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

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

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)**
- **An automotive-compliant part is available under separate datasheet (DMWSH120H90SM3Q)**

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
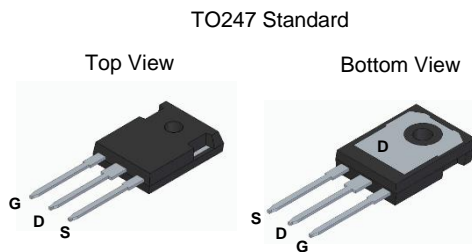
Pin Configuration
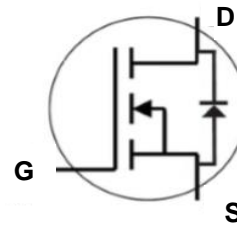
Internal Schematic

Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMWSH120H90SM3	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
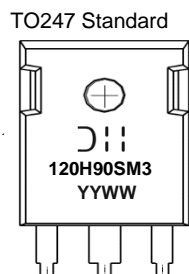
⊃║ = Manufacturer's Marking
120H90SM3 = Product Type Marking Code
YYWW or YYWW = Date Code Marking
YY or YY = Last Two Digits of Year (ex: 24 = 2024)
WW or WW = Week Code (01 to 53)

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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	I_D	41	A
	T_C = +100°C		29	
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_θJA	30	°C/W
Thermal Resistance, Junction to Case (Note 5)		R_θJC	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.
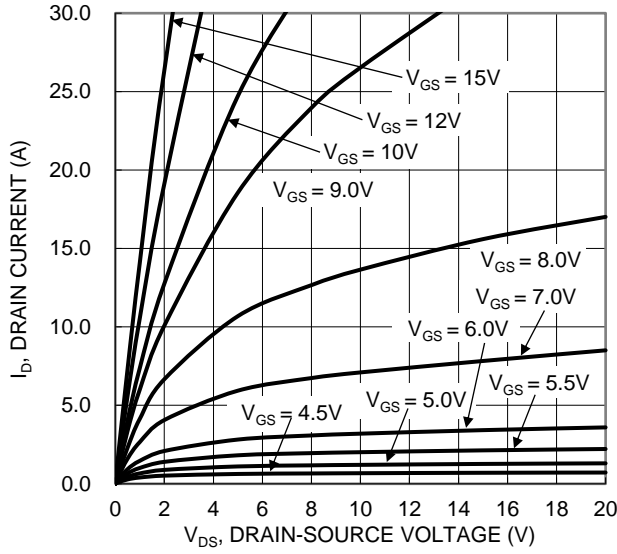9. Drain current limited by maximum junction temperature.

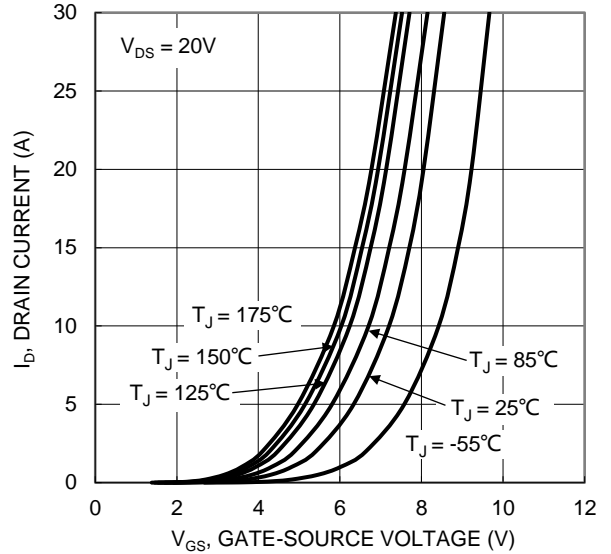Figure 1. Typical Output Characteristic
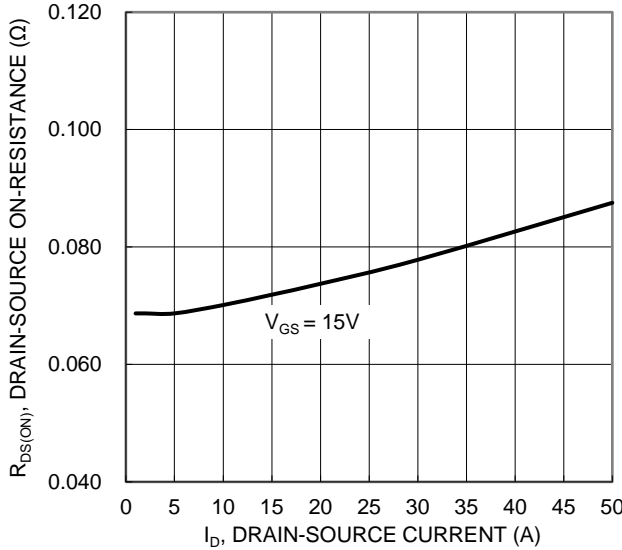

