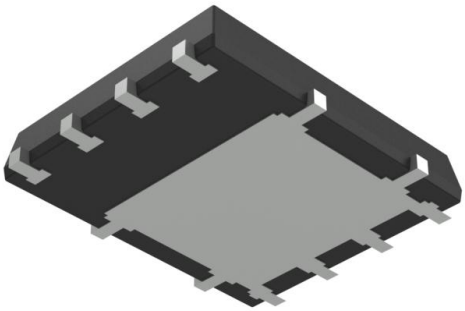
DMTH6004SPS-13 Datasheet



DiGi Electronics Part Number	DMTH6004SPS-13-DG
Manufacturer	Diodes Incorporated
Manufacturer Product Number	DMTH6004SPS-13
Description	MOSFET N-CH 60V 25A PWRDI5060
Detailed Description	N-Channel 60 V 25A (Ta), 100A (Tc) 2.1W (Ta), 167W (Tc) Surface Mount PowerDI5060-8

Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
DMTH6004SPS-13	Diodes Incorporated
Series:	Product Status:
-	Active
FET Type:	Technology:
N-Channel	MOSFET (Metal Oxide)
Drain to Source Voltage (Vdss):	Current - Continuous Drain (Id) @ 25°C:
60 V	25A (Ta), 100A (Tc)
Drive Voltage (Max Rds On, Min Rds On):	Rds On (Max) @ Id, Vgs:
10V	3.1mOhm @ 50A, 10V
Vgs(th) (Max) @ Id:	Gate Charge (Qg) (Max) @ Vgs:
4V @ 250µA	95.4 nC @ 10 V
Vgs (Max):	Input Capacitance (Ciss) (Max) @ Vds:
±20V	4556 pF @ 30 V
FET Feature:	Power Dissipation (Max):
-	2.1W (Ta), 167W (Tc)
Operating Temperature:	Mounting Type:
-55°C ~ 175°C (TJ)	Surface Mount
Supplier Device Package:	Package / Case:
PowerDI5060-8	8-PowerTDFN
Base Product Number:	
DMTH6004	

Environmental & Export classification

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8541.29.0095	

DMTH6004SPS

60V 175°C N-CHANNEL ENHANCEMENT MODE MOSFET
PowerDI5060-8

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_C = +25°C (Note 9)
60V	3.1mΩ @ V_{GS} = 10V	100A

Features

- 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
- Low $R_{DS(ON)}$ – Minimizes Power Losses
- Low Q_g – Minimizes Switching Losses
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **An automotive-compliant part is available under separate datasheet (DMTH6004SPSQ)**

Description and Applications

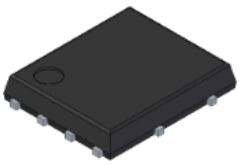
This new generation MOSFET features low on-resistance and fast switching, making it ideal for high-efficiency power-management applications.

- DC motor controls
- Synchronous rectifications
- DC/DC converters

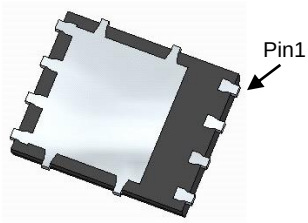
Mechanical Data

- 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
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.097 grams (Approximate)

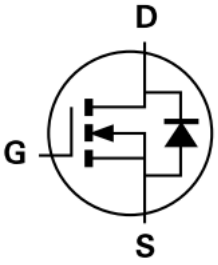
PowerDI5060-8



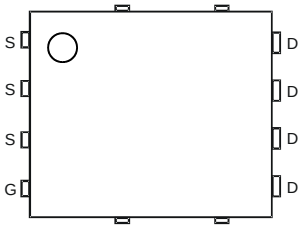
Top View



Bottom View



Internal Schematic



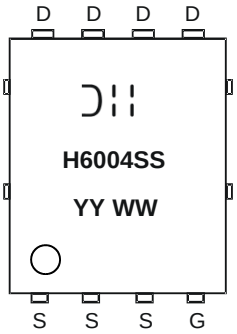
Top View
Pin Configuration

Ordering Information (Note 4)

