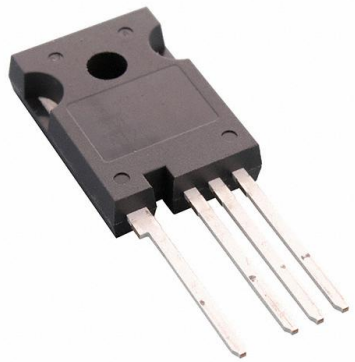
NVH4L020N120SC1 Datasheet



DiGi Electronics Part Number	NVH4L020N120SC1-DG
Manufacturer	onsemi
Manufacturer Product Number	NVH4L020N120SC1
Description	SICFET N-CH 1200V 102A TO247
Detailed Description	N-Channel 1200 V 102A (Tc) 510W (Tc) Through Hole TO-247-4L

https://www.DiGi-Electronics.com

Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
NVH4L020N120SC1	onsemi
Series:	Product Status:
-	Active
FET Type:	Technology:
N-Channel	SiCFET (Silicon Carbide)
Drain to Source Voltage (Vdss):	Current - Continuous Drain (Id) @ 25°C:
1200 V	102A (Tc)
Drive Voltage (Max Rds On, Min Rds On):	Rds On (Max) @ Id, Vgs:
20V	28mOhm @ 60A, 20V
Vgs(th) (Max) @ Id:	Gate Charge (Qg) (Max) @ Vgs:
4.3V @ 20mA	220 nC @ 20 V
Vgs (Max):	Input Capacitance (Ciss) (Max) @ Vds:
+25V, -15V	2943 pF @ 800 V
FET Feature:	Power Dissipation (Max):
-	510W (Tc)
Operating Temperature:	Grade:
-55°C ~ 175°C (TJ)	Automotive
Qualification:	Mounting Type:
AEC-Q101	Through Hole
Supplier Device Package:	Package / Case:
TO-247-4L	TO-247-4
Base Product Number:	
NVH4L020	

Environmental & Export classification

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	Not Applicable
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8541.29.0095	

onsemi

DATA SHEET
www.onsemi.com

Silicon Carbide (SiC) MOSFET – 20 mohm, 1200 V, M1, TO-247-4L

NVH4L020N120SC1

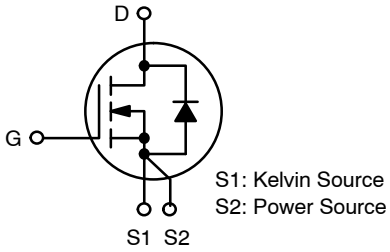
$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
1200 V	28 mΩ @ 20 V	102 A

Features

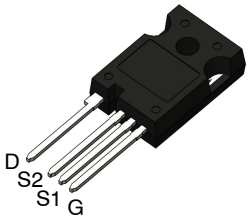
- Typ. $R_{DS(on)}$ = 20 mΩ
- Ultra Low Gate Charge ($Q_{G(tot)}$ = 220 nC)
- High Speed Switching with Low Capacitance (C_{oss} = 258 pF)
- 100% Avalanche Tested
- AEC−Q101 Qualified and PPAP Capable
- This Device is Halide Free and RoHS Compliant with exemption 7a, Pb−Free 2LI (on second level interconnection)

Typical Applications

- Automotive On Board Charger
- Automotive DC-DC Converter for EV/HEV
- Automotive Traction Inverter



