

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> T <sub>C</sub> = +25°C
1200V	97.5mΩ @V <sub>GS</sub> = 15V	40A

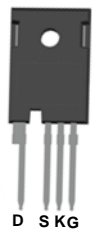
## Description and Applications

This SiC MOSFET is designed to minimize the on-state resistance yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

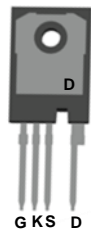
- EV high-power DC-DC converters
- EV charging systems
- AC-DC traction inverters
- Automotive motor drivers

TO247-4 Standard

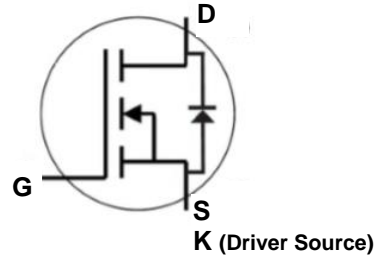
Top View



Bottom View



Pin Configuration



Internal Schematic

## Features and Benefits

- Low On-Resistance
- High BV<sub>DSS</sub> Rating for Power Application
- Low Input Capacitance
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DMWSH120H90SM4Q 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: TO247-4
- Package 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 <sup>Ⓔ</sup>3
- Weight: 6.6 grams (Approximate)

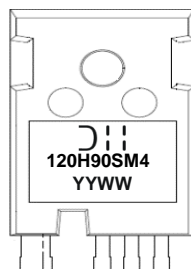
## Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMWSH120H90SM4Q	TO247-4 Standard	30 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

TO247-4 Standard



**D** = Manufacturer's Marking  
**120H90SM4** = Product Type Marking Code  
**YYWW** or **YYWW** = Date Code Marking  
**YY** or **YY** = Last Two Digits of Year (ex: 24 = 2024)  
**WW** or **WW** = Week Code (01 to 53)

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	1200	V
Gate-Source Voltage (Dynamic)	V <sub>GSS</sub>	+19/-8	V
Gate-Source Voltage (Static)	V <sub>GSS</sub>	+15/-4	V
Continuous Drain Current (Notes 5, 9)	I <sub>D</sub>	T <sub>C</sub> = +25°C	40.0
		T <sub>C</sub> = +100°C	28.3
Continuous Diode Forward Current (Note 5)	I <sub>S</sub>	43	A
Pulsed Source Current (Pulse Width t <sub>P</sub> Limited by T <sub>J Max</sub> ) (Note 5)	I <sub>SM</sub>	88	A
Pulsed Drain Current (Pulse Width t <sub>P</sub> Limited by T <sub>J Max</sub> ) (Note 5)	I <sub>DM</sub>	88	A

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P <sub>D</sub>	T <sub>C</sub> = +25°C	235
		T <sub>C</sub> = +100°C	117
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	30	°C/W
Thermal Resistance, Junction to Case (Note 5)	R <sub>θJC</sub>	0.64	
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +175	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	1200	—	—	V	V <sub>GS</sub> = 0, I <sub>D</sub> = 100μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	100	μA	V <sub>DS</sub> = 1200V, V <sub>GS</sub> = 0
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±200	nA	V <sub>GS</sub> = +15/-4V, V <sub>DS</sub> = 0
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1.7	2.5	3.5	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 5mA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	75	97.5	mΩ	V <sub>GS</sub> = 15V, I <sub>D</sub> = 20A
Diode Forward Voltage	V <sub>SD</sub>	—	4.3	—	V	V <sub>GS</sub> = -4V, I <sub>S</sub> = 10A
Transconductance	g <sub>fs</sub>	—	4.7	—	S	V <sub>DS</sub> = 20V, I <sub>D</sub> = 20A
<b>DYNAMIC CHARACTERISTICS (Note 7)</b>						
Input Capacitance	C <sub>iss</sub>	—	1112	—	pF	V <sub>GS</sub> = 0, V <sub>DS</sub> = 1000V, V <sub>AC</sub> = 25mV, f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	64	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	4.42	—		
C <sub>oss</sub> Stored Energy	E <sub>oss</sub>	—	39.5	—	μJ	V <sub>GS</sub> = -4V/+15V, V <sub>DS</sub> = 800V, R <sub>g</sub> = 5Ω, I <sub>D</sub> = 20A, L = 156μH
Turn-On Switching Energy (Body Diode Forward)	E <sub>ON</sub>	—	172	—	μJ	
Turn-Off Switching Energy (Body Diode Forward)	E <sub>OFF</sub>	—	71	—	μJ	V <sub>GS</sub> = -4V/+15V, V <sub>DS</sub> = 800V, I <sub>D</sub> = 20A
Gate Resistance	R <sub>g</sub>	—	2.5	—	Ω	
Total Gate Charge	Q <sub>g</sub>	—	51.1	—	nC	V <sub>GS</sub> = -4V/+15V, V <sub>DS</sub> = 800V, I <sub>D</sub> = 20A
Gate-Source Charge	Q <sub>gs</sub>	—	15.9	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	18.8	—		
Turn-On Delay Time	t <sub>d(ON)</sub>	—	9.1	—	ns	V <sub>GS</sub> = -4V/+15V, V <sub>DD</sub> = 800V, R <sub>g</sub> = 5Ω, I <sub>D</sub> = 20A, Inductive Load
Turn-On Rise Time	t <sub>r</sub>	—	21.3	—		
Turn-Off Delay Time	t <sub>d(OFF)</sub>	—	17.4	—		
Turn-Off Fall Time	t <sub>f</sub>	—	6.4	—		
Body Diode Reverse-Recovery Time	t <sub>rR</sub>	—	12.1	—	ns	V <sub>GS</sub> = -4V, V <sub>DS</sub> = 800V, I <sub>F</sub> = 20A, di/dt = 3600A/μs
Body Diode Reverse-Recovery Charge	Q <sub>rR</sub>	—	145	—	nC	
Body Diode Reverse-Recovery Current	I <sub>rRM</sub>	—	20.7	—	A	

