60V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_C = +25°C
60V	10.5mΩ @ V_{GS} = 10V	75A
	15mΩ @ V_{GS} = 4.5V	62A

Features and Benefits

- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- Low On-Resistance
- Low Input Capacitance
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Description and Applications

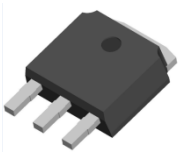
This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

- Motor Control
- Backlighting

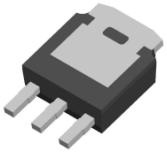
Mechanical Data

- Case: TO251
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.33 grams (Approximate)

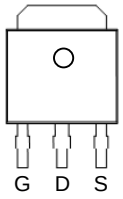
TO251 (Type TH3)



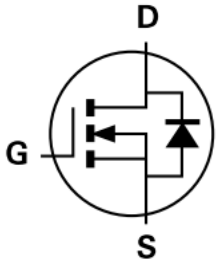
Top View



Bottom View



Top View
Pin Configuration



Internal Schematic

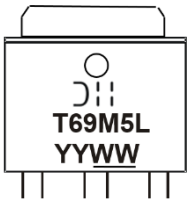
Ordering Information (Note 4)

Part Number	Case	Packaging
DMT69M5LH3	TO251 (Type TH3)	75 Pieces / Tube

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

TO251 (Type TH3)



= Manufacturer's Marking
T69M5L = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 20 = 2020)
WW = Week (01 to 53)

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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 6) V_{GS} = 10V	T_C = +25°C T_C = +70°C	I_D	75 60	A
Maximum Body Diode Forward Current (Note 6)		I_S	75	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I_{DM}	300	A
Pulsed Body Diode Current (10µs Pulse, Duty Cycle = 1%)		I_{SM}	300	A
Avalanche Current, L = 0.1mH		I_{AS}	27.4	A
Avalanche Energy, L = 0.1mH		E_{AS}	37.5	mJ

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	3.3	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	38	°C/W
Total Power Dissipation (Note 6)	T_C = +25°C	P_D	96	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	1.3	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°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 = 250µA
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	$V_{GS(TH)}$	1.4	—	2.5	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	5.8	10.5	mΩ	V_{GS} = 10V, I_D = 20A
		—	8.5	15		V_{GS} = 4.5V, I_D = 20A
Diode Forward Voltage	V_{SD}	—	0.8	1.2	V	V_{GS} = 0V, I_S = 1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	1406	—	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	540	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	52	—	pF	
Gate Resistance	R_g	—	1.85	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 10V)	Q_g	—	28.4	—	nC	V_{DS} = 30V, I_D = 13.5A
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	15.4	—	nC	
Gate-Source Charge	Q_{gs}	—	2.4	—	nC	
Gate-Drain Charge	Q_{gd}	—	9.0	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	10.5	—	ns	V_{DD} = 30V, V_{GS} = 10V, R_G = 6Ω, I_D = 13.5A
Turn-On Rise Time	t_R	—	49.0	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	30.9	—	ns	
Turn-Off Fall Time	t_F	—	79.5	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	26.7	—	ns	I_F = 13.5A, di/dt = 300A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	44.8	—	nC	

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
6. Device mounted on infinite heatsink.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.

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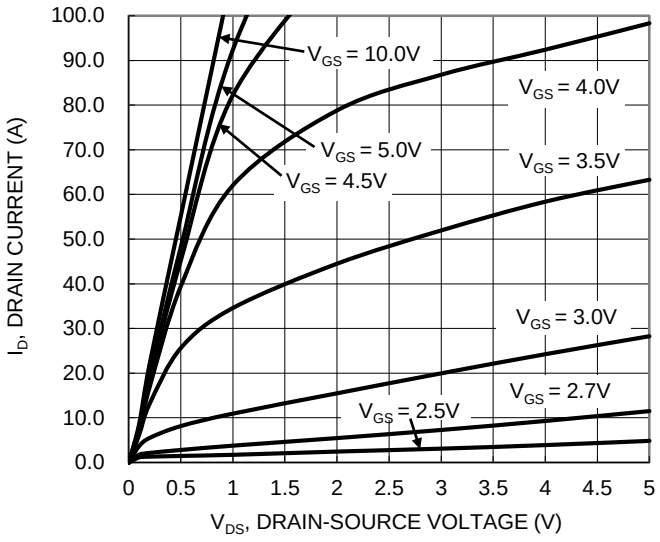


