1200V N-CHANNEL SILICON CARBIDE POWER MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D T_C = +25°C
1200V	97.5mΩ @V_{GS} = 15V	41A

Features and Benefits

- Low On-Resistance
- High BV_{DSS} Rating for Power Application
- Low Input Capacitance
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DMWSH120H90SM3Q 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/

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.

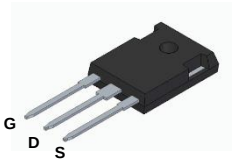
- EV high-power DC-DC converters
- EV charging systems
- AC-DC traction inverters
- Automotive motor drivers

Mechanical Data

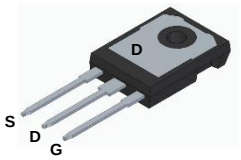
- Package: TO247
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 5.6 grams (Approximate)

TO247 Standard

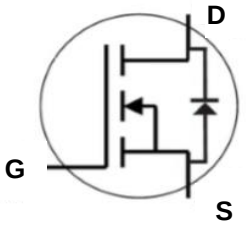
Top View



Bottom View



Pin Configuration



Internal Schematic

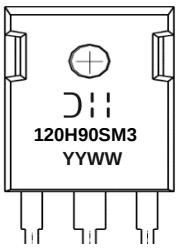
Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMWSH120H90SM3Q	TO247 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 Standard



= Manufacturer's Marking
120H90SM3 = 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_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Drain-Source Voltage		V_{DSS}	1200	V
Gate-Source Voltage (Dynamic)		V_{GSS}	+19/-8	V
Gate-Source Voltage (Static)		V_{GSS}	+15/-4	V
Continuous Drain Current (Notes 5, 9)	T_C = +25°C T_C = +100°C	I_D	41 29	A
Continuous Diode Forward Current (Note 5)		I_S	42	A
Pulsed Source Current (Pulse Width t_P Limited by $T_{J\,Max}$) (Note 5)		I_{SM}	85	A
Pulsed Drain Current (Pulse Width t_P Limited by $T_{J\,Max}$) (Note 5)		I_{DM}	85	A

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_C = +25°C	P_D	246	W
	T_C = +100°C		123	
Thermal Resistance, Junction to Ambient (Note 6)		$R_{\theta JA}$	30	°C/W
Thermal Resistance, Junction to Case (Note 5)		$R_{\theta JC}$	0.61	
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}	1200	—	—	V	V_{GS} = 0V, I_D = 100µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	100	µA	V_{DS} = 1200V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±200	nA	V_{GS} = +15/-4V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	1.7	2.5	3.5	V	V_{DS} = V_{GS}, I_D = 5mA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	75	97.5	mΩ	V_{GS} = 15V, I_D = 20A
Diode Forward Voltage	V_{SD}	—	4.3	—	V	V_{GS} = -4V, I_S = 10A
Transconductance	gfs	—	4.5	—	S	V_{DS} = 20V, I_D = 20A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	—	1090	—	pF	V_{GS} = 0V, V_{DS} = 1000V, V_{AC} = 25mV, f = 1MHz
Output Capacitance	C_{oss}	—	59	—		
Reverse Transfer Capacitance	C_{rss}	—	4.72	—		
C_{oss} Stored Energy	E_{oss}	—	33.9	—	µJ	
Turn-On Switching Energy (Body Diode Forward)	E_{ON}	—	175	—	µJ	V_{GS} = -4V/+15V, V_{DS} = 800V, R_g = 5Ω, I_D = 20A, L = 156µH
Turn-Off Switching Energy (Body Diode Forward)	E_{OFF}	—	69	—		
Gate Resistance	R_g	—	2.5	—	Ω	V_{AC} = 100mV, f = 1MHz
Total Gate Charge	Q_g	—	50.9	—	nC	V_{GS} = -4V/+15V, V_{DS} = 800V, I_D = 20A
Gate-Source Charge	Q_{gs}	—	16.2	—		
Gate-Drain Charge	Q_{gd}	—	18.8	—		
Turn-On Delay Time	$t_{D(ON)}$	—	10.1	—	ns	V_{GS} = -4V/+15V, V_{DD} = 800V, R_g = 5Ω, I_D = 20A, Inductive Load
Turn-On Rise Time	t_R	—	20.0	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	18.0	—		
Turn-Off Fall Time	t_F	—	7.1	—		
Body Diode Reverse-Recovery Time	t_{RR}	—	11.8	—	ns	V_{GS} = -4V, V_{DS} = 800V, I_F = 20A, di/dt = 3600A/µs
Body Diode Reverse-Recovery Charge	Q_{RR}	—	162	—	nC	
Body Diode Reverse-Recovery Current	I_{RRM}	—	22.8	—	A	

