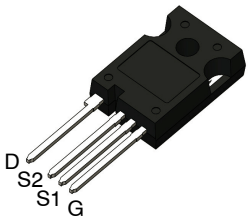
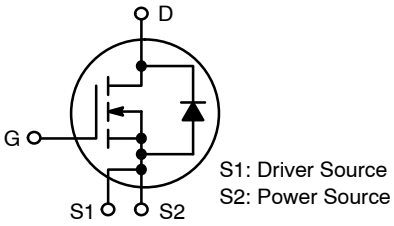
Silicon Carbide (SiC) MOSFET – EliteSiC, 13 mohm, 1200 V, M3S, TO-247-4L

NTH4L013N120M3S

$V_{(BR)DSS}$	$R_{DS(ON)}$ TYP	I_D MAX
1200 V	13 mΩ @ 18 V	151 A



TO247-4L
CASE 340CJ



N-CHANNEL MOSFET

Features

- Typ. $R_{DS(on)}$ = 13 mΩ @ V_{GS} = 18 V
- Ultra Low Gate Charge ($Q_{G(tot)}$ = 254 nC)
- High Speed Switching with Low Capacitance (C_{oss} = 262 pF)
- 100% Avalanche Tested
- This Device is Halide Free and RoHS Compliant with exemption 7a, Pb-Free 2LI (on second level interconnection)

Typical Applications

- Solar Inverters
- Electric Vehicle Charging Stations
- UPS (Uninterruptible Power Supplies)
- Energy Storage Systems
- SMPS (Switch Mode Power Supplies)

MAXIMUM RATINGS (T_J = 25 °C unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-to-Source Voltage	1200	V
V_{GS}	Gate-to-Source Voltage	−10/+22	V
I_D	Continuous Drain Current - Steady State (Notes 1, 3) T_C = 25 °C T_C = 100 °C	 151 107	A
P_D	Power Dissipation - Steady State (Note 1) T_C = 25 °C T_C = 100 °C	 682 340	W
I_{DM}	Pulsed Drain Current (Note 2), T_C = 25 °C	505	A
T_J, T_{stg}	Operating Junction and Storage Temperature Range	−55 to +175	°C
I_S	Source Current (Body Diode), T_C = 25 °C, V_{GS} = −3 V	151	A
E_{AS}	Single Pulse Drain-to-Source Avalanche Energy (Note 4)	800	mJ
T_L	Maximum Lead Temperature for Soldering (1/25″ from case for 10 s)	270	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Single pulse rating, limited by max junction temperature.
3. The maximum current rating is based on typical $R_{DS(on)}$ performance.
4. E_{AS} of 800 mJ is based on starting T_J = 25 °C; L = 1 mH, I_{AS} = 40 A, V_{DD} = 100 V, V_{GS} = 18 V.

MARKING DIAGRAM



H4L013120M3S	= Specific Device Code
A	= Assembly Location
Y	= Year
WW	= Work Week
ZZ	= Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping
NTH4L013N120M3S	TO247-4L	30 Units / Tube

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THERMAL CHARACTERISTICS

Symbol	Parameter	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-Case - Steady State (Note 1)	0.17	0.22	°C/W
$R_{\theta JA}$	Junction-to-Ambient - Steady State (Note 1)	–	40	

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{GSop}	Operation Values of Gate-to-Source Voltage	−5...0/18	V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.
Operation at 0 V turn-off requires consideration of system-level design trade-offs. Design guidance and application considerations are provided in Application Note AND90255/D.