Figure 1. Typical Output Characteristic

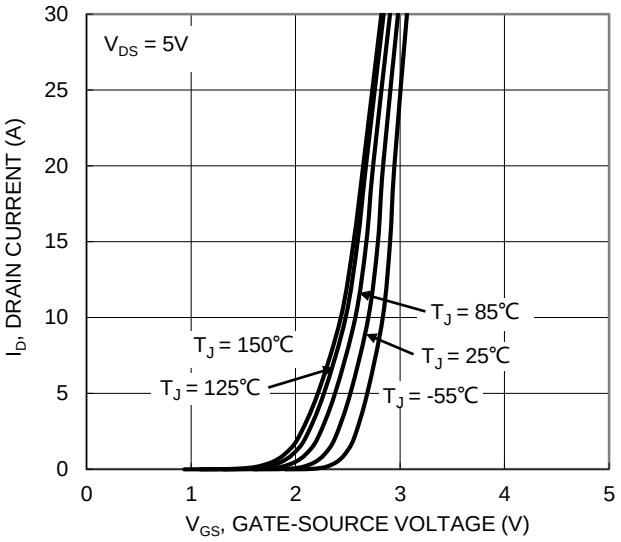


Figure 2. Typical Transfer Characteristic

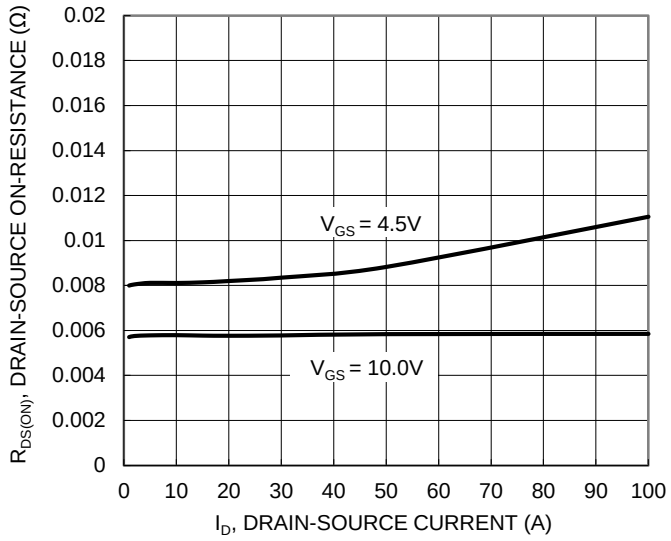


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

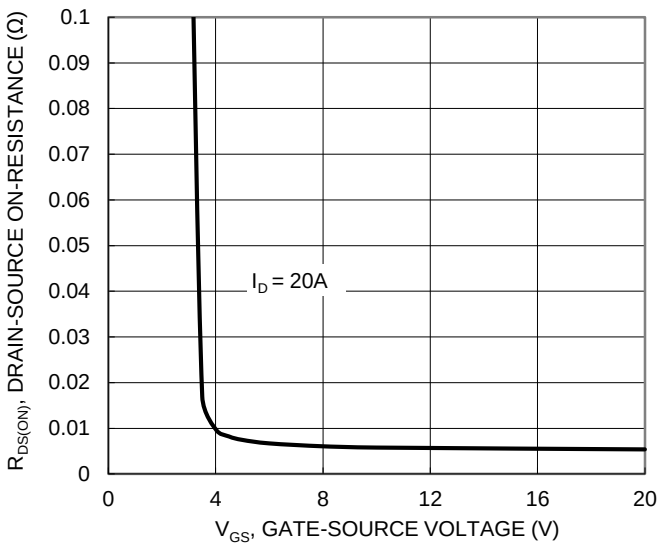


Figure 4. Typical Transfer Characteristic