N−CHANNEL MOSFET



TO−247−4L
CASE 340CJ

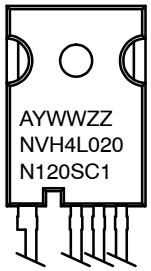
MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	1200	V
Gate−to−Source Voltage			V_{GS}	−15/+25	V
Recommended Operation Values of Gate−to−Source Voltage		T_C < 175°C	V_{GSop}	−5/+20	V
Continuous Drain Current (Note 2)	Steady State	T_C = 25°C	I_D	101	A
Power Dissipation (Note 2)			P_D	500	W
Continuous Drain Current (Notes 1, 2)	Steady State	T_C = 100°C	I_D	71.4	A
Power Dissipation (Notes 1, 2)			P_D	250	W
Pulsed Drain Current (Note 3)	T_A = 25°C		I_{DM}	408	A
Single Pulse Surge Drain Current Capability	T_A = 25°C, t_p = 10 μs, R_G = 4.7 Ω		I_{DSC}	807	A
Operating Junction and Storage Temperature Range			T_J, T_{stg}	−55 to +175	°C
Source Current (Body Diode)			I_S	46	A
Single Pulse Drain−to−Source Avalanche Energy ($I_{L(pk)}$ = 23 A, L = 1 mH) (Note 4)			E_{AS}	264	mJ
Maximum Lead Temperature for Soldering (1/8″ from case for 5 s)			T_L	300	°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. JA is constant value to follow guide table of LV/HV discrete final datasheet generation.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
3. Repetitive rating, limited by max junction temperature.
4. EAS of 264 mJ is based on starting T_J = 25°C; L = 1 mH, I_{AS} = 23 A, V_{DD} = 120 V, V_{GS} = 18 V.

MARKING DIAGRAM



A = Assembly Location
Y = Year
WW = Work Week
ZZ = Lot Traceability
NVH4L020N120SC1 = Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping
NVH4L020N120SC1	TO−247−4L	30 Units / Tube

NVH4L020N120SC1

Table 1. THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Max	Unit
Junction−to−Case − Steady State (Note 2)	$R_{\theta JC}$	0.3	°C/W
Junction−to−Ambient − Steady State (Notes 1, 2)	$R_{\theta JA}$	40	

Table 2. ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 1 mA		1200	−	−	V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	I_D = 1 mA, referenced to 25°C		−	0.5	−	V/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 1200 V	T_J = 25°C	−	−	100	μA
			T_J = 175°C	−	−	1	mA
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = +25/−15 V, V_{DS} = 0 V		−	−	±1	μA
ON CHARACTERISTICS (Note 3)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 20 mA		1.8	2.7	4.3	V
Recommended Gate Voltage	V_{GOP}			−5	−	+20	V
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 20 V, I_D = 60 A, T_J = 25°C		−	20	28	mΩ
		V_{GS} = 20 V, I_D = 60 A, T_J = 175°C		−	37	50	
Forward Transconductance	g_{FS}	V_{DS} = 20 V, I_D = 60 A		−	36	−	S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 800 V		−	2943	−	pF
Output Capacitance	C_{OSS}			−	258	−	
Reverse Transfer Capacitance	C_{RSS}			−	24	−	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −5/20 V, V_{DS} = 600 V, I_D = 80 A		−	220	−	nC
Threshold Gate Charge	$Q_{G(TH)}$			−	33	−	
Gate−to−Source Charge	Q_{GS}			−	66	−	
Gate−to−Drain Charge	Q_{GD}			−	63	−	
Gate−Resistance	R_G	f = 1 MHz		−	1.6	−	Ω
SWITCHING CHARACTERISTICS, VGS = 10 V							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −5/20 V, V_{DS} = 800 V, I_D = 80 A, R_G = 2 Ω Inductive load		−	21.6	35	ns
Rise Time	t_r			−	21	34	
Turn−Off Delay Time	$t_{d(OFF)}$			−	41	66	
Fall Time	t_f			−	10	20	
Turn−On Switching Loss	E_{ON}			−	494	−	μJ
Turn−Off Switching Loss	E_{OFF}			−	397	−	
Total Switching Loss	E_{tot}			−	891	−	
DRAIN−SOURCE DIODE CHARACTERISTICS							
Continuous Drain−Source Diode Forward Current	I_{SD}	V_{GS} = −5 V, T_J = 25°C		−	−	46	A
Pulsed Drain−Source Diode Forward Current (Note 3)	I_{SDM}			−	−	408	
Forward Diode Voltage	V_{SD}	V_{GS} = −5 V, I_{SD} = 30 A, T_J = 25°C		−	3.7	−	V

Table 2. ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified) (continued)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DRAIN−SOURCE DIODE CHARACTERISTICS						
Reverse Recovery Time	t_{RR}	V_{GS} = −5/20 V, I_{SD} = 80 A, dI_S/dt = 1000 A/μs	–	30	–	ns
Reverse Recovery Charge	Q_{RR}		–	225	–	nC
Reverse Recovery Energy	E_{REC}		–	16	–	μJ
Peak Reverse Recovery Current	I_{RRM}		–	15	–	A
Charge Time	Ta		–	16	–	ns
Discharge Time	Tb		–	15	–	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.