Orderable Part Number	Package	Packing	
		Qty.	Carrier
DMTH6004SPS-13	PowerDI5060-8	2,500	Tape & Reel

Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
2. 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.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



= Manufacturer's Marking
H6004SS = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 24 = 2024)
WW = Week (01 to 53)

DMTH6004SPS

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 (Note 5)	Steady state	T_A = +25°C T_A = +70°C	I_D	25 21	A
Continuous Drain Current (Notes 6 & 9)		T_C = +25°C T_C = +100°C	I_D	100 100	A
Maximum Continuous Body Diode Forward Current (Notes 6 & 9)			I_S	100	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	400	A
Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%)			I_{SM}	400	A
Avalanche Current, L = 0.2mH			I_{AS}	45	A
Avalanche Energy, L = 0.2mH			E_{AS}	200	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	3.2	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	47	°C/W
Total Power Dissipation (Note 6)	T_C = +25°C	P_D	167	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	0.9	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	°C

Electrical Characteristics (@T_A = +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 = 1mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 48V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	2	—	4	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	2.5	3.1	mΩ	V_{GS} = 10V, I_D = 50A
Diode Forward Voltage	V_{SD}	—	0.9	1.2	V	V_{GS} = 0V, I_S = 20A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	4556	—	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	1383	—		
Reverse Transfer Capacitance	C_{rss}	—	105.2	—		
Gate Resistance	R_g	—	0.66	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge	Q_g	—	95.4	—	nC	V_{DD} = 30V, I_D = 90A, V_{GS} = 10V
Gate-Source Charge	Q_{gs}	—	21.6	—		
Gate-Drain Charge	Q_{gd}	—	20.4	—		
Turn-On Delay Time	$t_{D(ON)}$	—	13.2	—	ns	V_{DD} = 30V, V_{GS} = 10V, I_D = 90A, R_G = 3.5Ω
Turn-On Rise Time	t_R	—	11.7	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	31	—		
Turn-Off Fall Time	t_F	—	12	—		
Body Diode Reverse-Recovery Time	t_{RR}	—	50.5	—	ns	I_F = 50A, di/dt = 100A/µs
Body Diode Reverse-Recovery Charge	Q_{RR}	—	80.8	—	nC	

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.
9. Package limited.

