



**THE DATASHEET OF
DF51K-12DP-2DS(805)**



Product Summary

BV _{DSS}	R _{DS(ON)} Max	I _D Max T _A = +25°C
40V	11.5mΩ @ V _{GS} = 10V	11.6A
	18mΩ @ V _{GS} = 4.5V	9.3A

Description

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:

- Power-management functions
- DC-DC converters
- Backlighting

Features

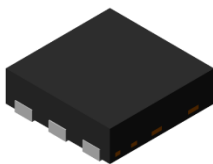
- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low R_{DS(ON)} – Ensures On State Losses Are Minimized
- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm²
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**
- **The DMTH4008LFDFWQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

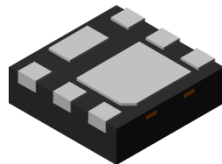
Mechanical Data

- Package: U-DFN2020-6
- 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: 0.0065 grams (Approximate)

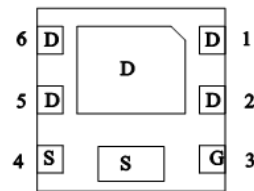
U-DFN2020-6/SWP (Type F)



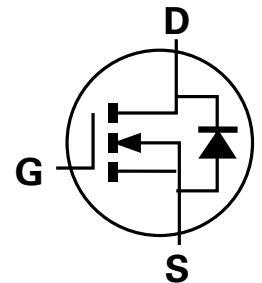
Top View



Bottom View



Pin Out
Bottom View



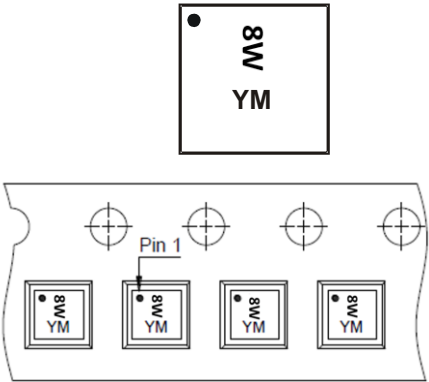
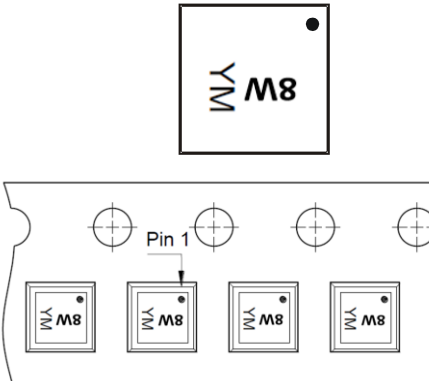
Internal Schematic

Ordering Information (Note 4)

Orderable Part Number	Package	Packing	
		Qty.	Carrier
DMTH4008LFDFWQ-7	U-DFN2020-6/SWP (Type F)	3,000	Reel
DMTH4008LFDFWQ-13	U-DFN2020-6/SWP (Type F)	10,000	Reel
DMTH4008LFDFWQ-7R	U-DFN2020-6/SWP (Type F)	3,000	Reel
DMTH4008LFDFWQ-13R	U-DFN2020-6/SWP (Type F)	10,000	Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 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

DMTH4008LFDFWQ-7 DMTH4008LFDFWQ-13	 <p style="margin-left: 20px;">8W = Product Type Marking Code YM = Date Code Marking Y = Year (ex: M = 2025) M = Month (ex: 9 = September)</p>
DMTH4008LFDFWQ-7R DMTH4008LFDFWQ-13R	 <p style="margin-left: 20px;">8W = Product Type Marking Code YM = Date Code Marking Y = Year (ex: M = 2025) M = Month (ex: 9 = September)</p>

Date Code Key

Year	2017	-	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Code	E	-	M	N	P	R	S	T	U	V	W	X
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V _{DSS}	40	V
Gate-Source Voltage	V _{GSS}	±20	V
Continuous Drain Current (Note 5) V _{GS} = 10V	I _D	T _A = +25°C	11.6
		T _A = +100°C	8.2
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I _{DM}	80	A
Continuous Source-Drain Diode Current (Note 5)	I _S	2.55	A
Pulsed Source-Drain Diode Current (10µs Pulse, Duty Cycle = 1%)	I _{SM}	80	A
Avalanche Current, L = 0.3mH (Note 6)	I _{AS}	14.7	A
Avalanche Energy, L = 0.3mH (Note 6)	E _{AS}	32.4	mJ