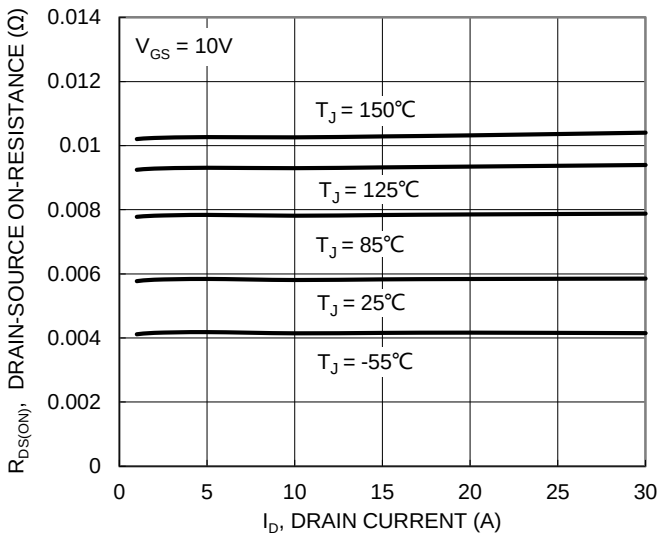


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

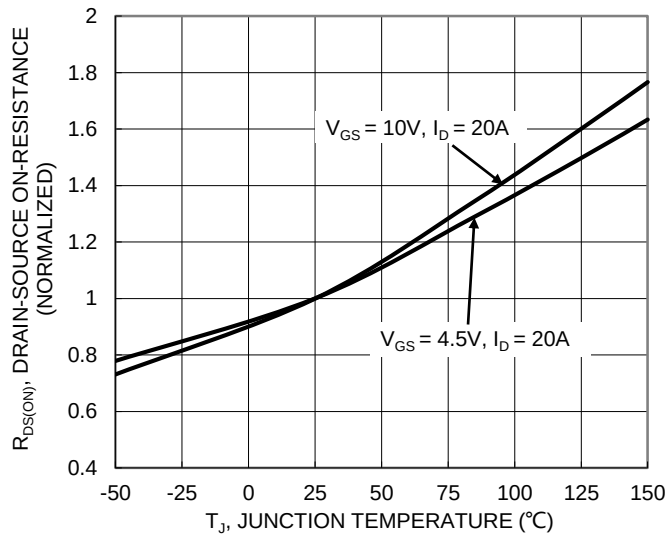


Figure 6. On-Resistance Variation with Junction Temperature

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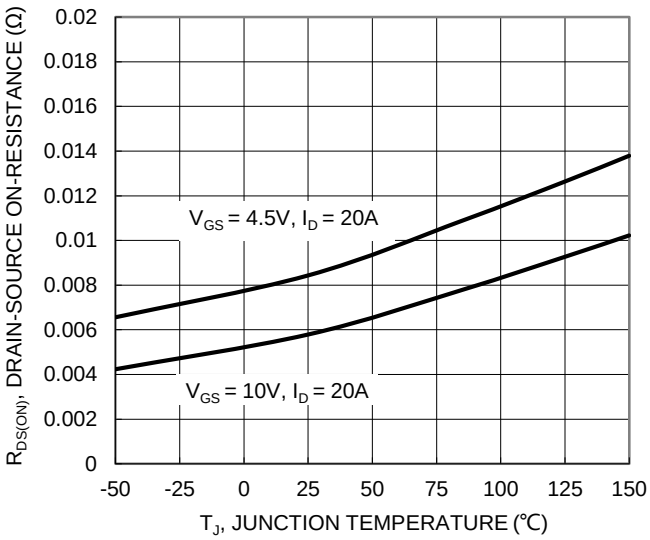