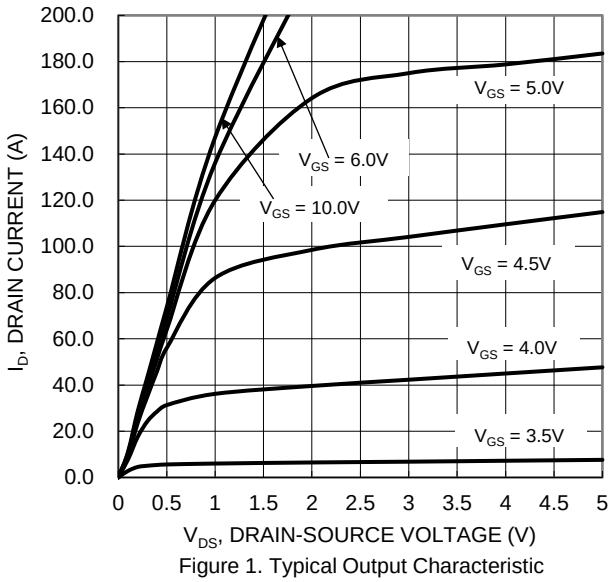


Figure 1. Typical Output Characteristic

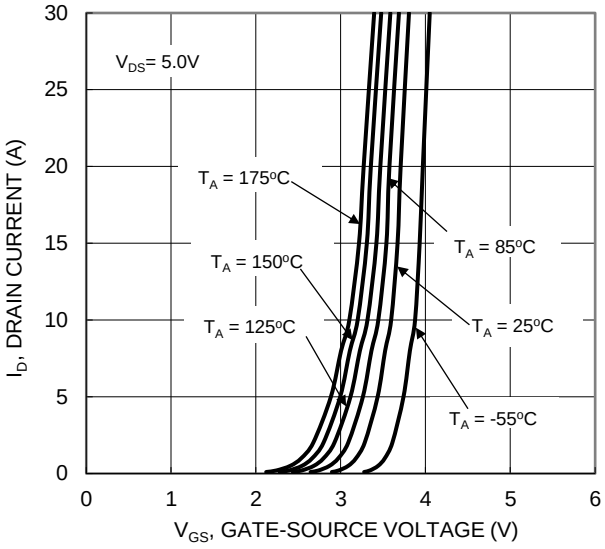


Figure 2. Typical Transfer Characteristic

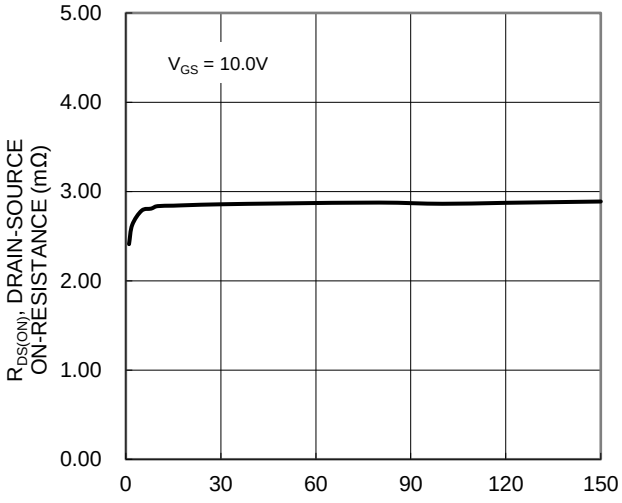


Figure 3. Typical On-Resistance vs Drain Current and Gate Voltage