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

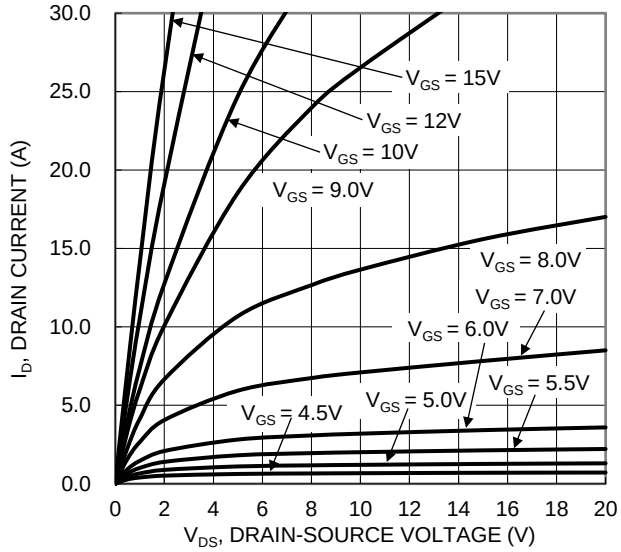


Figure 1. Typical Output Characteristic

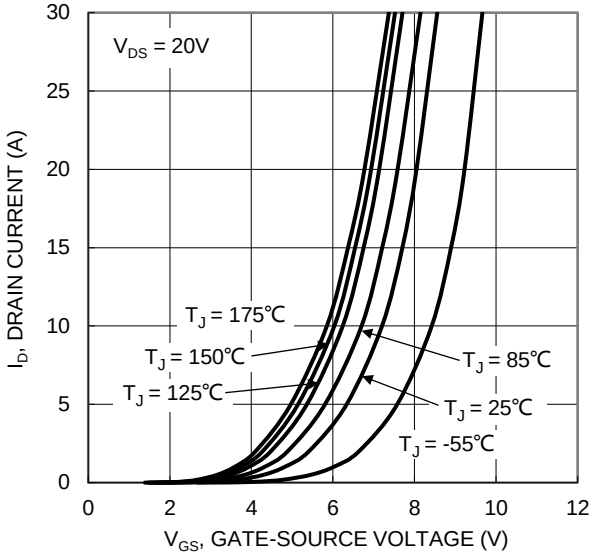


Figure 2. Typical Transfer Characteristic

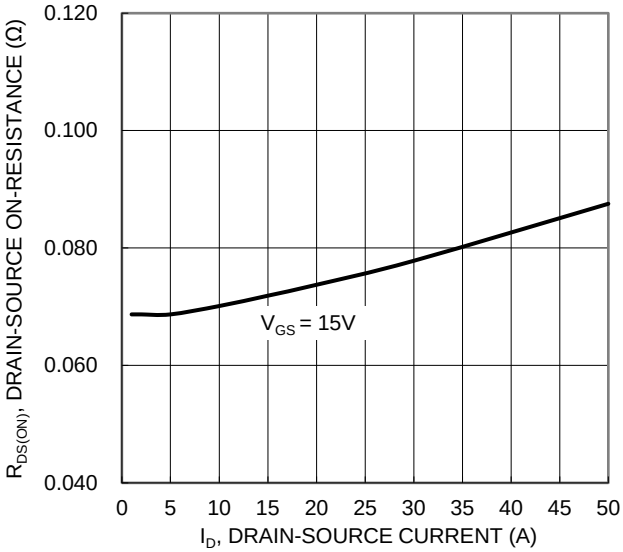


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