Figure 2. Typical Transfer Characteristic

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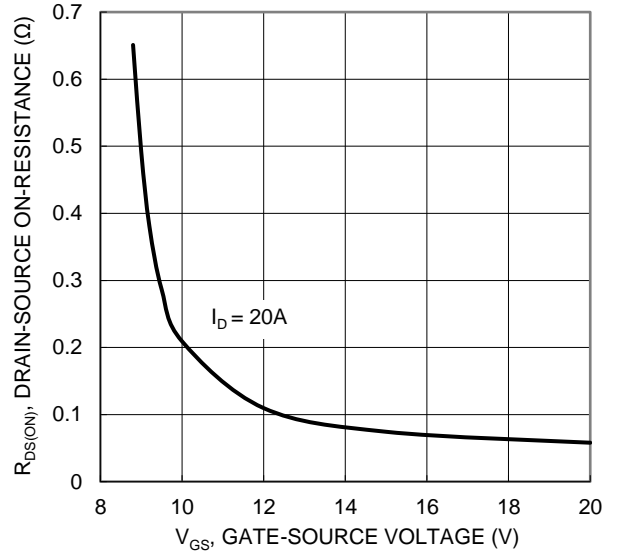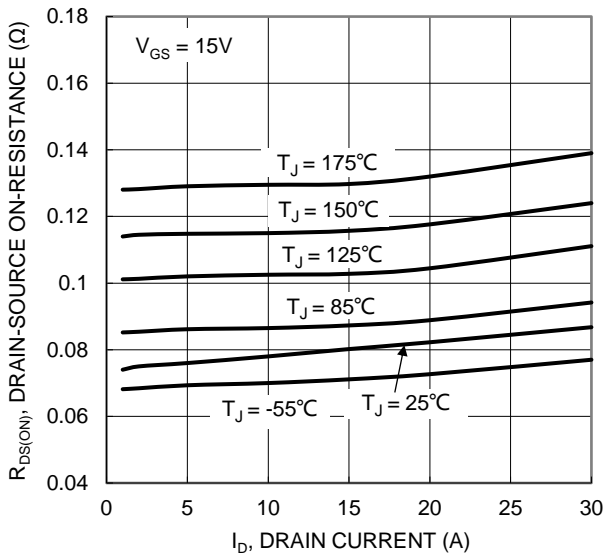

Figure 4. Typical Transfer Characteristic

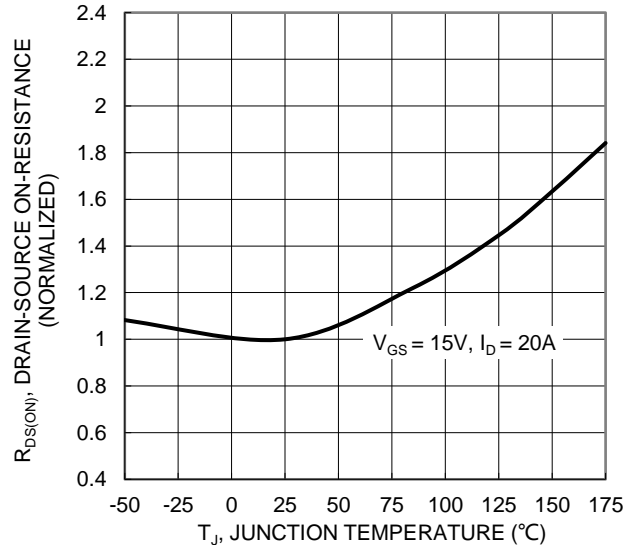Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

Figure 6. On-Resistance Variation with Junction Temperature

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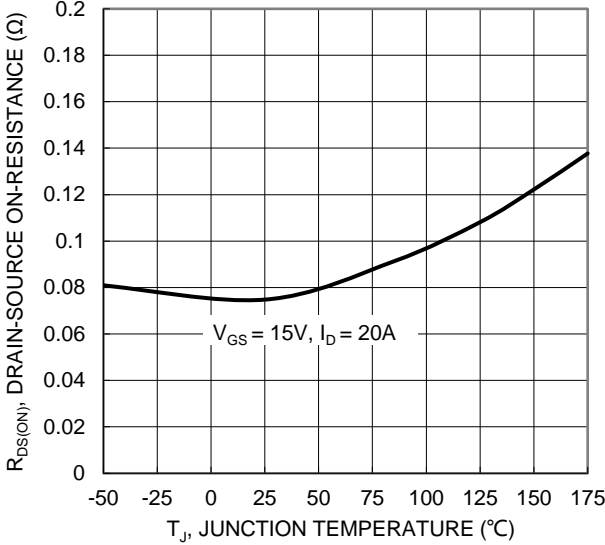© 2024 Copyright Diodes Incorporated. All Rights Reserved.