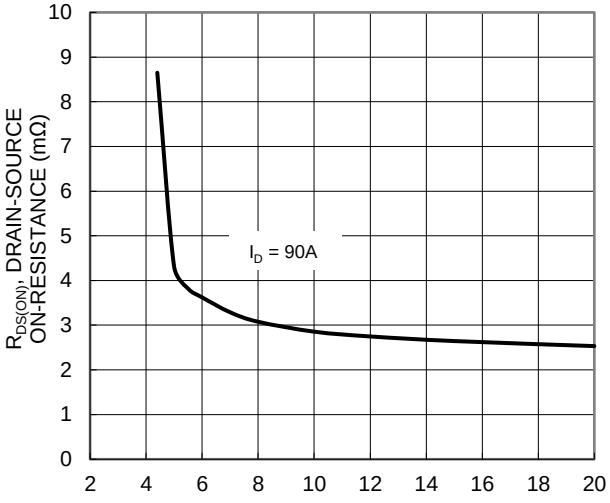


Figure 4. Typical Transfer Characteristic

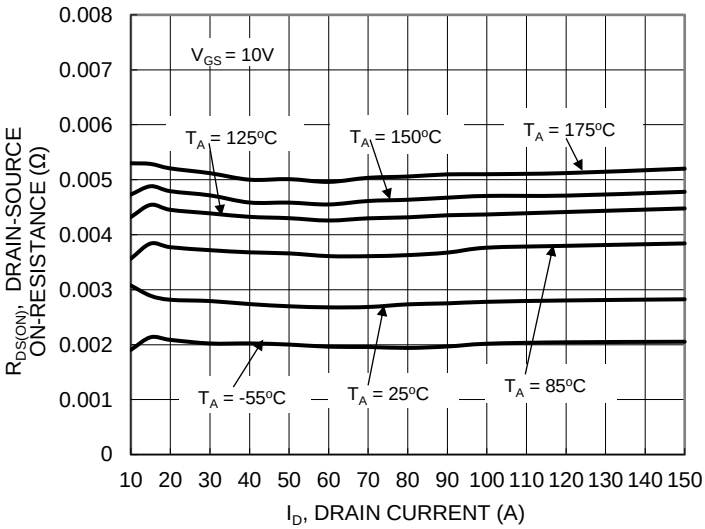


Figure 5. Typical On-Resistance vs Drain Current and Temperature

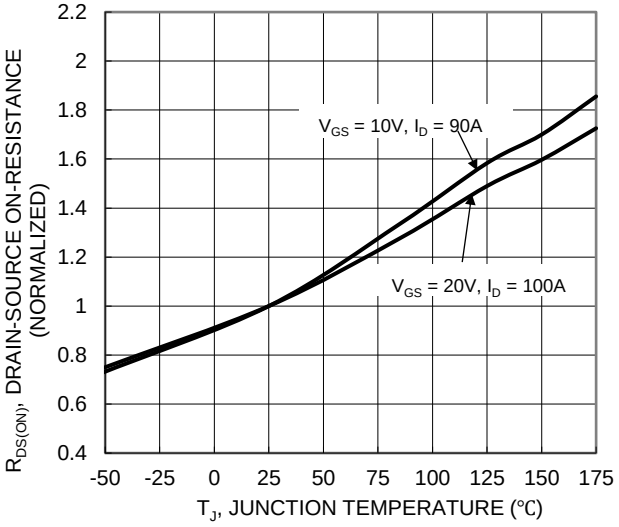


Figure 6. On-Resistance Variation with Temperature