NVH4L020N120SC1

TYPICAL CHARACTERISTICS

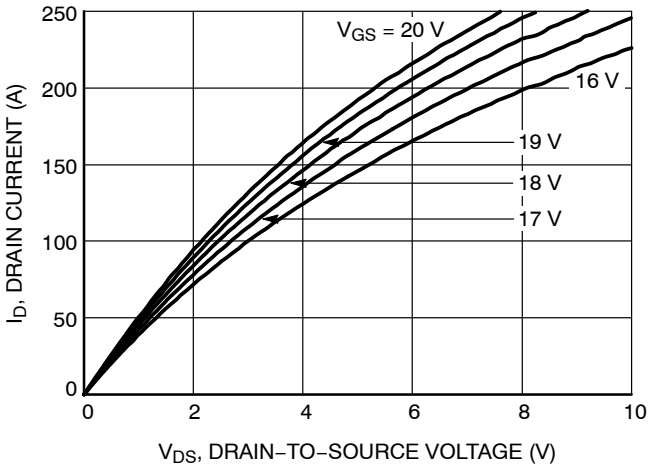


Figure 1. On−Region Characteristics

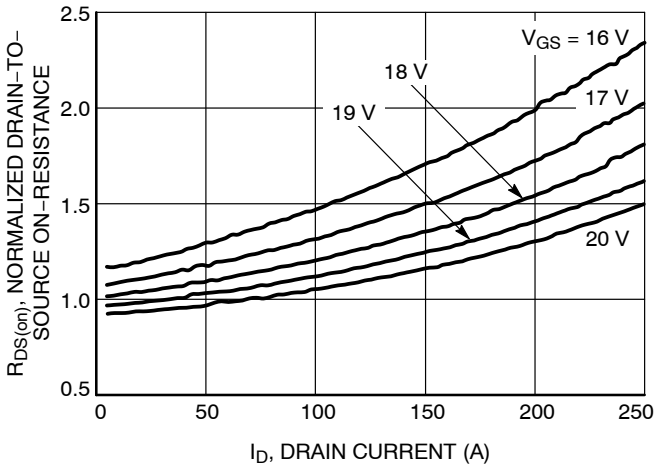


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

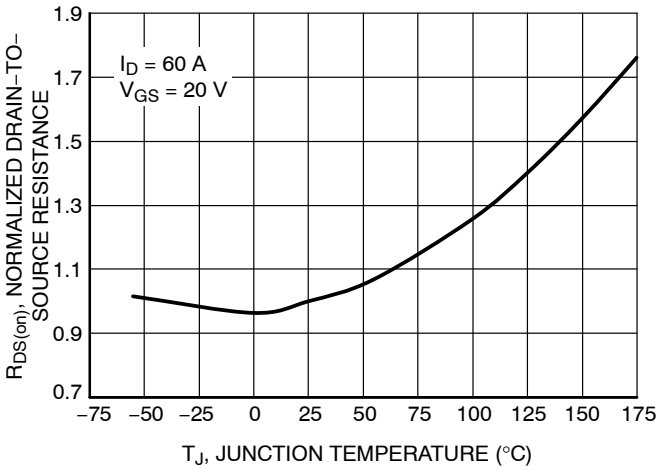


Figure 3. On−Resistance Variation with Temperature