Figure 7. On-Resistance Variation with Junction Temperature

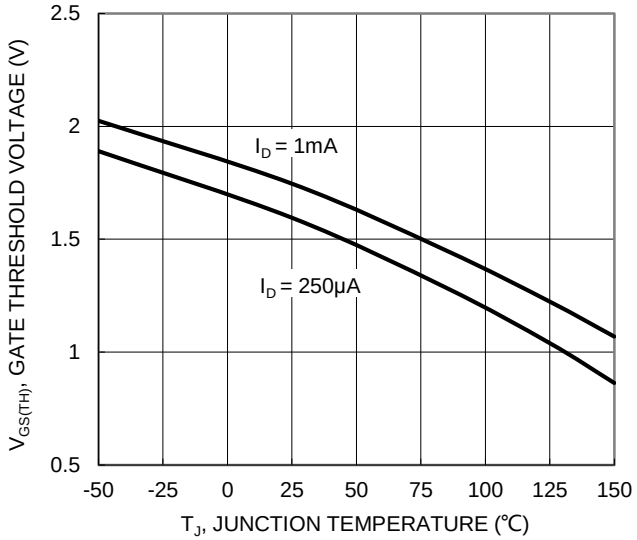


Figure 8. Gate Threshold Variation vs. Junction Temperature

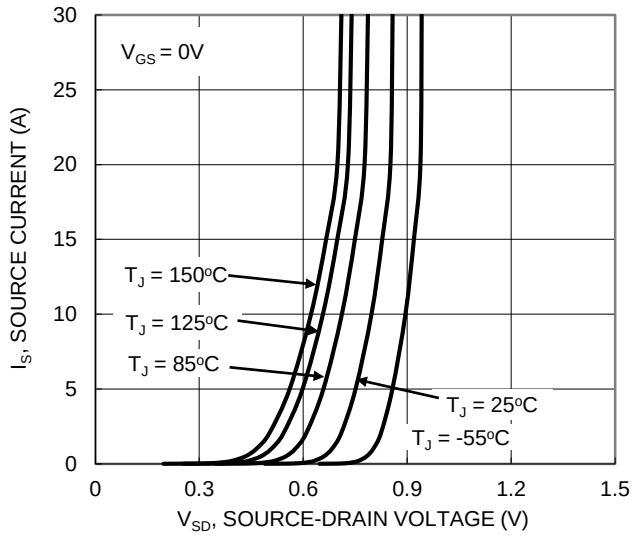


Figure 9. Diode Forward Voltage vs. Current

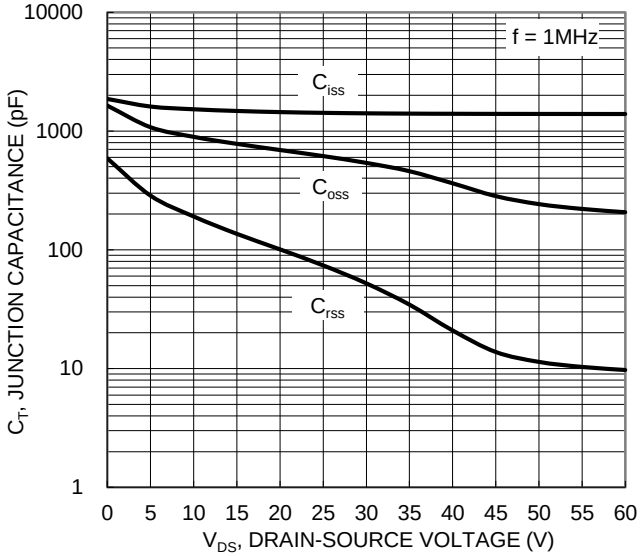