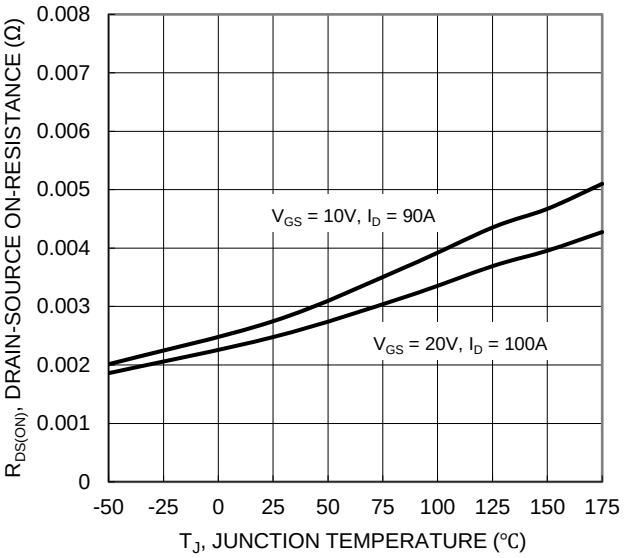


Figure 7. On-Resistance Variation with Temperature

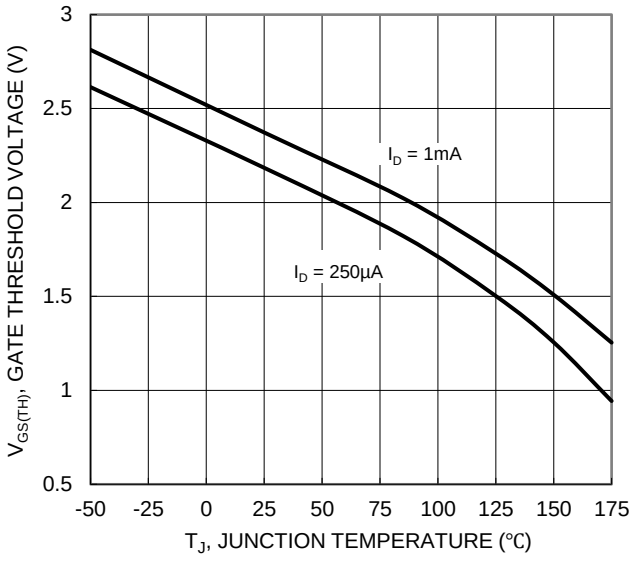


Figure 8. Gate Threshold Variation vs Temperature

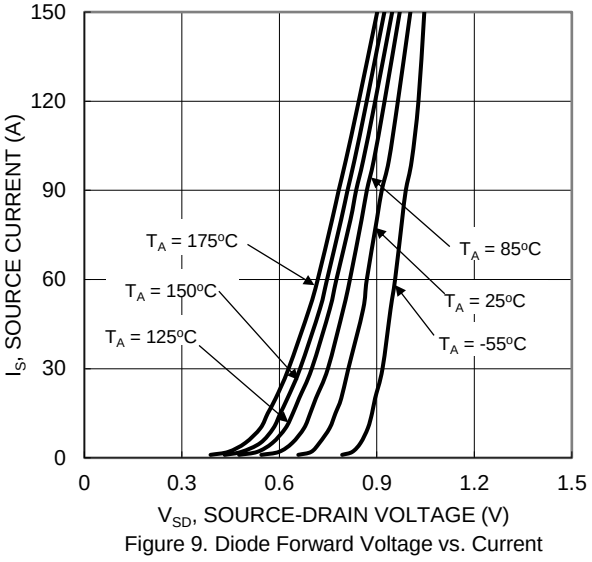


Figure 9. Diode Forward Voltage vs. Current

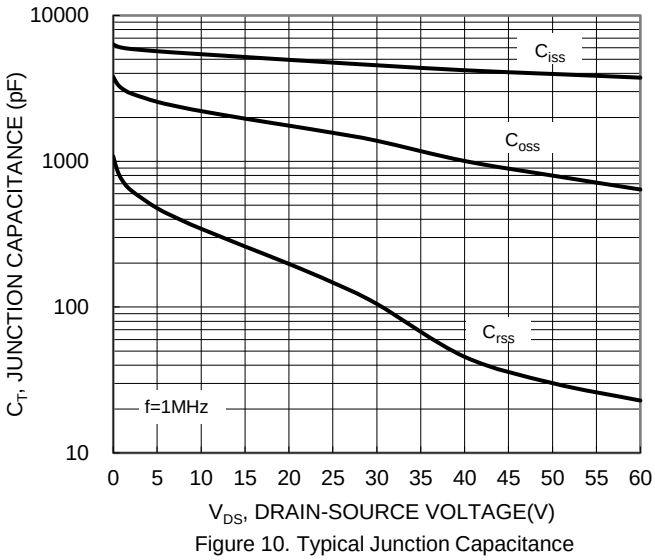