ELECTRICAL CHARACTERISTICS (T_J = 25 °C unless otherwise specified)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
OFF-STATE CHARACTERISTICS						
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 1 mA	1200			V
$V_{(BR)DSS}/T_J$	Drain-to-Source Breakdown Voltage Temperature Coefficient	I_D = 1 mA, referenced to 25 °C (Note 6)		0.3		V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0 V, V_{DS} = 1200 V, T_J = 25 °C			100	μA
I_{GSS}	Gate-to-Source Leakage Current	V_{GS} = +22/−10 V, V_{DS} = 0 V			±1	μA
ON-STATE CHARACTERISTICS (Note 2)						
$V_{GS(TH)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 37 mA	2.04	2.8	4.4	V
$R_{DS(on)}$	Drain-to-Source On Resistance	V_{GS} = 18 V, I_D = 75 A, T_J = 25 °C		13	20	mΩ
		V_{GS} = 18 V, I_D = 75 A, T_J = 175 °C (Note 6)		29		
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 75 A (Note 6)		57		S
CHARGES, CAPACITANCES & GATE RESISTANCE						
C_{ISS}	Input Capacitance	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 800 V (Note 6)		5813		pF
C_{OSS}	Output Capacitance			262		
C_{RSS}	Reverse Transfer Capacitance			21		
$Q_{G(TOT)}$	Total Gate Charge	V_{GS} = −3/18 V, V_{DS} = 800 V, I_D = 75 A (Note 6)		254		nC
$Q_{G(TH)}$	Threshold Gate Charge			37		
Q_{GS}	Gate-to-Source Charge			46		
Q_{GD}	Gate-to-Drain Charge			61		
R_G	Gate-Resistance	f = 1 MHz		1.4		Ω
SWITCHING CHARACTERISTICS						
$t_{d(ON)}$	Turn-On Delay Time	V_{GS} = −3/18 V, V_{DS} = 800 V, I_D = 75 A, R_G = 2 Ω Inductive load (Notes 5, 6)		22		ns
t_r	Rise Time			23		
$t_{d(OFF)}$	Turn-Off Delay Time			56		
t_f	Fall Time			10		
E_{ON}	Turn-On Switching Loss			563		μJ
E_{OFF}	Turn-Off Switching Loss			390		
E_{tot}	Total Switching Loss			953		

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ELECTRICAL CHARACTERISTICS (T_J = 25 °C unless otherwise specified) (continued)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
SOURCE-DRAIN DIODE CHARACTERISTICS						
I_{SD}	Continuous Source-Drain Diode Forward Current	V_{GS} = −3 V, T_C = 25 °C (Note 6)			151	A
I_{SDM}	Pulsed Source-Drain Diode Forward Current (Note 2)				505	
V_{SD}	Forward Diode Voltage	V_{GS} = −3 V, I_{SD} = 75 A, T_J = 25 °C		4.7		V
t_{RR}	Reverse Recovery Time	V_{GS} = −3/18 V, I_{SD} = 75 A, dI_S/dt = 1000 A/μs, V_{DS} = 800 V (Note 6)		29		ns
Q_{RR}	Reverse Recovery Charge			252		nC
E_{REC}	Reverse Recovery Energy			26		μJ
I_{RRM}	Peak Reverse Recovery Current			18		A
T_A	Charge Time			17		ns
T_B	Discharge Time			12		ns