Figure 10. Typical Junction Capacitance

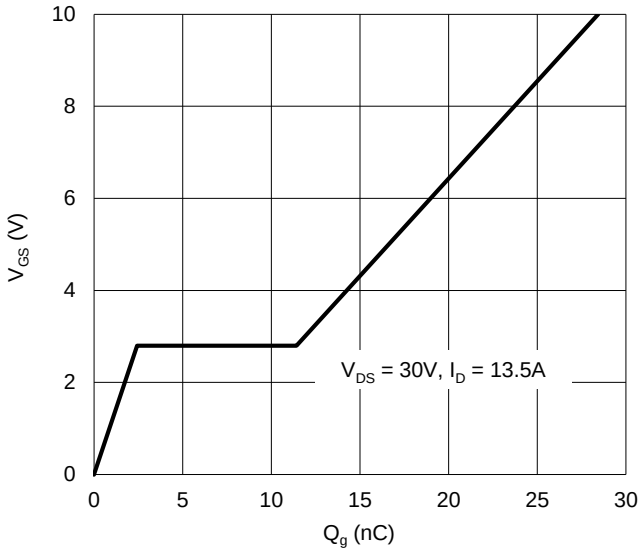


Figure 11. Gate Charge

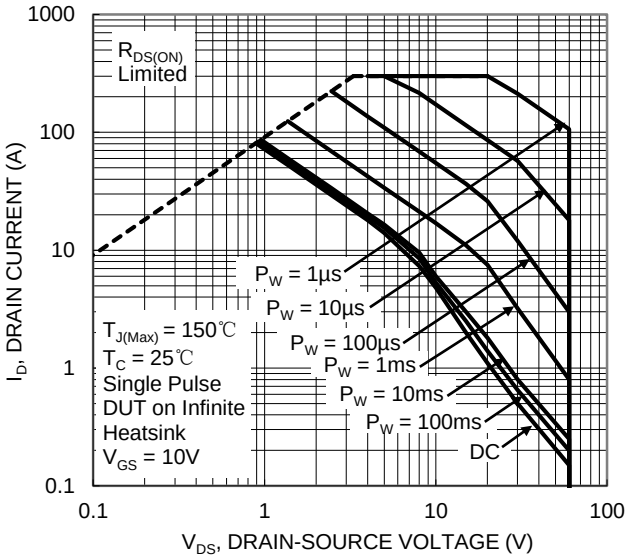


Figure 12. SOA, Safe Operation Area

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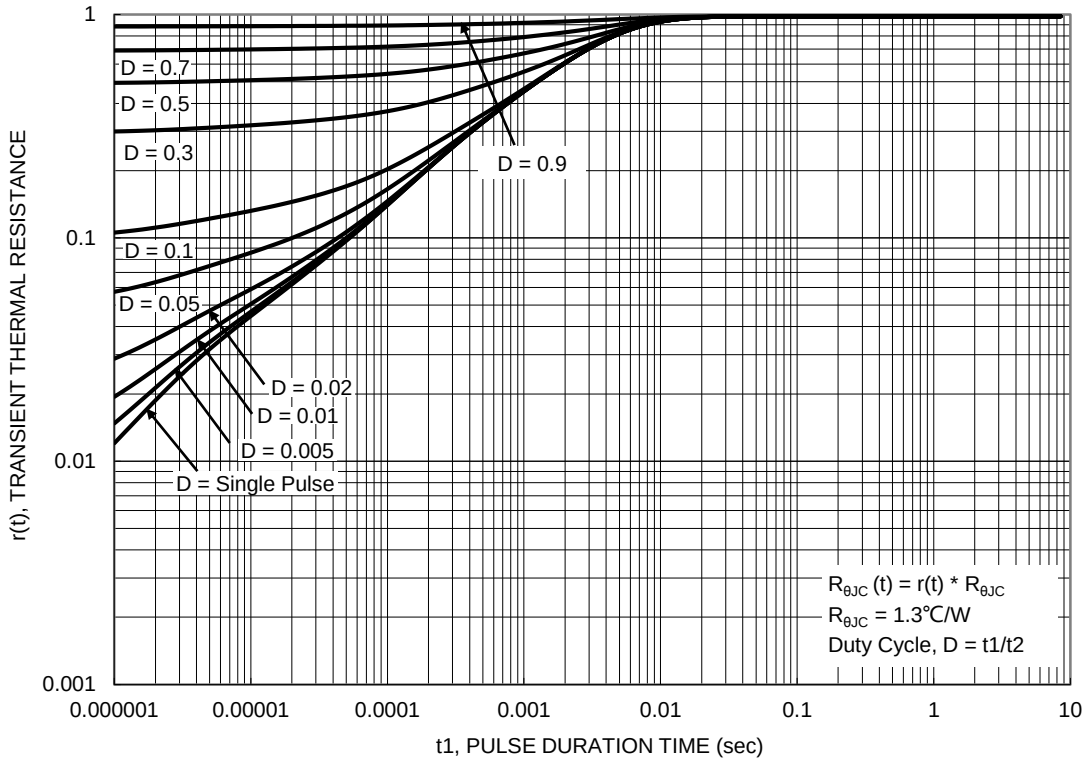