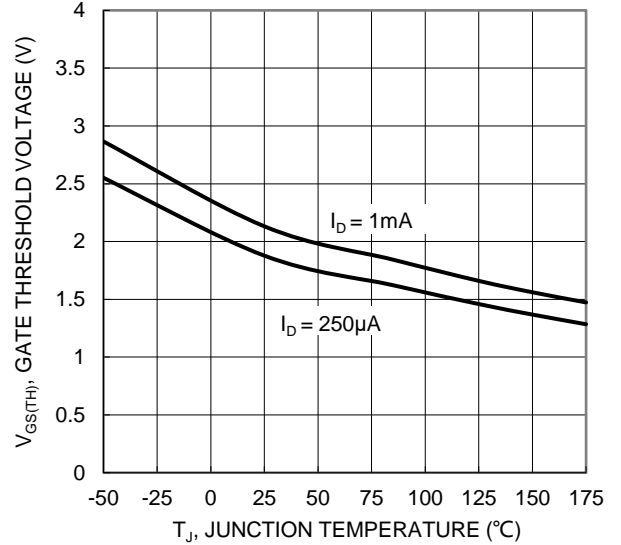Figure 7. On-Resistance Variation with Junction Temperature

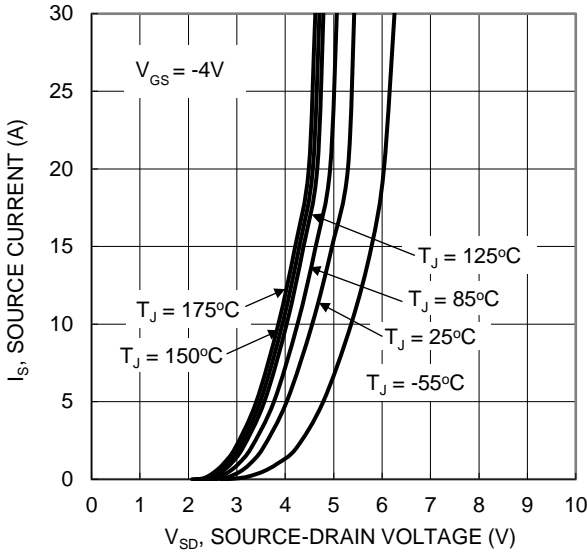Figure 8. Gate Threshold Variation vs. Junction Temperature
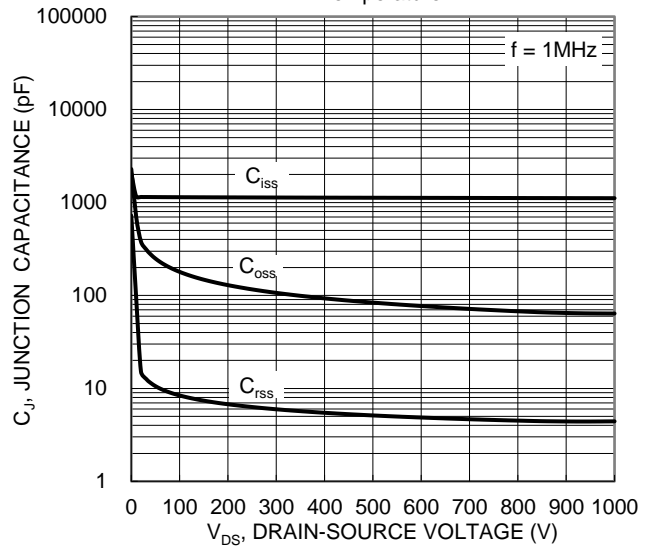
Figure 9. Diode Forward Voltage vs. Current