- Notes:
- Device mounted on an infinite heatsink.
  - Device mounted on FR-4 substrate PC board, 2oz. copper, with minimum recommended pad layout.
  - Guaranteed by design. Not subject to production testing.
  - Short duration pulse test used to minimize self-heating effect.
  - Drain current limited by maximum junction temperature.

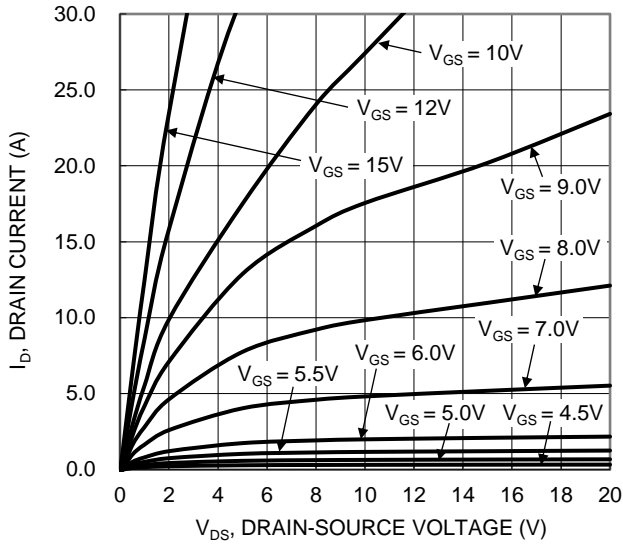


Figure 1. Typical Output Characteristic

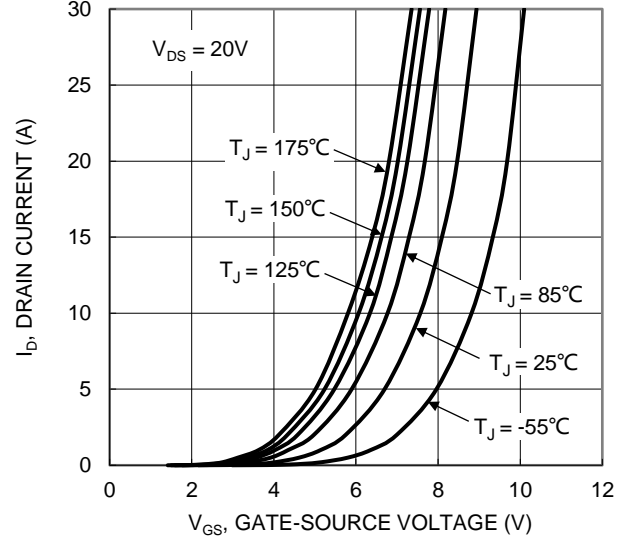


