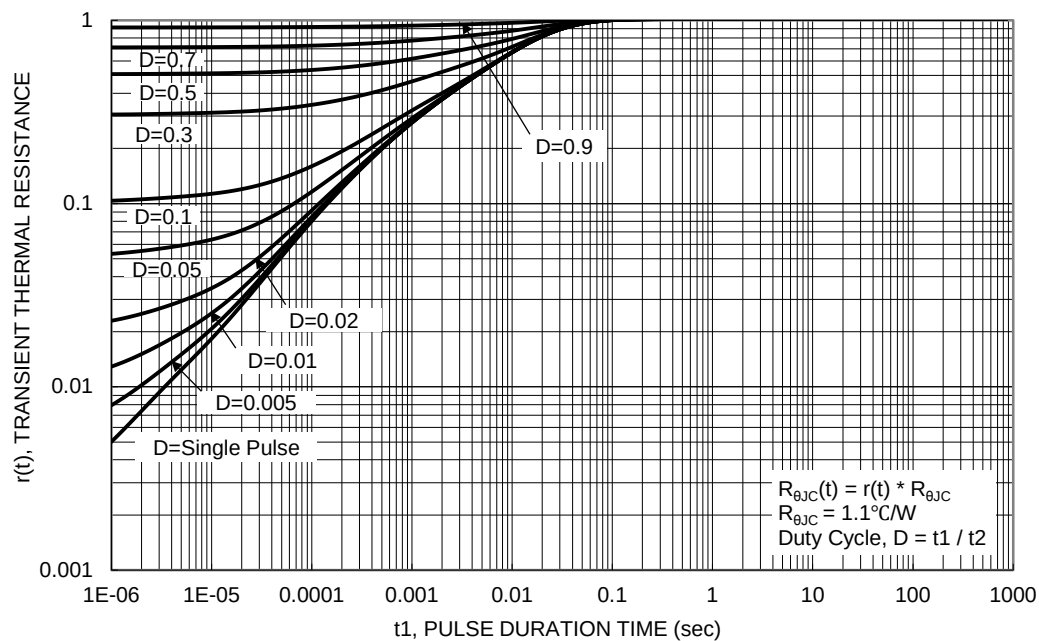
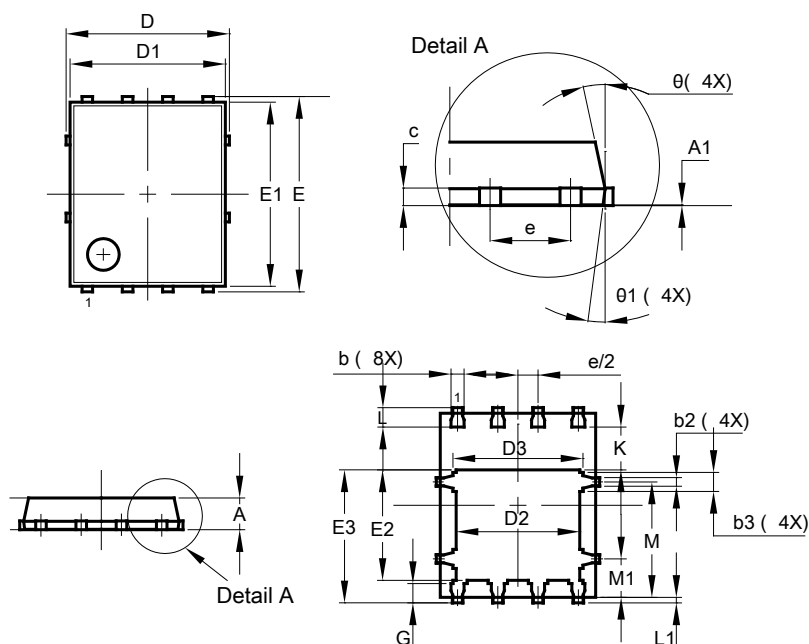


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

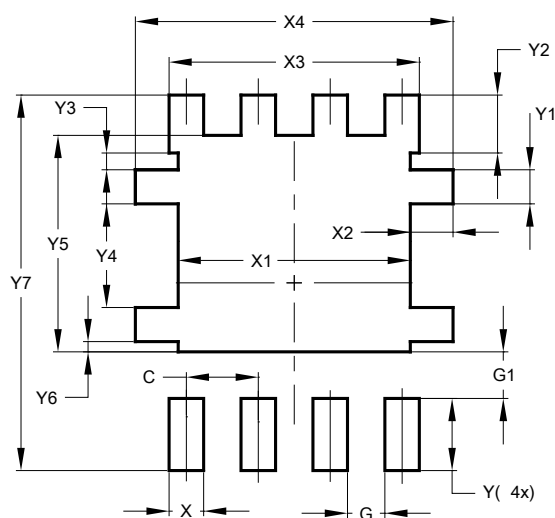
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



PowerDI5060-8			
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
theta	10°	12°	11°
theta1	6°	8°	7°
All Dimensions in mm			

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.



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

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