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

5. E_{ON}/E_{OFF} result is with body diode.
6. Defined by design, not subject to production test.

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TYPICAL CHARACTERISTICS

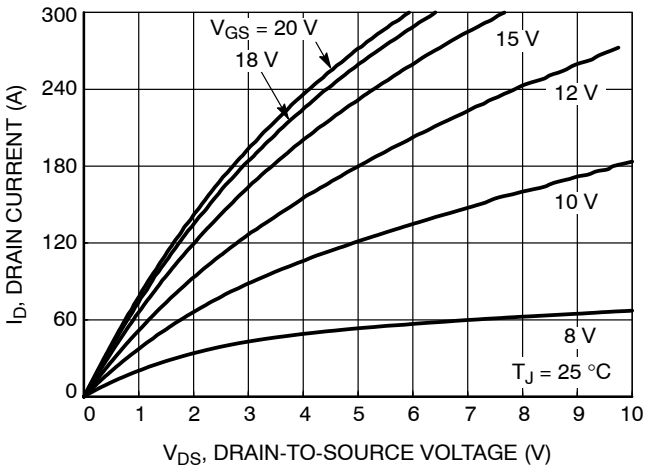

Figure 1. On-Region Characteristics

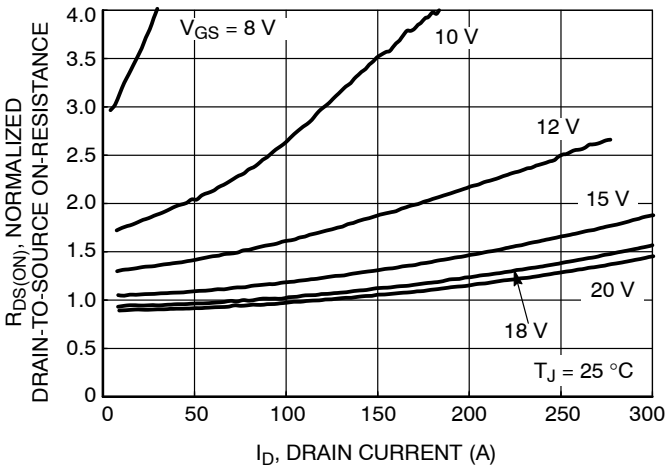

Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