Figure 2. Typical Transfer Characteristic

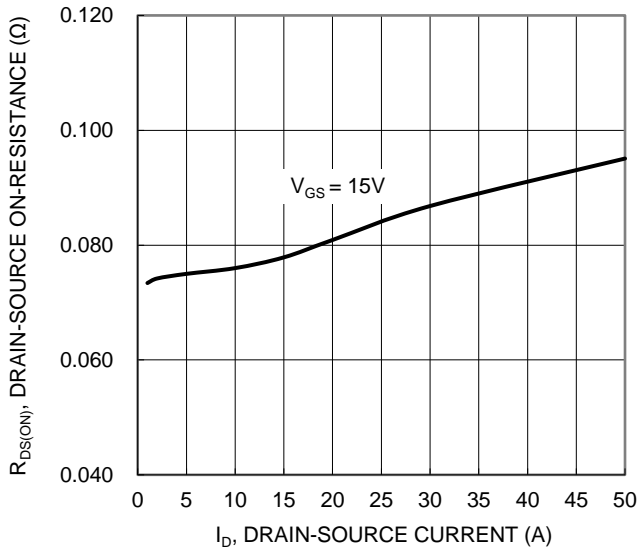


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

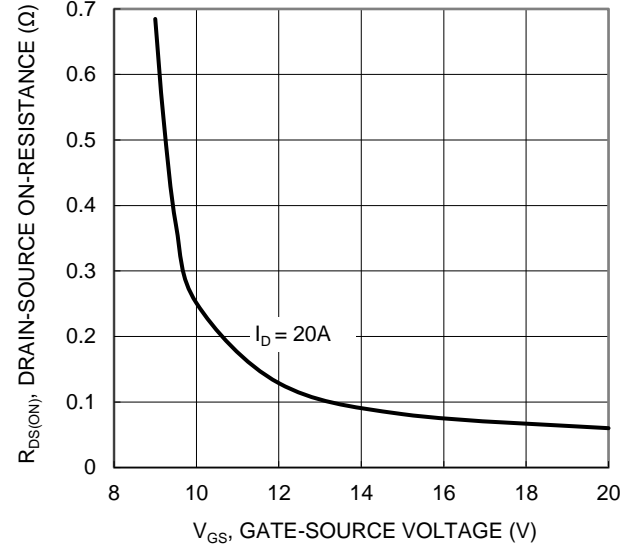


Figure 4. Typical Transfer Characteristic

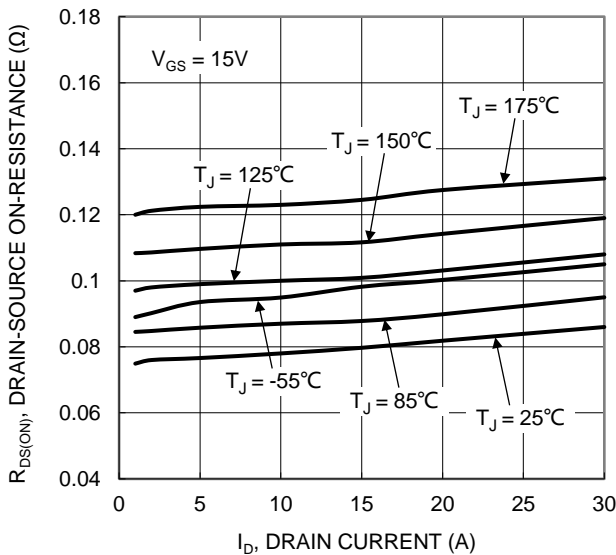


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

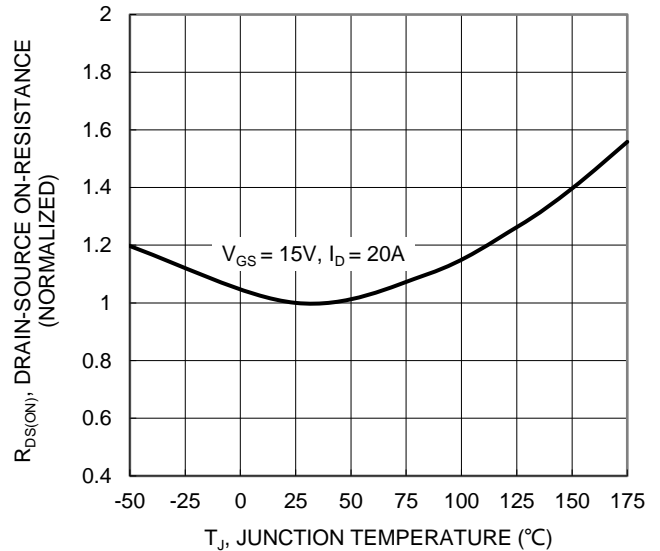


Figure 6. On-Resistance Variation with Temperature

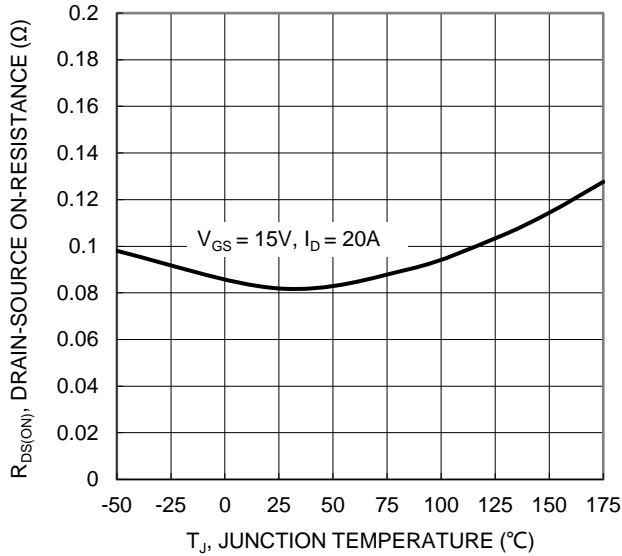