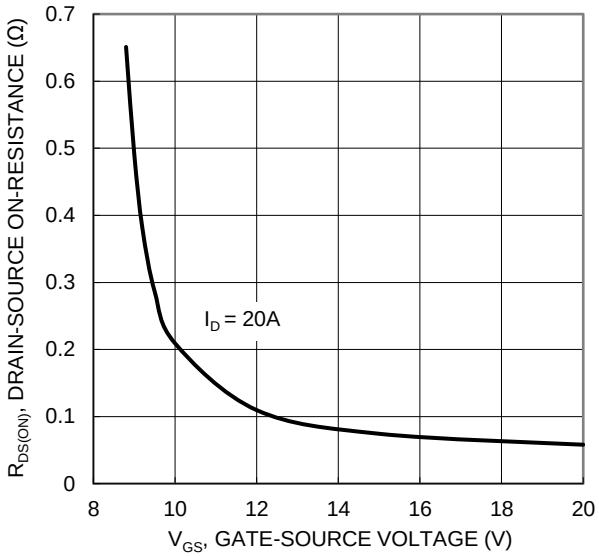


Figure 4. Typical Transfer Characteristic

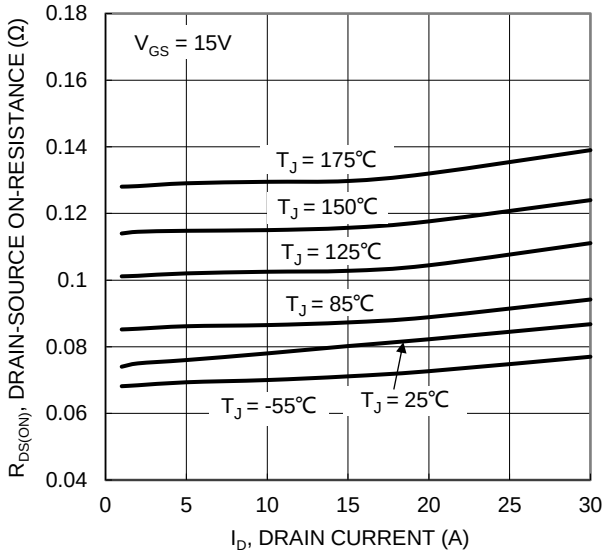


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

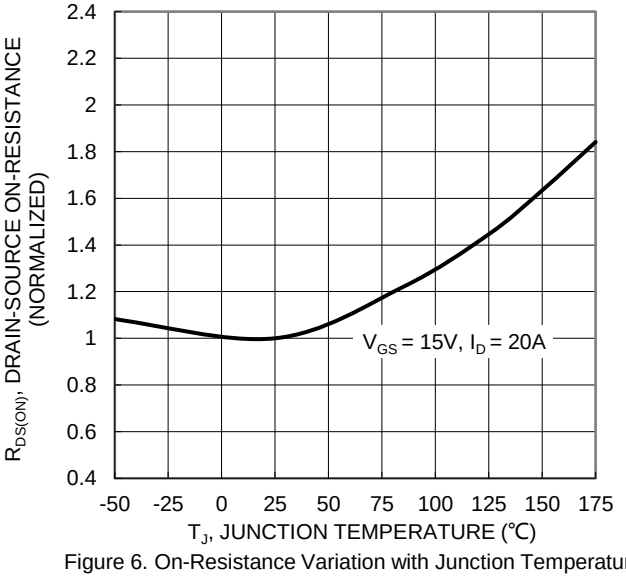


Figure 6. On-Resistance Variation with Junction Temperature