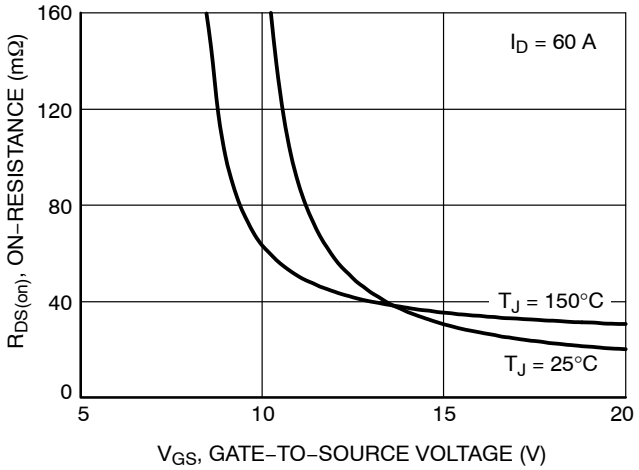


Figure 4. On−Resistance vs. Gate−to−Source Voltage

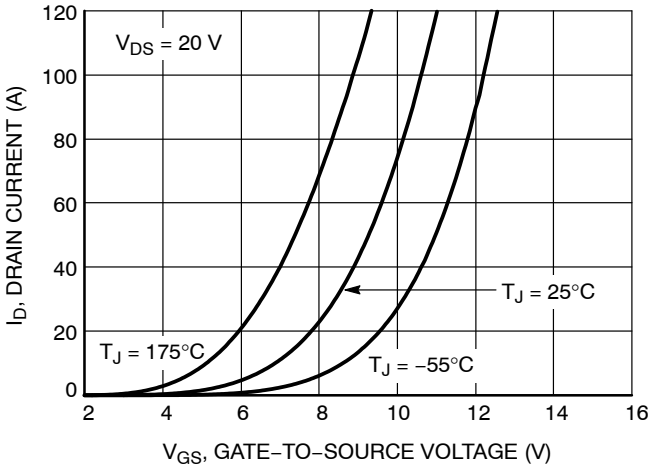


Figure 5. Transfer Characteristics

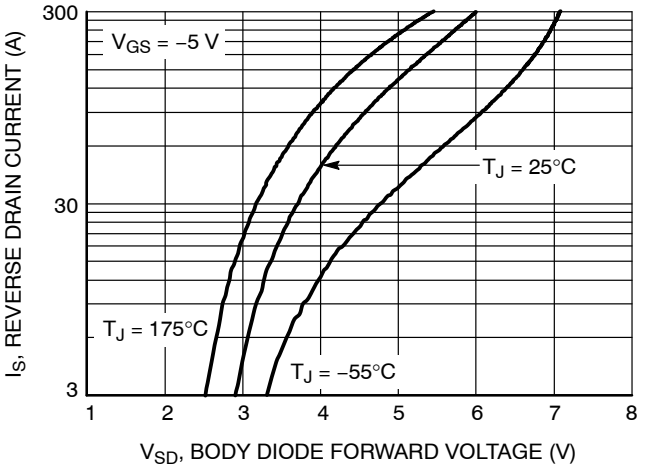


Figure 6. Diode Forward Voltage vs. Current

TYPICAL CHARACTERISTICS (continued)