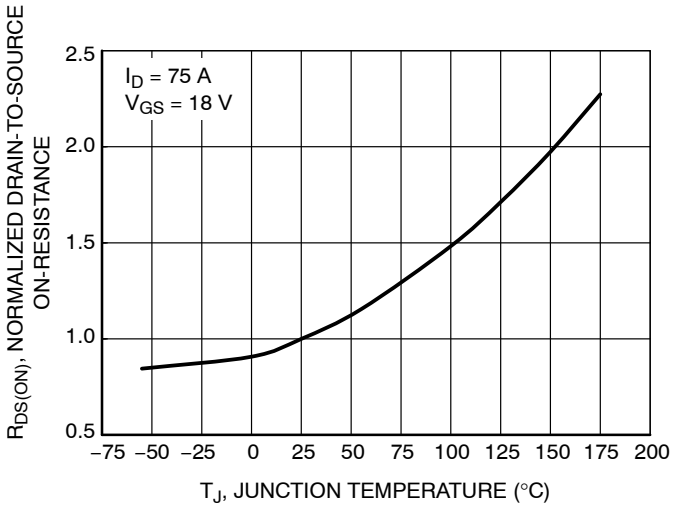

Figure 3. On-Resistance Variation with Temperature

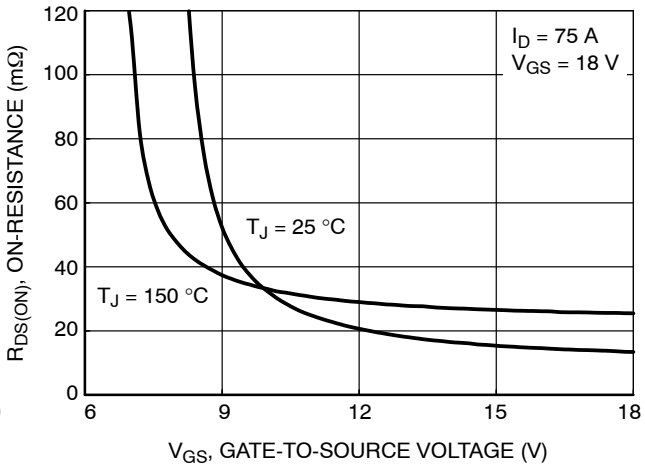

Figure 4. On-Resistance vs. Gate-to-Source Voltage

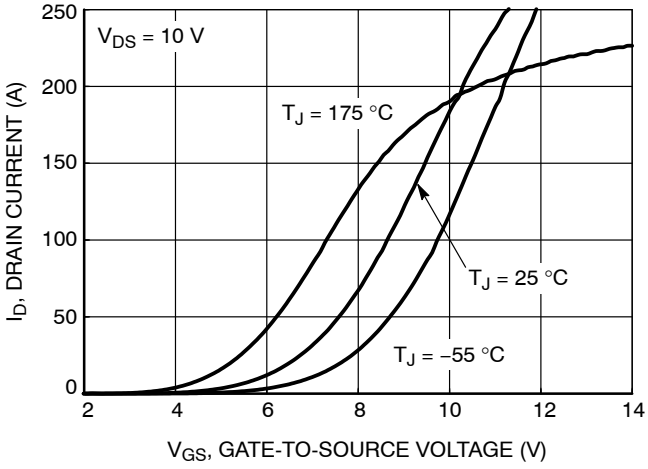

Figure 5. Transfer Characteristics

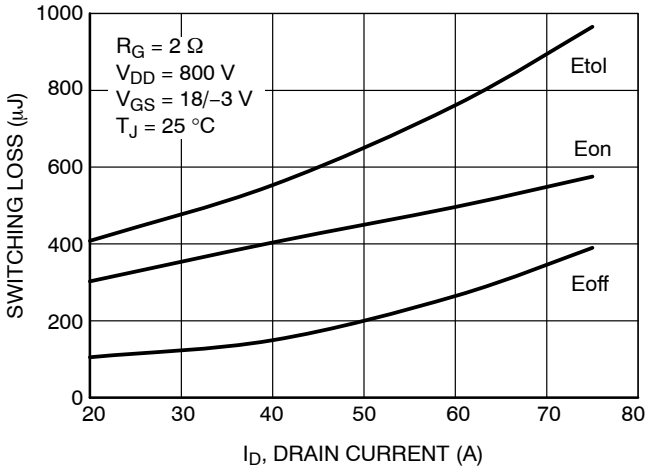

Figure 6. Switching Loss vs. Drain Current

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TYPICAL CHARACTERISTICS (continued)