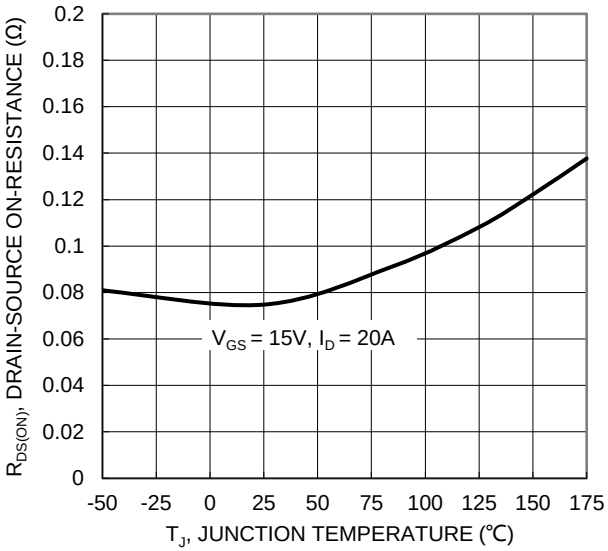


Figure 7. On-Resistance Variation with Junction Temperature

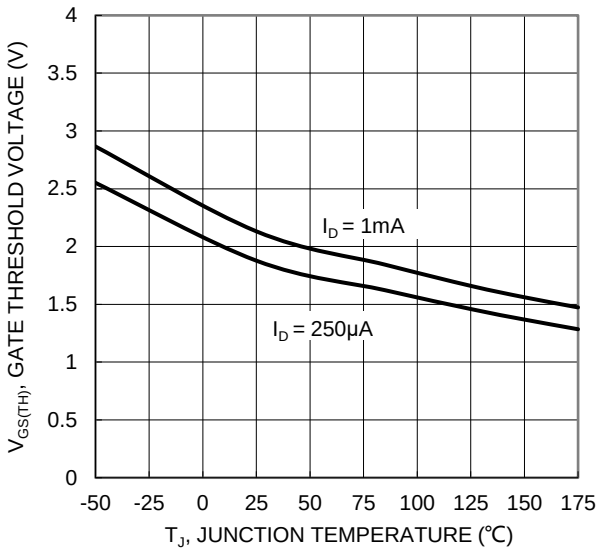


Figure 8. Gate Threshold Variation vs. Junction Temperature

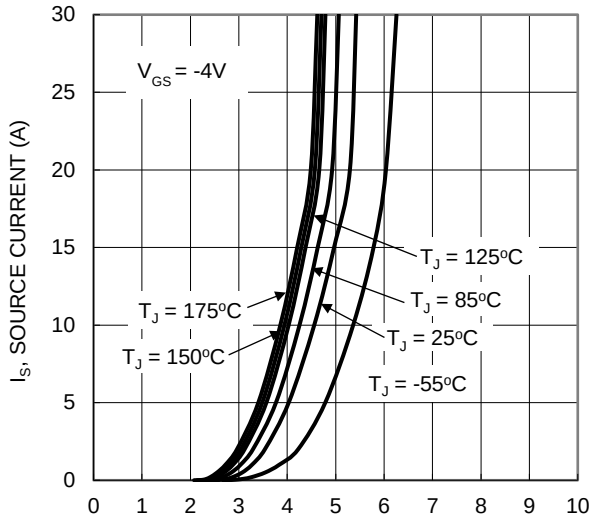


Figure 9. Diode Forward Voltage vs. Current