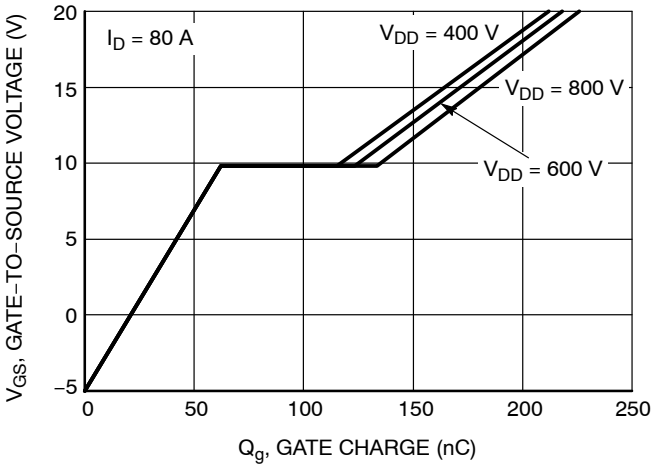


Figure 7. Gate−to−Source Voltage vs. Total Charge

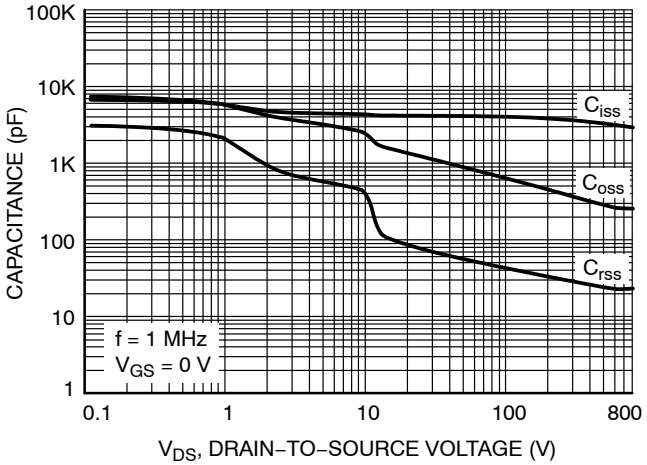


Figure 8. Capacitance vs. Drain−to−Source Voltage

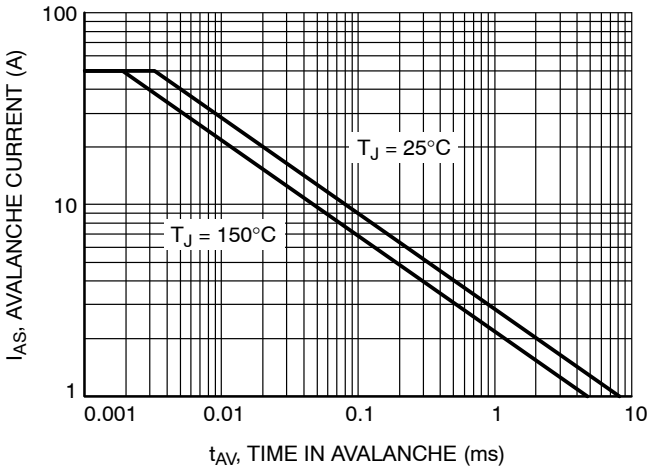


Figure 9. Unclamped Inductive Switching Capability

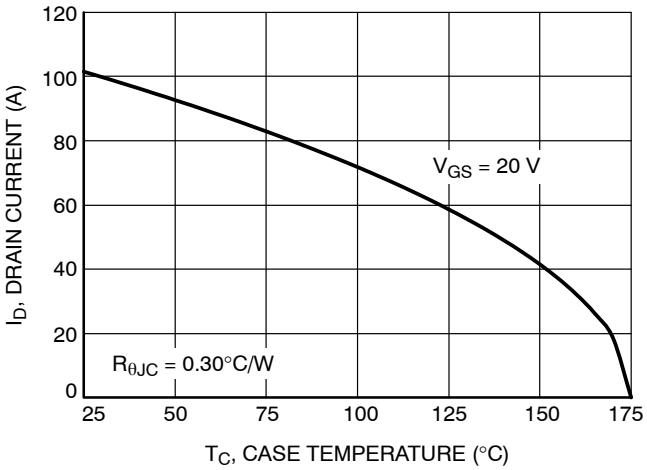


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

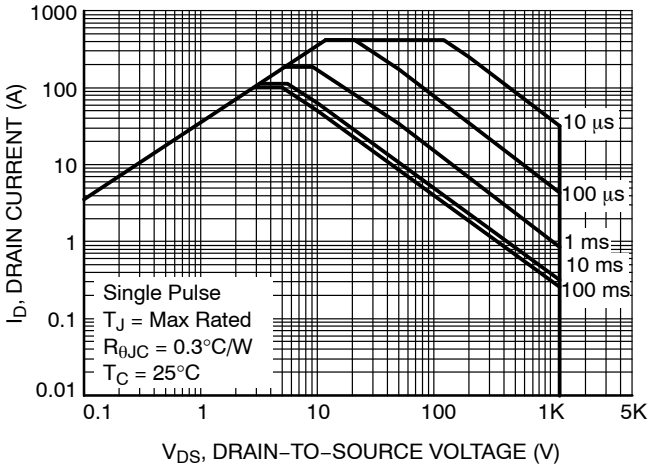


Figure 11. Safe Operating Area

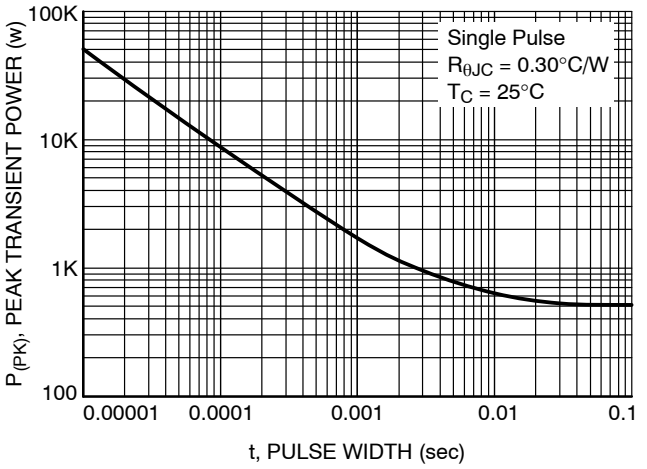


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (continued)