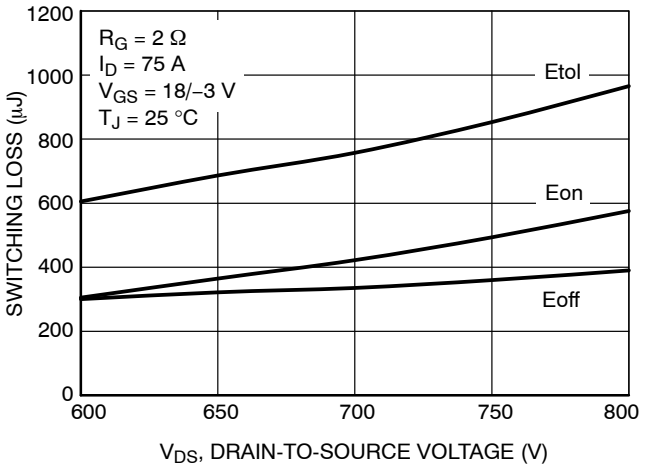

Figure 7. Switching Loss vs. Drain-to-Source Voltage

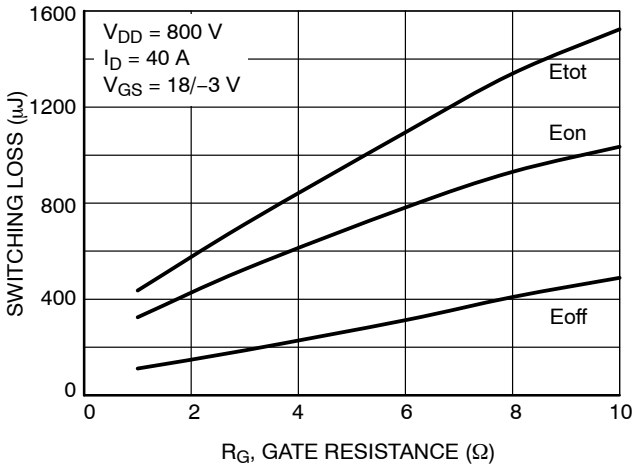

Figure 8. Switching Loss vs. Gate Resistance

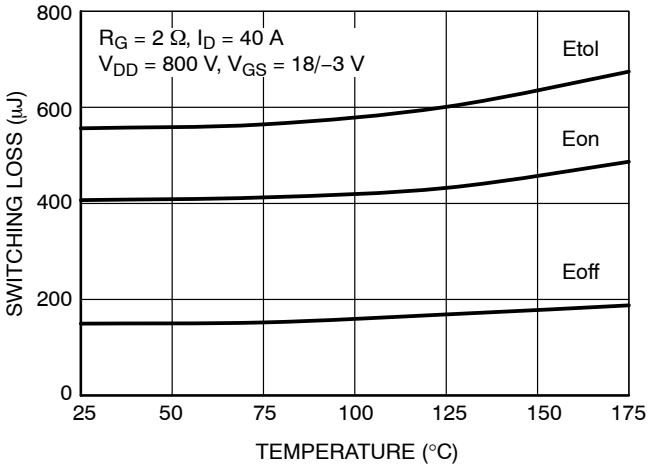

Figure 9. Switching Loss vs. Temperature

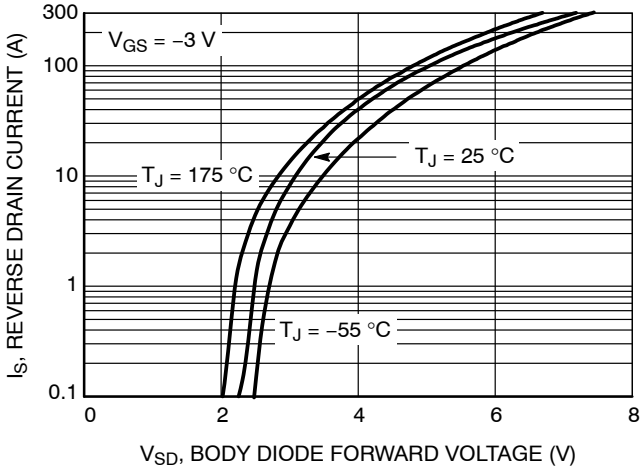

Figure 10. Reverse Drain Current vs. Body Diode Forward Voltage

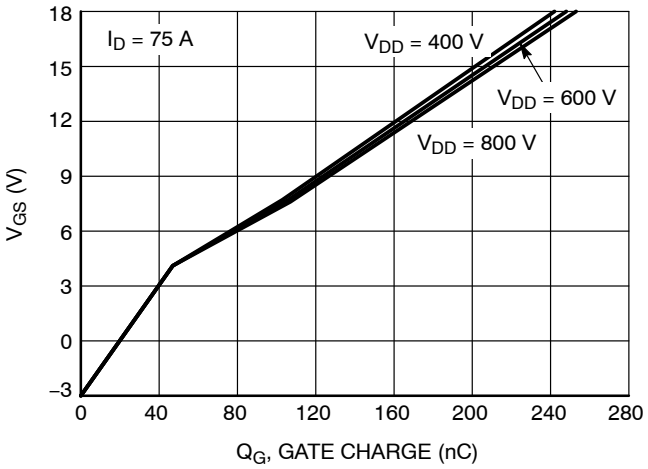

Figure 11. Gate-to-Source Voltage vs. Total Charge

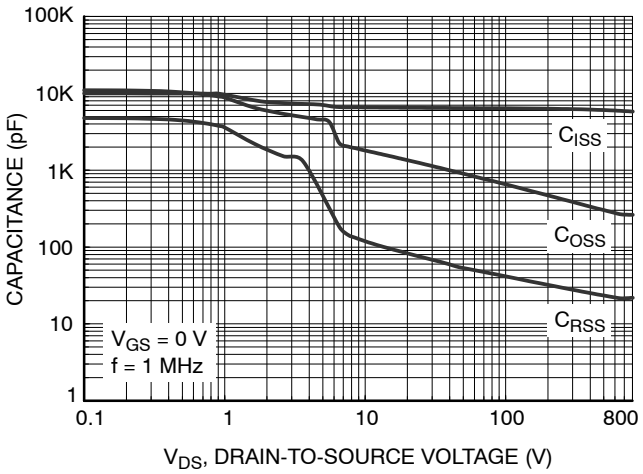

Figure 12. Capacitance vs. Drain-to-Source Voltage

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TYPICAL CHARACTERISTICS (continued)