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 6. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 7)	T _A = +25°C	P _D	0.99	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	R _{θJA}	153	°C/W
Total Power Dissipation (Note 5)	T _A = +25°C	P _D	2.35	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R _{θJA}	64.5	°C/W
Thermal Resistance, Junction to Case (Note 5)	T _C = +25°C	R _{θJC}	14.8	°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 8)						
Drain-Source Breakdown Voltage	BV _{DSS}	40	—	—	V	V _{GS} = 0V, I _D = 250μA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	1	μA	V _{DS} = 32V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	V _{GS(TH)}	1	1.7	3	V	V _{DS} = V _{GS} , I _D = 250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	9.1	11.5	mΩ	V _{GS} = 10V, I _D = 10A
			12.9	18		V _{GS} = 4.5V, I _D = 8.5A
Diode Forward Voltage	V _{SD}	—	0.8	1.0	V	V _{GS} = 0V, I _S = 10A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C _{iss}	—	1030	—	pF	V _{DS} = 20V, V _{GS} = 0V, f = 1MHz
Output Capacitance	C _{oss}	—	324	—		
Reverse Transfer Capacitance	C _{rss}	—	27	—		
Gate Resistance	R _g	—	1.82	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 4.5V)	Q _g	—	6.8	—	nC	V _{DD} = 20V, I _D = 10A
Total Gate Charge (V _{GS} = 10V)	Q _g	—	14.2	—		
Gate-Source Charge	Q _{gs}	—	2.0	—		
Gate-Drain Charge	Q _{gd}	—	2.7	—		
Turn-On Delay Time	t _{D(ON)}	—	3.1	—	ns	V _{DD} = 20V, V _{GS} = 10V, R _g = 6Ω, I _D = 10A
Turn-On Rise Time	t _r	—	3.1	—		
Turn-Off Delay Time	t _{D(OFF)}	—	14.2	—		
Turn-Off Fall Time	t _f	—	5.8	—		
Reverse-Recovery Time	t _{RR}	—	19.6	—	ns	I _F = 10A, di/dt = 100A/μs
Reverse-Recovery Charge	Q _{RR}	—	8.2	—	nC	

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 - I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