Figure 7. On-Resistance Variation with Temperature

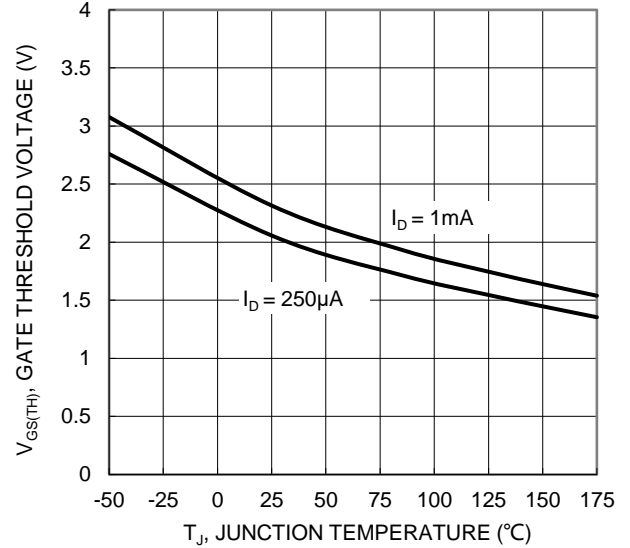


Figure 8. Gate Threshold Variation vs. Junction Temperature

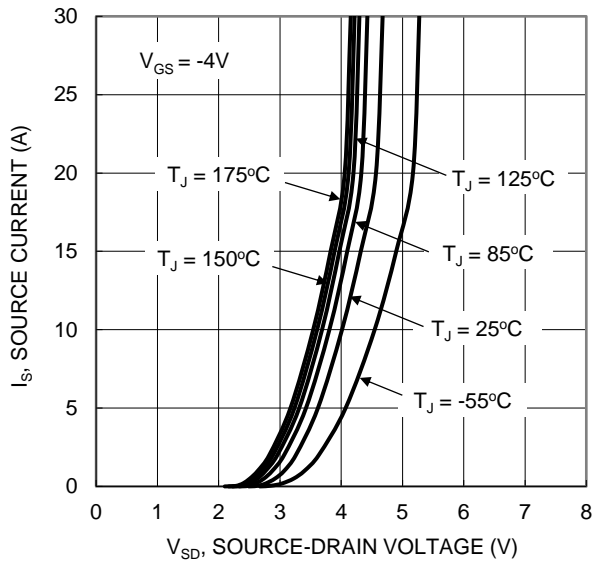


Figure 9. Diode Forward Voltage vs. Current

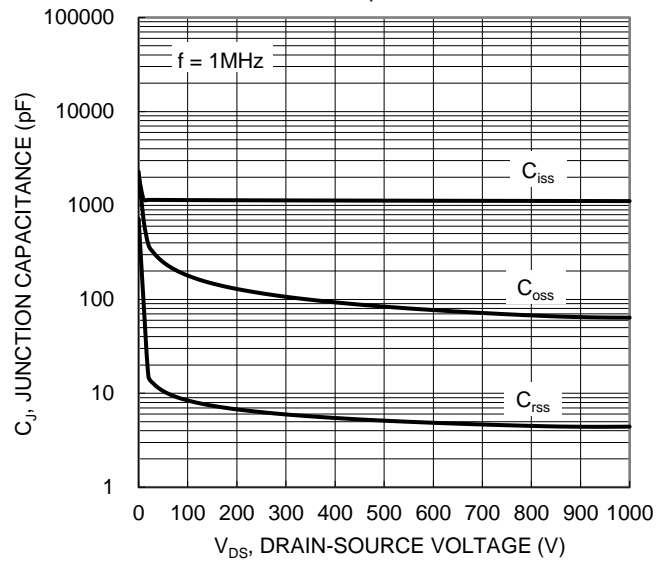


Figure 10. Typical Junction Capacitance

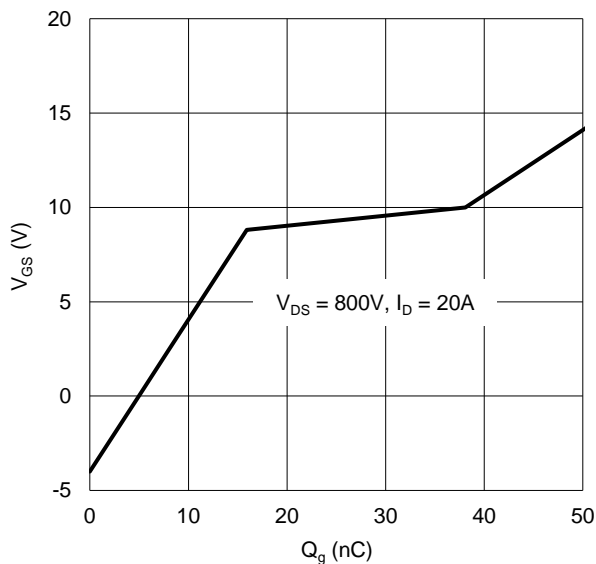


Figure 11. Gate Charge

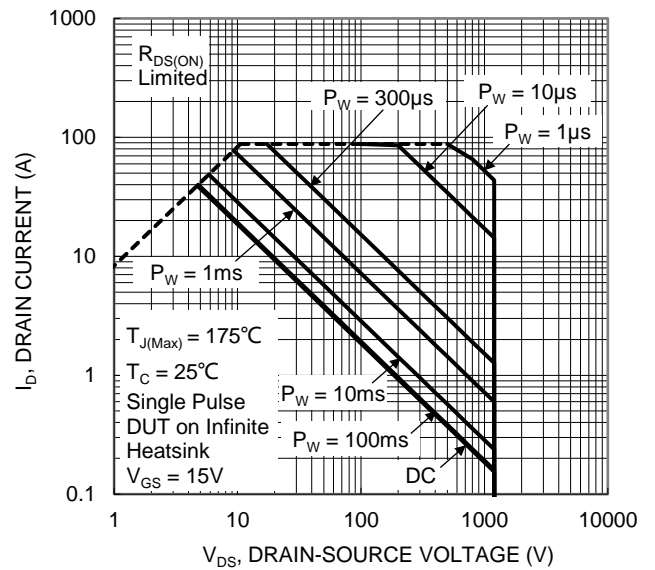