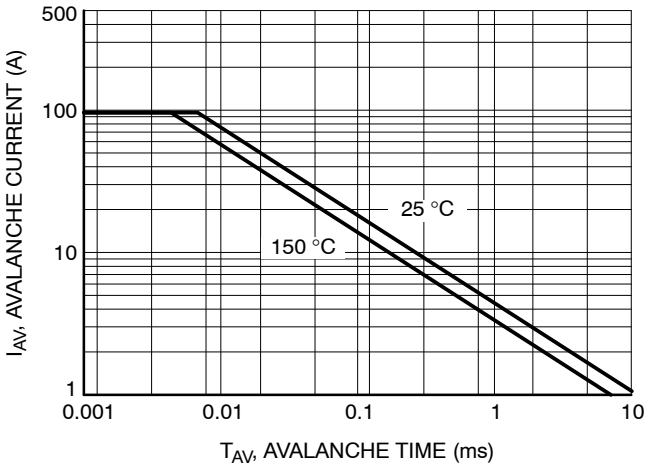

Figure 13. Unclamped Inductive Switching Capability

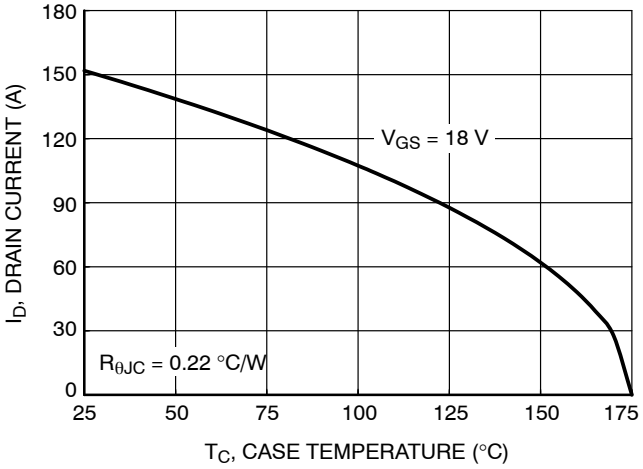

Figure 14. Maximum Continuous Drain Current vs. Case Temperature

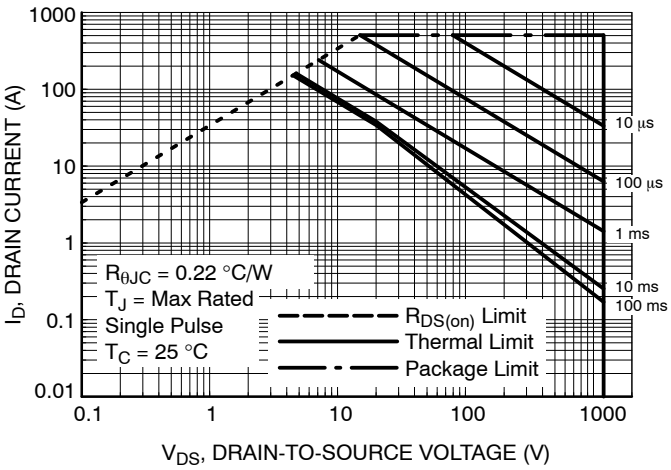

Figure 15. Safe Operating Area

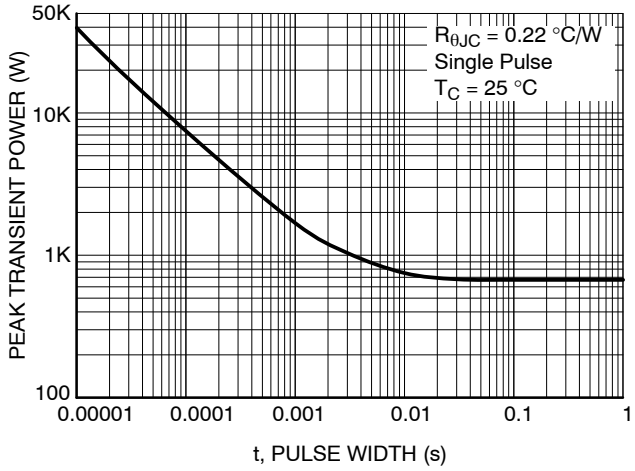

Figure 16. Single Pulse Maximum Power Dissipation

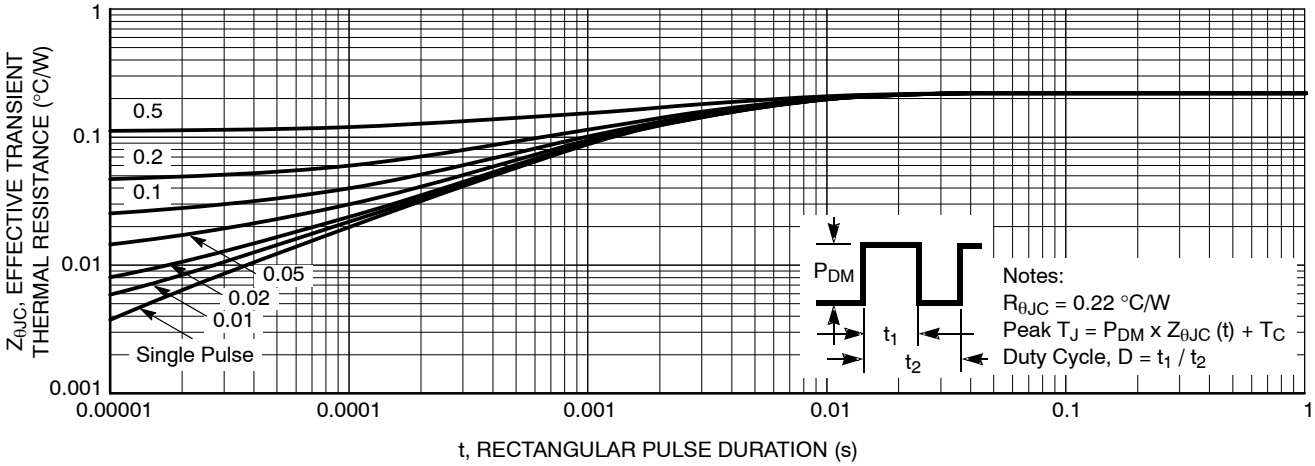

Figure 17. Junction-to-Case Transient Thermal Response

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REVISION HISTORY

Revision	Description of Changes	Date
3	Change R_g values to 2 ohm of Switching Characteristics in Test Condition Column.	12/12/2025
4	Edit to the ROC table on page 2 and add a new note.	9/2/2026

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.