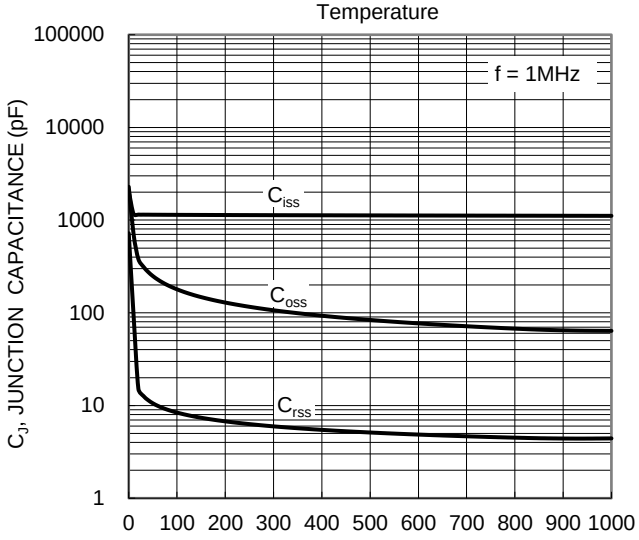


Figure 10. Typical Junction Capacitance

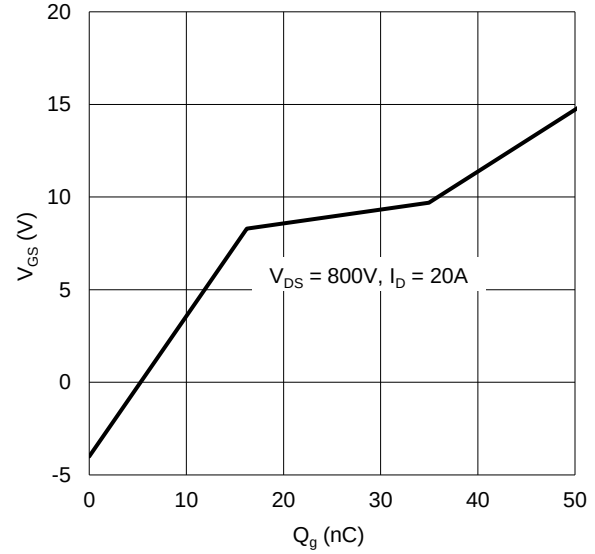


Figure 11. Gate Charge

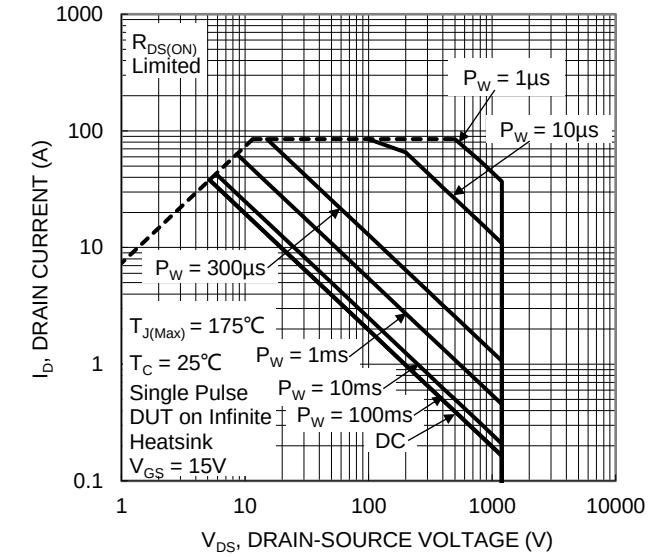


Figure 12. SOA, Safe Operation Area

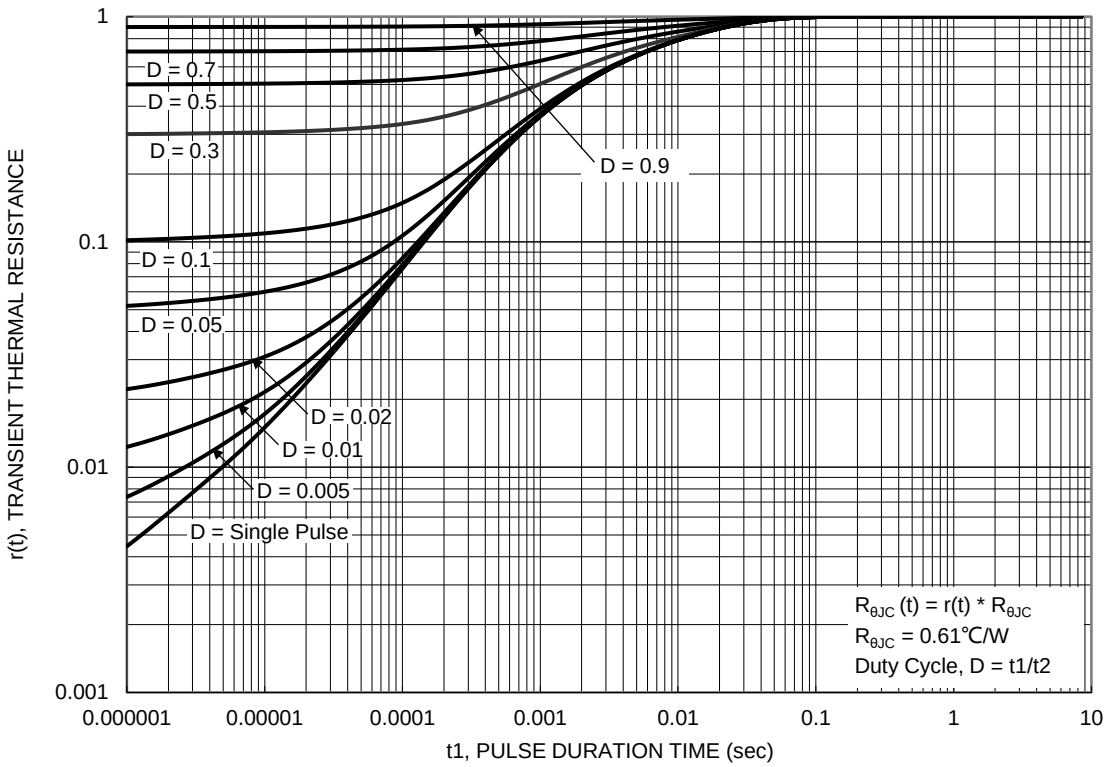
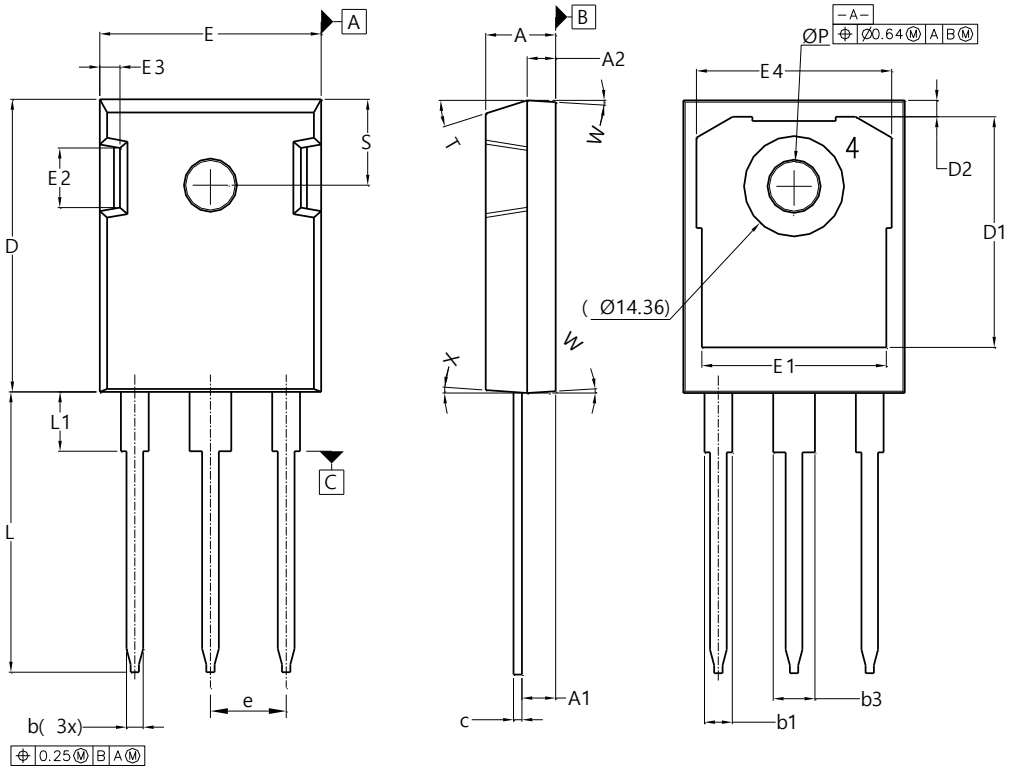