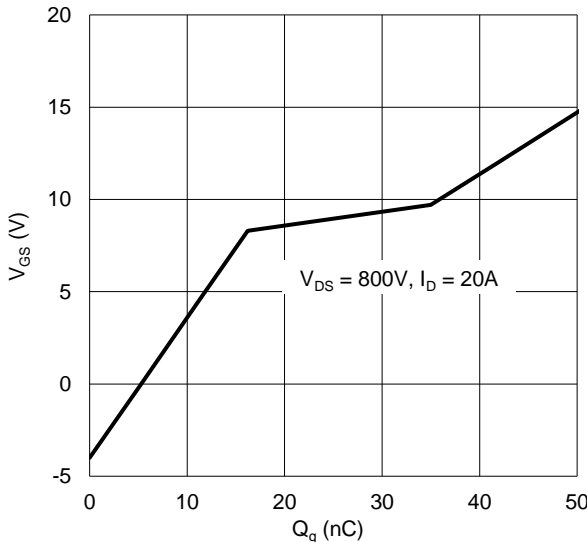Figure 10. Typical Junction Capacitance

Figure 11. Gate Charge
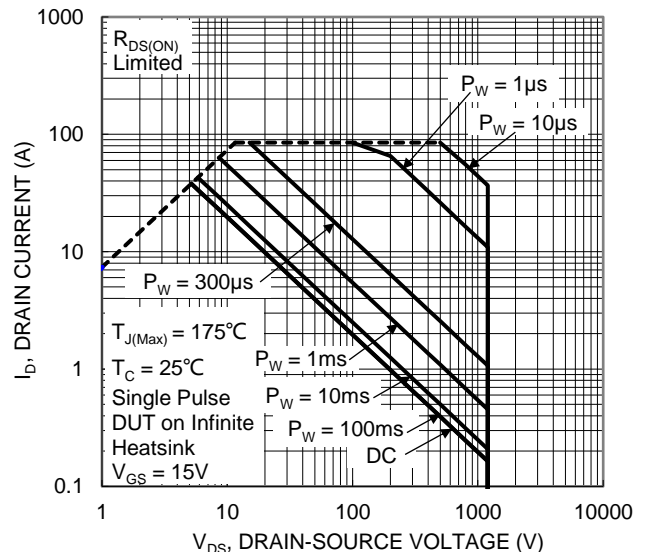
Figure 12. SOA, Safe Operation Area

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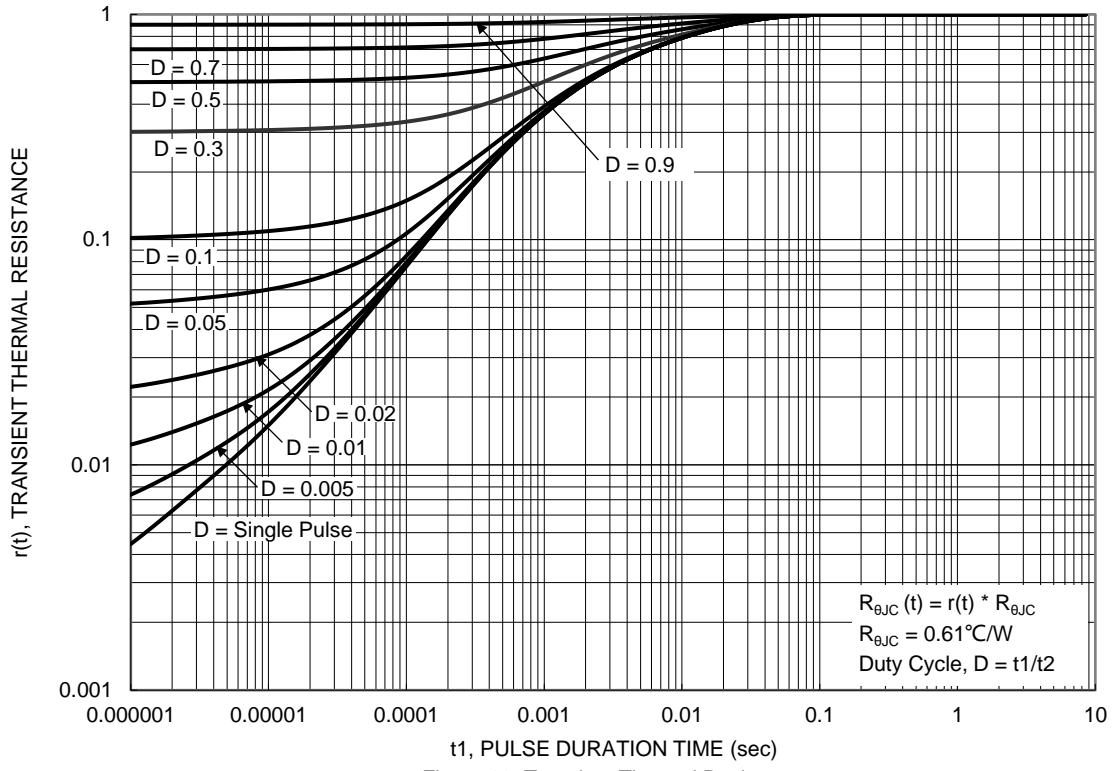
Figure 13. Transient Thermal Resistance

The chart shows r(t), TRANSIENT THERMAL RESISTANCE on the vertical axis (from 0.001 to 1) versus t1, PULSE DURATION TIME (sec) on the horizontal axis (from 0.000001 to 10). Curves are labeled D = 0.9, D = 0.7, D = 0.5, D = 0.3, D = 0.1, D = 0.05, D = 0.02, D = 0.01, D = 0.005, and D = Single Pulse.