Figure 12. SOA, Safe Operation Area

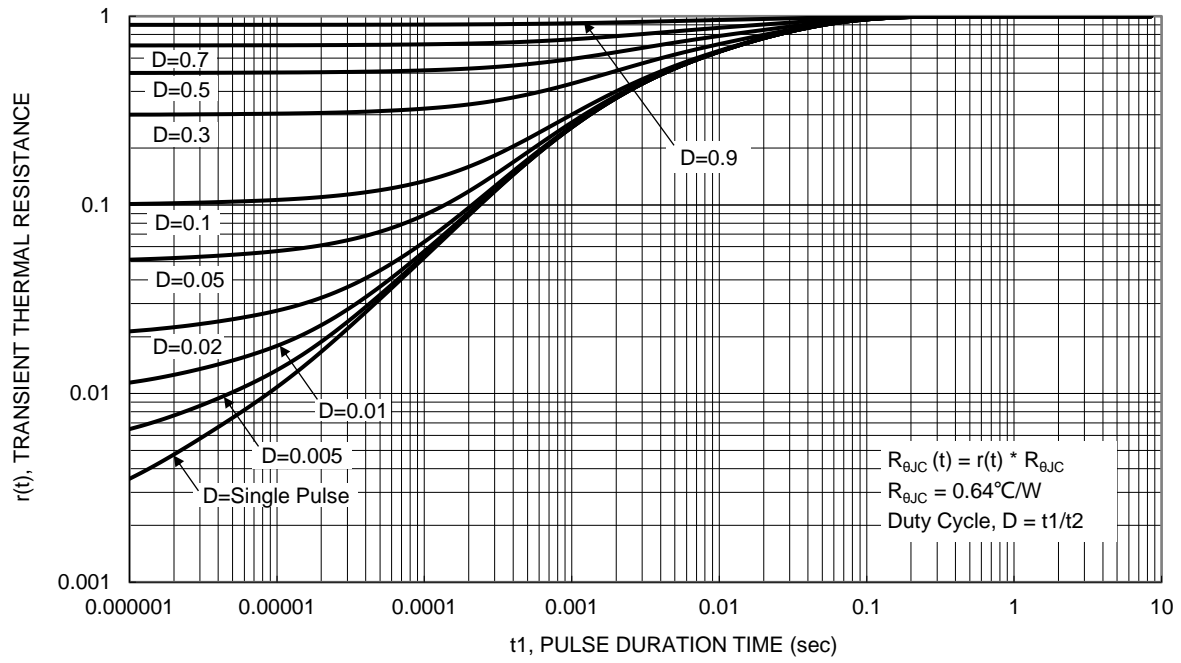
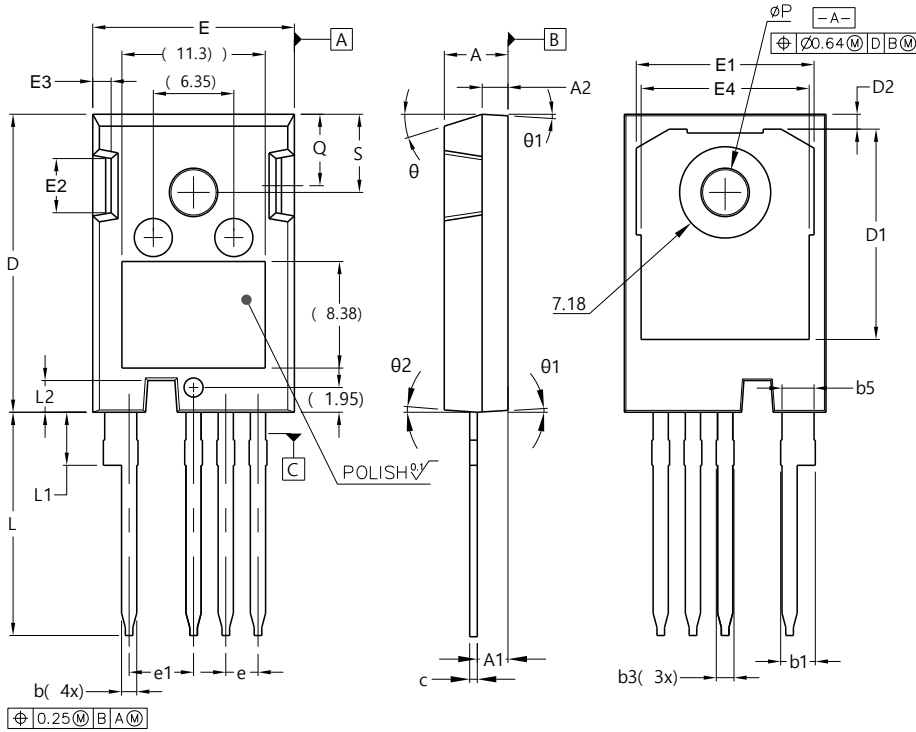


Figure 13. Transient Thermal Resistance

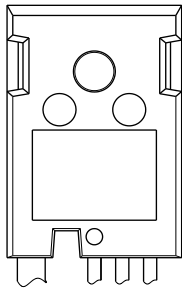
**Package Outline Dimensions**

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

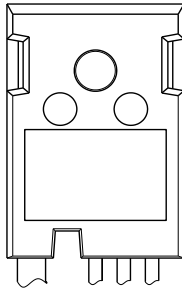
**TO247-4 Standard**



TO247-4 Standard		
Dim	Min	Max
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.07	1.33
b1	2.39	2.94
b3	1.07	1.60
b5	2.39	2.69
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.30
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	2.54 BSC	
e1	5.08 BSC	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
ØP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
θ	17.5°- 20° REF	
θ1	3.5°- 5° REF	
θ2	4°- 5° REF	
<b>All Dimensions in mm</b>		



OPTION A  
(TOP VIEW)



OPTION B  
(TOP VIEW)

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