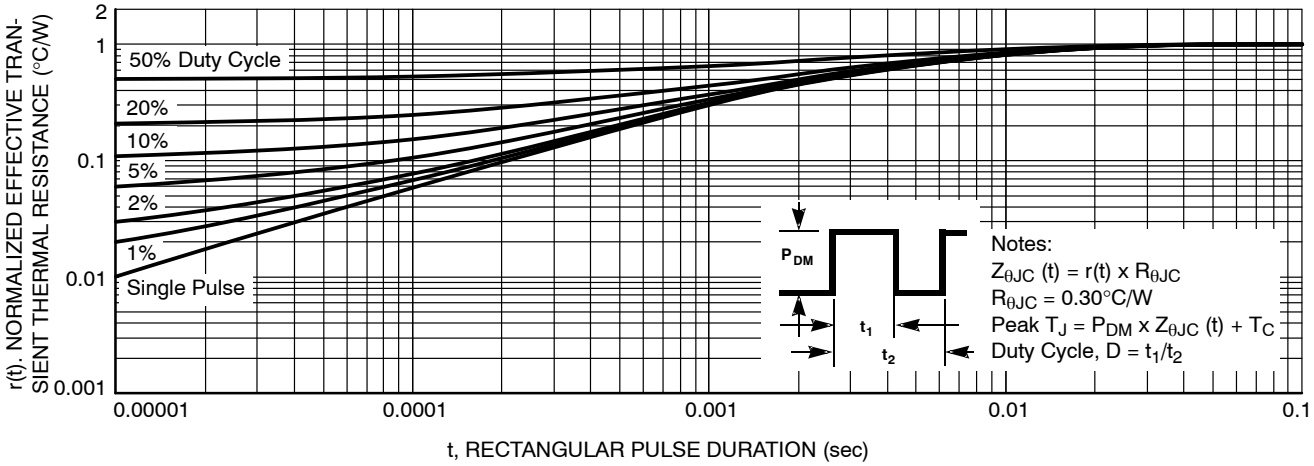
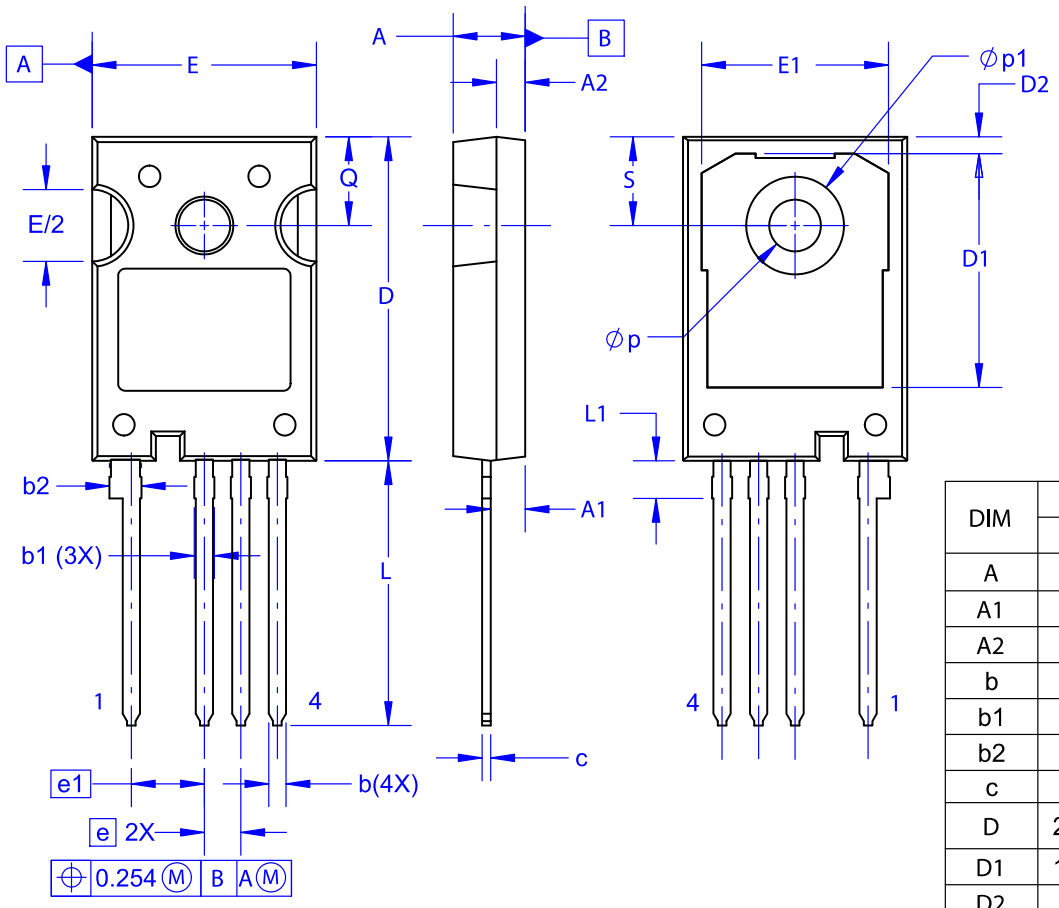