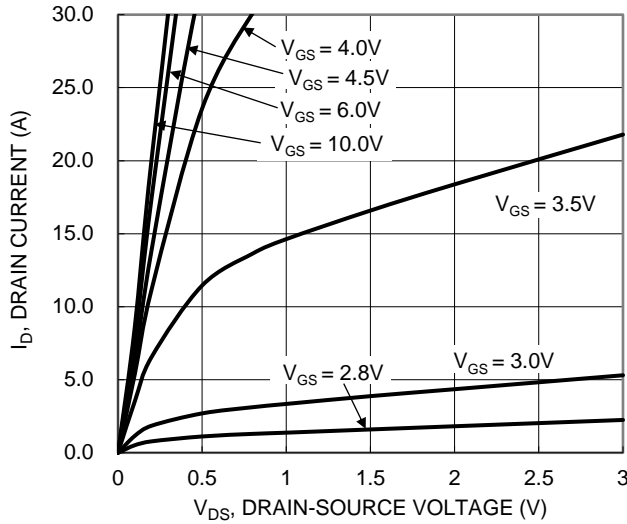


Figure 1. Typical Output Characteristic

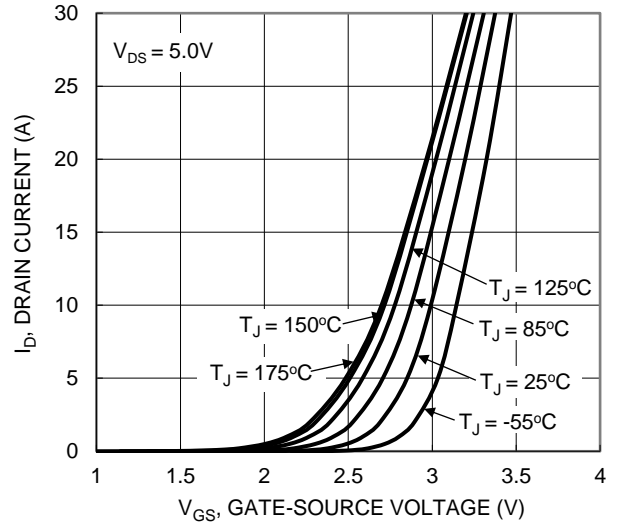


Figure 2. Typical Transfer Characteristic

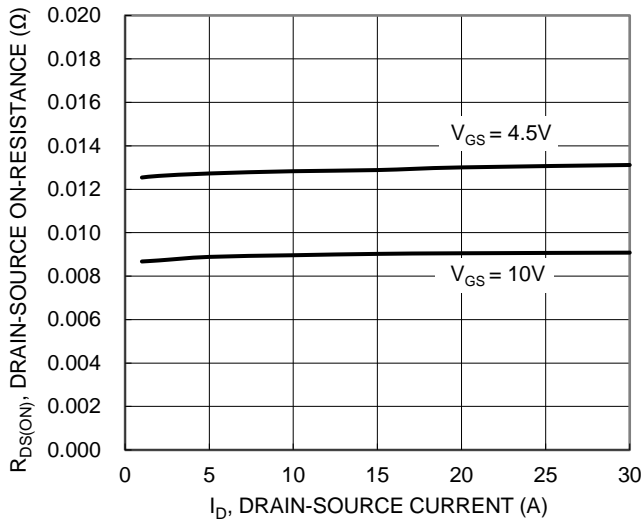


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

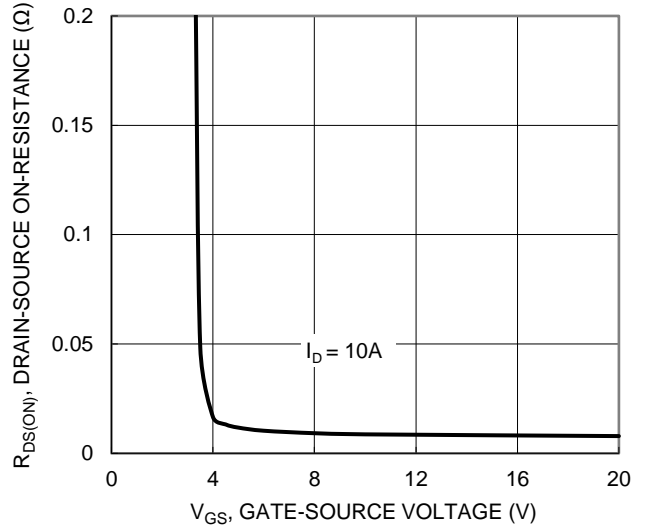


Figure 4. Typical Transfer Characteristic

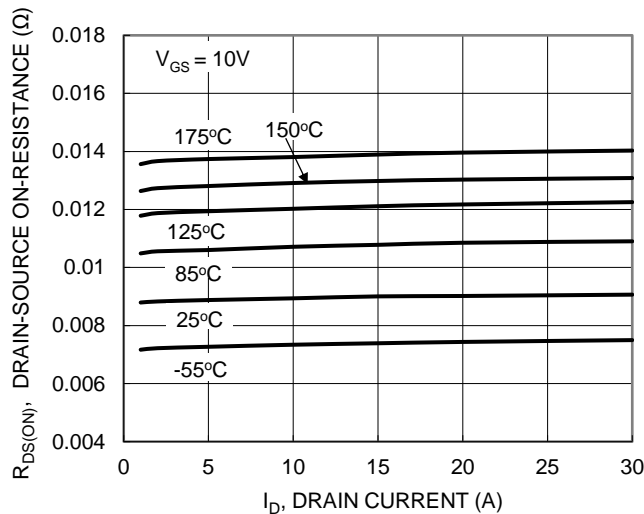