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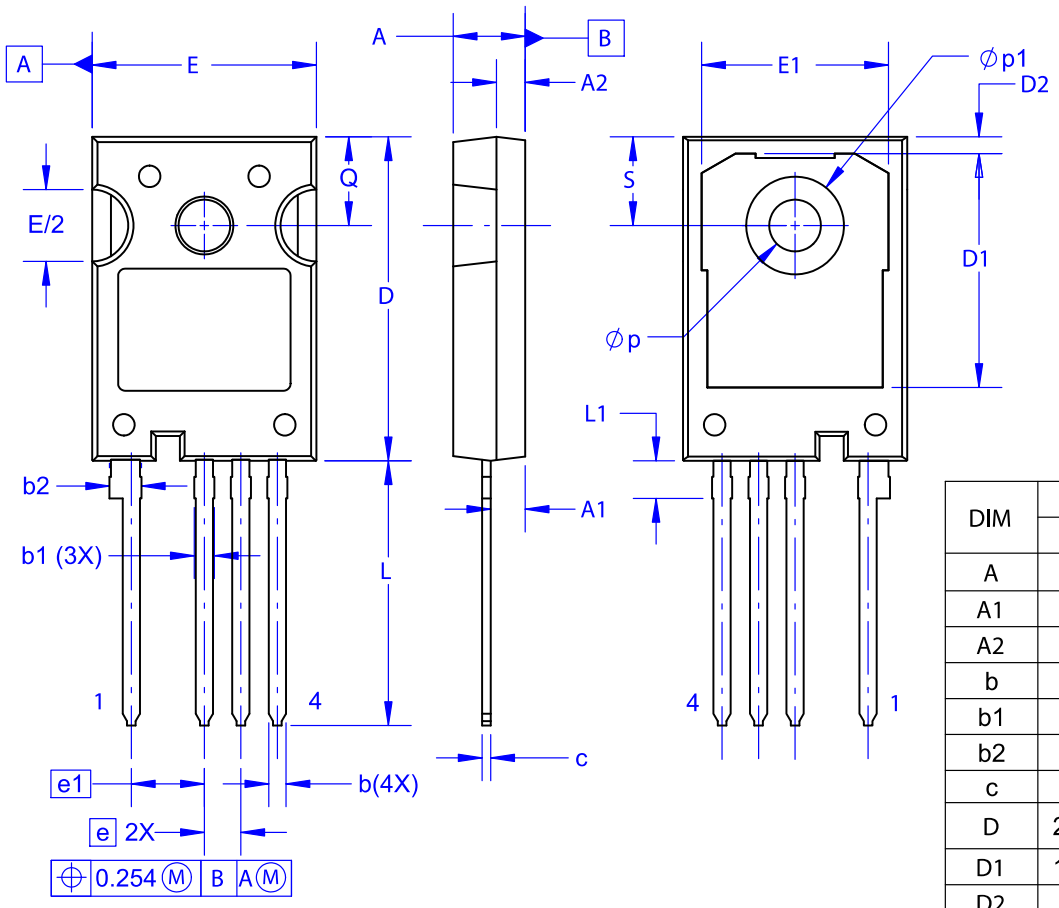
TO−247−4LD
CASE 340CJ
ISSUE A

DATE 16 SEP 2019



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C. ALL DIMENSIONS ARE IN MILLIMETERS.
D. DRAWING CONFORMS TO ASME Y14.5-2009.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.10	2.40	2.70
A2	1.80	2.00	2.20
b	1.07	1.20	1.33
b1	1.20	1.40	1.60
b2	2.02	2.22	2.42
c	0.50	0.60	0.70
D	22.34	22.54	22.74
D1	16.00	16.25	16.50
D2	0.97	1.17	1.37
e	2.54 BSC		
e1	5.08 BSC		
E	15.40	15.60	15.80
E1	12.80	13.00	13.20
E/2	4.80	5.00	5.20
L	18.22	18.42	18.62
L1	2.42	2.62	2.82
p	3.40	3.60	3.80
p1	6.60	6.80	7.00
Q	5.97	6.17	6.37
S	5.97	6.17	6.37

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