Figure 13. Junction−to−Ambient Thermal Response

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

TO−247−4LD
CASE 340CJ
ISSUE A

DATE 16 SEP 2019



NOTES:

A. NO INDUSTRY STANDARD APPLIES TO THIS PACKAGE.
B. DIMENSIONS ARE EXCLUSIVE OF BURRS,MOLD FLASH,AND TIE BAR EXTRUSIONS.
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

DOCUMENT NUMBER:	**98AON13852G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**TO−247−4LD**	**PAGE 1 OF 1**

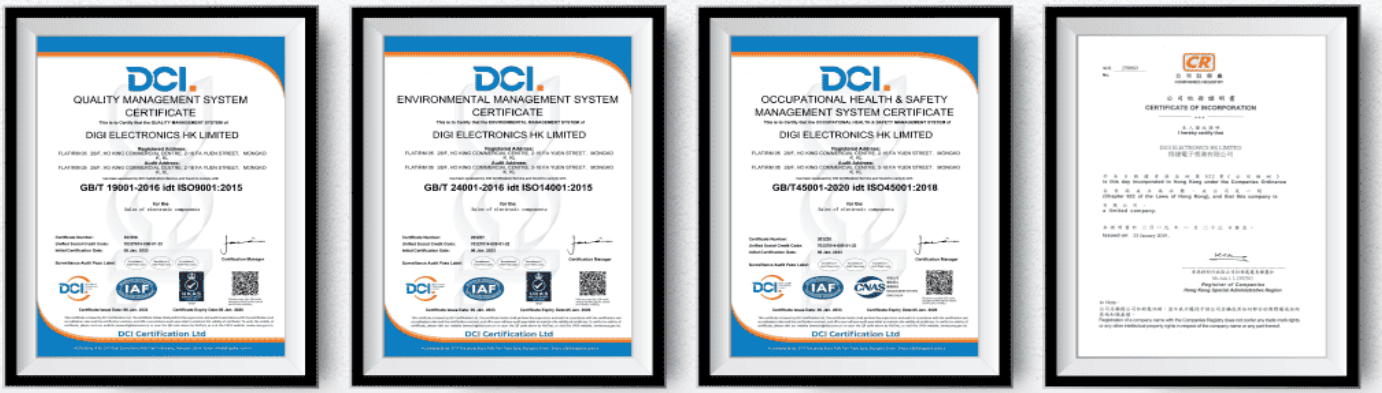
ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales

OUR CERTIFICATE

DiGi provide top-quality products and perfect service for customer worldwide through standardization, technological innovation and continuous improvement. DiGi through third-party certification, we striciy control the quality of products and services. Welcome your RFQ to Email: Info@DiGi-Electronics.com



Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.