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

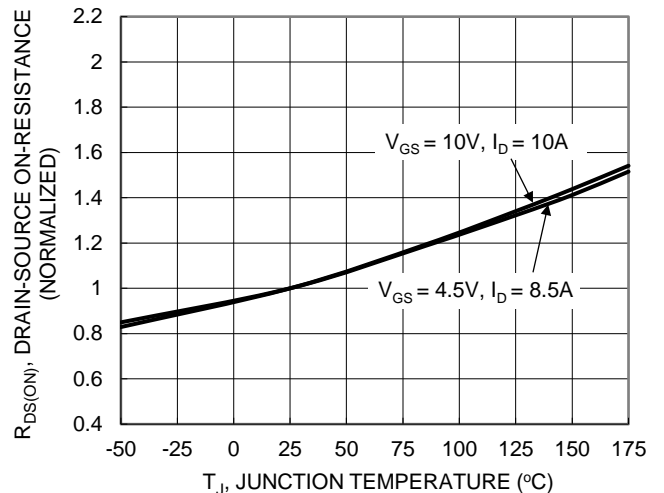


Figure 6. On-Resistance Variation with Temperature

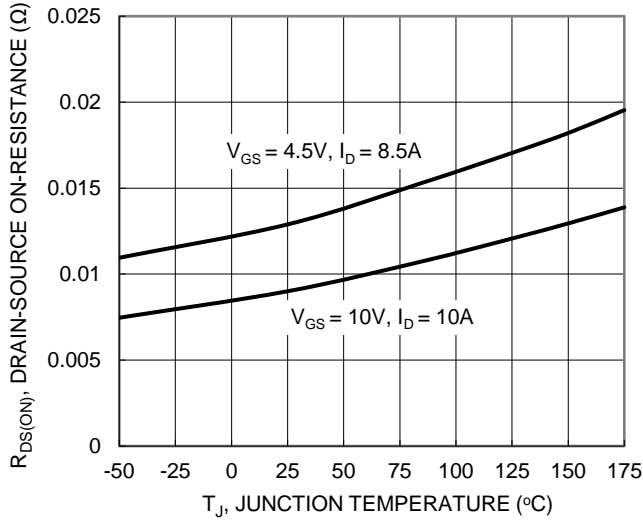


Figure 7. On-Resistance Variation with Temperature

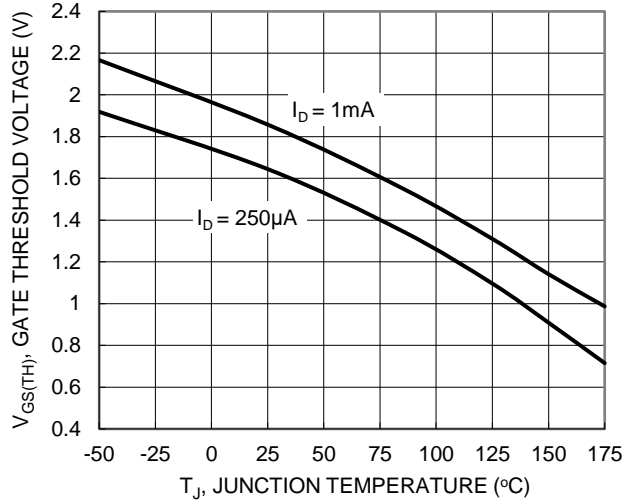


Figure 8. Gate Threshold Variation vs. Junction Temperature

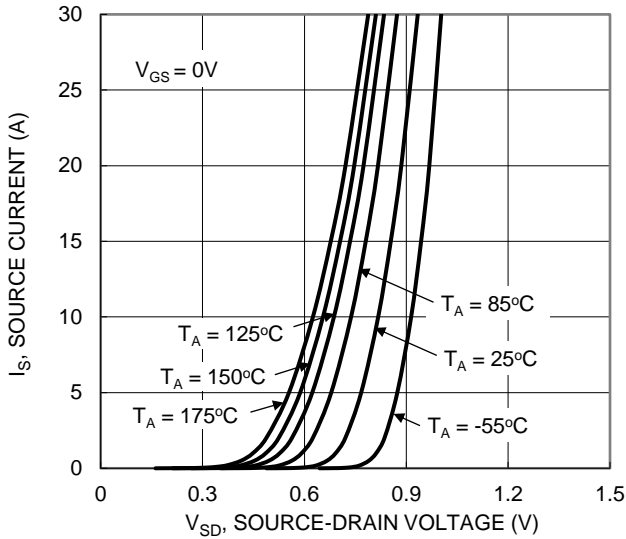