Figure 13. Transient Thermal Resistance

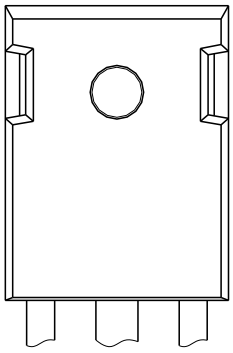
Package Outline Dimensions

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

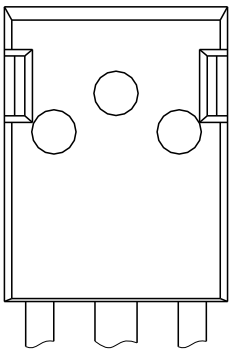
TO247 Standard



TO247 Standard			
Dim	**Min**	**Max**	**Typ**
A	4.83	5.21	--
A1	2.10	2.54	--
A2	1.88	2.16	--
b	1.07	1.33	--
b1	1.90	2.41	--
b3	2.87	3.38	--
c	0.51	0.76	0.60
D	20.80	21.75	--
D1	15.88	17.65	--
D2	0.95	1.77	--
E	15.75	16.25	--
E1	12.38	14.52	--
E2	3.68	5.10	--
E3	1.00	2.18	--
E4	13.10	14.52	--
e	5.44 BSC		
L	19.60	20.32	--
L1	3.78	4.40	--
PØ	2.90	3.65	--
S	6.04	6.80	--
T	17.5-20° REF		
W	3.5-4.5° REF		
X	4-5° REF		
All Dimensions in mm			



OPTION A
(TOP VIEW)



OPTION B
(TOP VIEW)

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