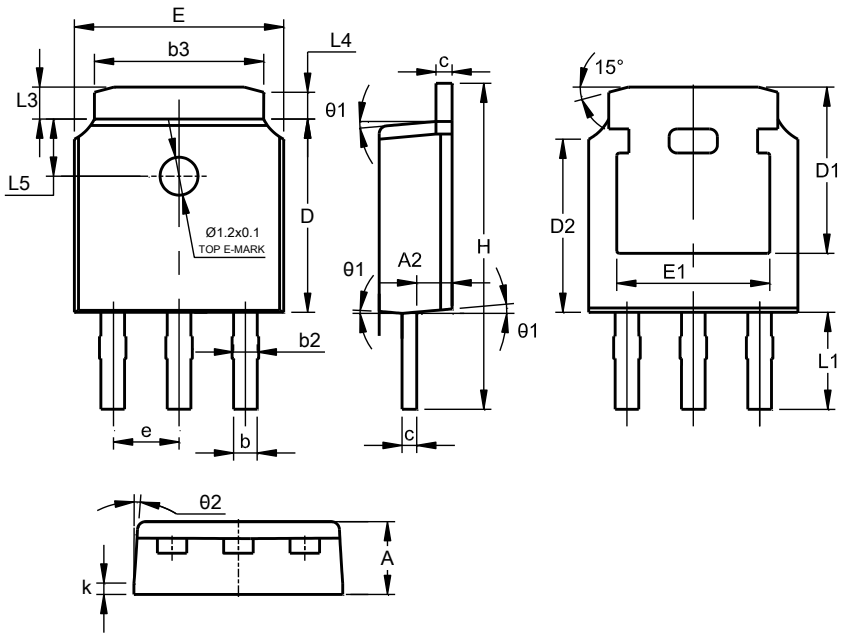
Figure 13. Transient Thermal Resistance

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Package Outline Dimensions

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

TO251 (Type TH3)



TO251 (Type TH3)			
Dim	**Min**	**Max**	**Typ**
A	2.20	2.40	2.30
A2	0.97	1.17	1.07
b	0.68	0.90	0.78
b2	0.76	0.95	0.84
b3	5.20	5.50	5.33
c	0.43	0.63	0.53
D	5.98	6.22	6.10
D1	5.30 REF		
D2	5.26	5.66	5.46
e	2.286 BSC		
E	6.40	6.80	6.60
E1	4.63	5.03	4.83
H	9.40	9.85	9.62
k	0.40REF		
L1	2.30	2.70	2.50
L3	0.88	1.28	1.02
L4	0.75 REF		
L5	1.65	1.95	1.80
θ1	5°	9°	7°
θ2	5°	9°	7°
All Dimensions in mm			

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