Figure 9. Diode Forward Voltage vs. Current

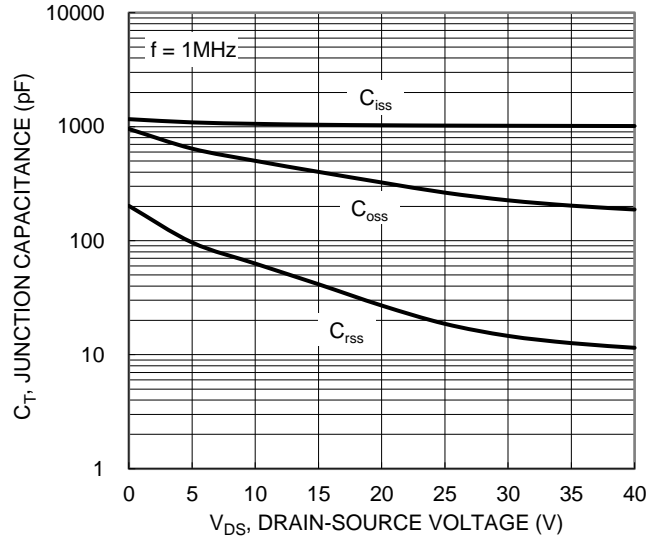


Figure 10. Typical Junction Capacitance

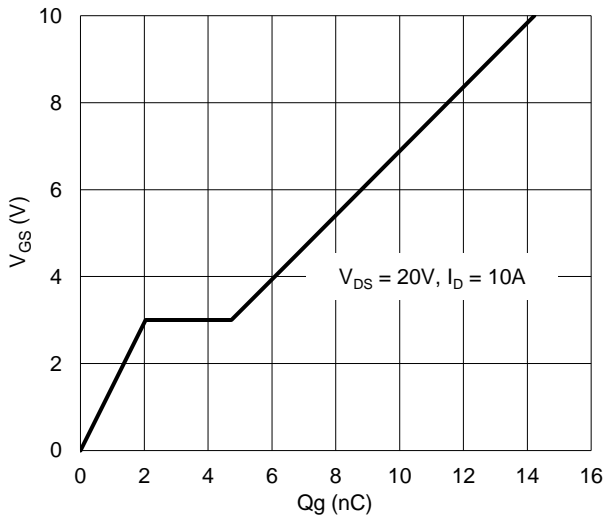


Figure 11. Gate Charge

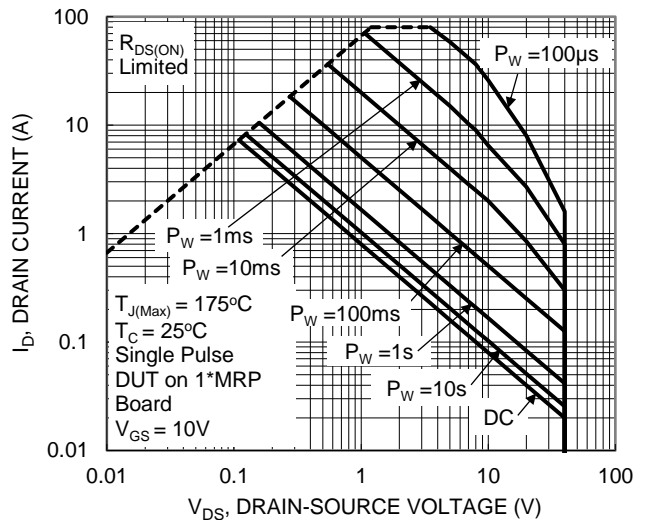


Figure 12. SOA, Safe Operation Area

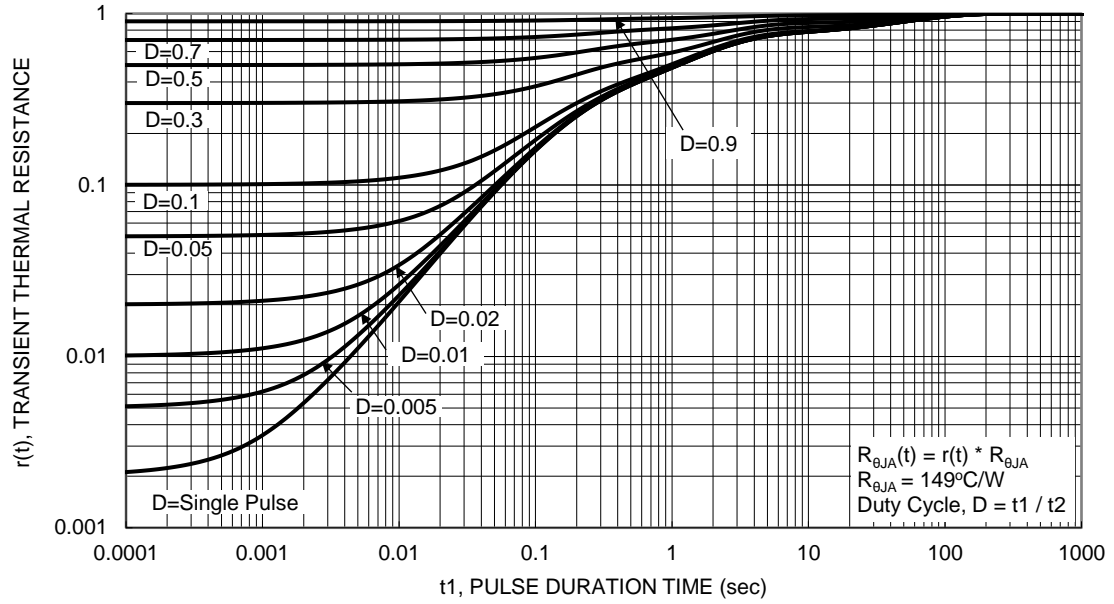


Figure 13. Transient Thermal Resistance

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