Figure 10. Typical Junction Capacitance

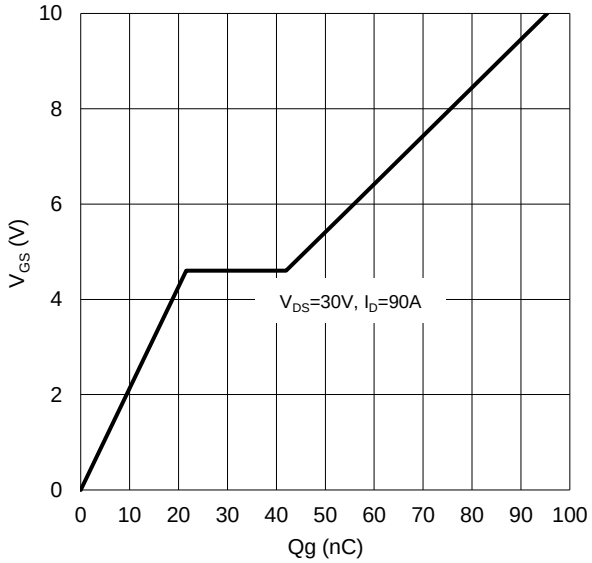


Figure 11. Gate Charge

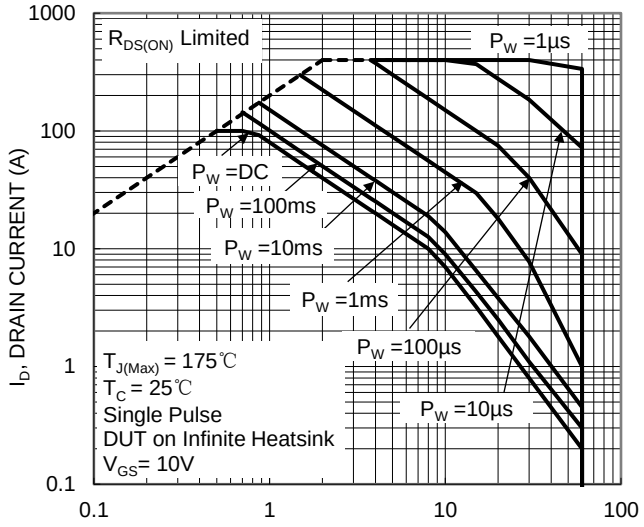


Figure 12. SOA, Safe Operation Area

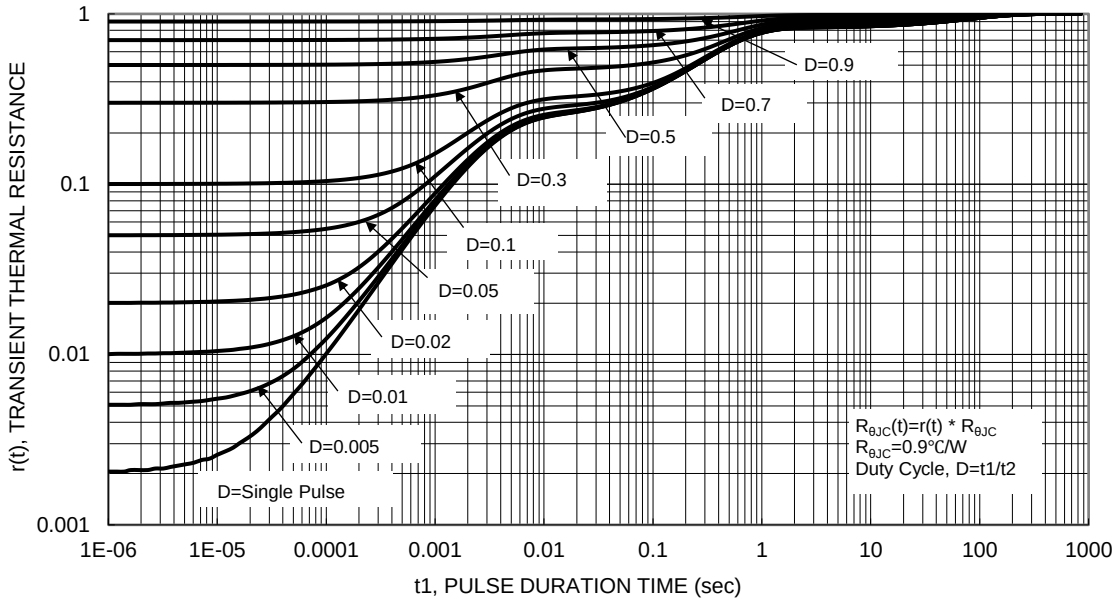
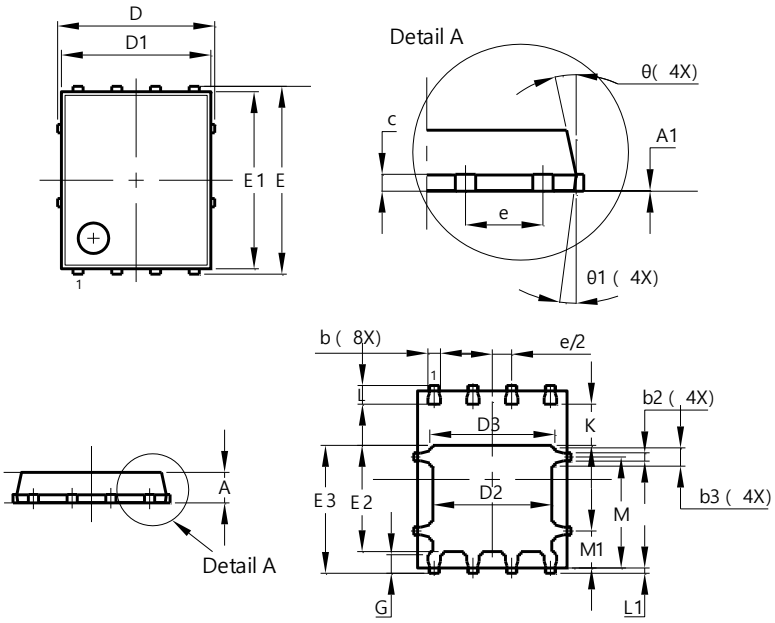