$R_{\theta JC}(t) = r(t) * R_{\theta JC}$

$R_{\theta JC} = 0.61°C/W$

Duty Cycle, $D = t1/t2$

Package Outline Dimensions

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

TO247 Standard
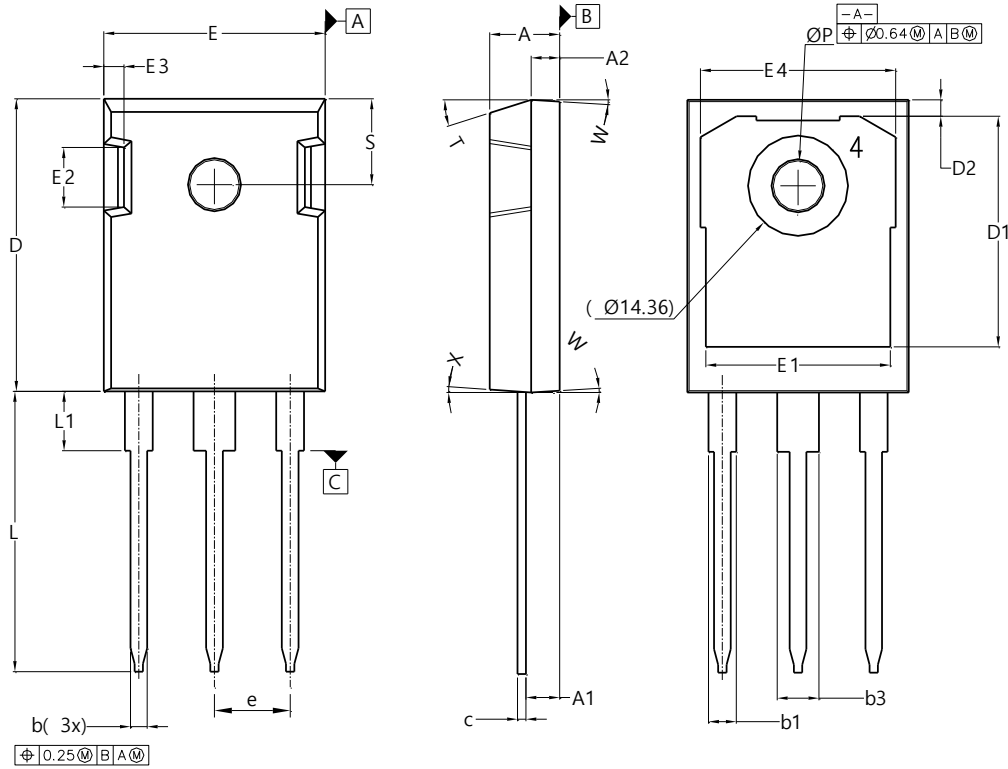
TO247 Standard			
Dim	**Min**	**Max**	**Typ**
A	4.83	5.21	--
A1	2.10	2.54	--
A2	1.88	2.16	--
b	1.07	1.33	--
b1	1.90	2.41	--
b3	2.87	3.38	--
c	0.51	0.76	0.60
D	20.80	21.75	--
D1	15.88	17.65	--
D2	0.95	1.77	--
E	15.75	16.25	--
E1	12.38	14.52	--
E2	3.68	5.10	--
E3	1.00	2.18	--
E4	13.10	14.52	--
e	5.44 BSC		
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			
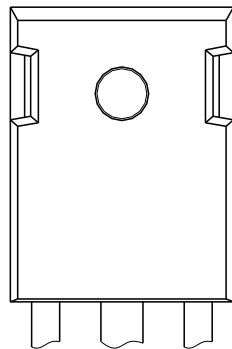
OPTION A
(TOP VIEW)

OPTION B
(TOP VIEW)

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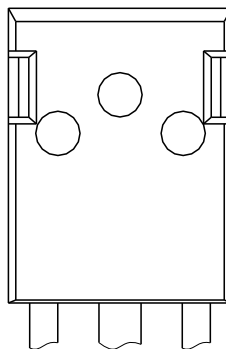
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