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI5060-8

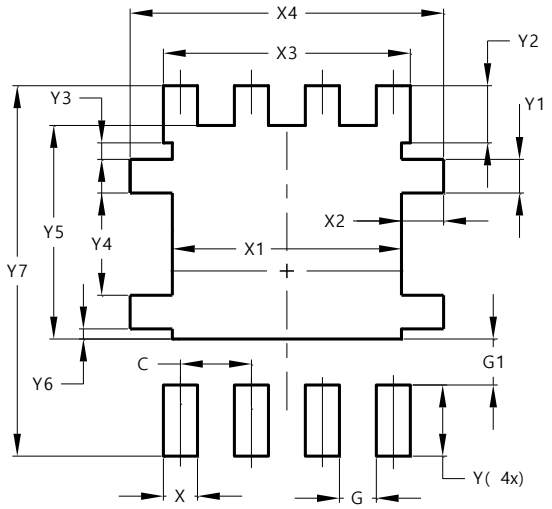


PowerDI5060-8			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.10	1.00
A1	0.00	0.05	–
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G	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
Θ	10°	12°	11°
Θ1	6°	8°	7°
All Dimensions in mm			

Suggested Pad Layout

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

PowerDI5060-8



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

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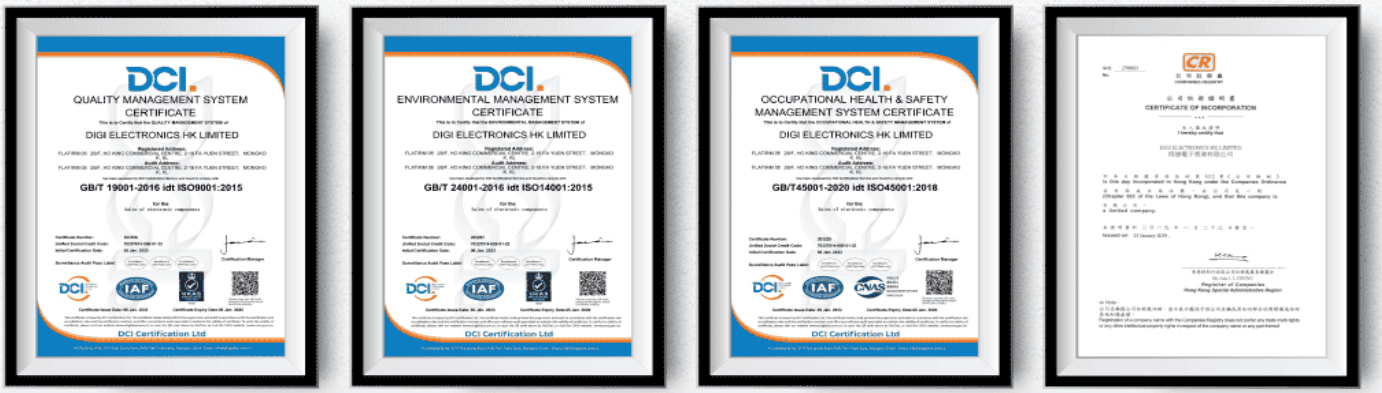

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