MOSFET - SiC Power, Single N-Channel, TO247-4L
650 V, 70 mΩ, 31 A

NTH4L095N065SC1

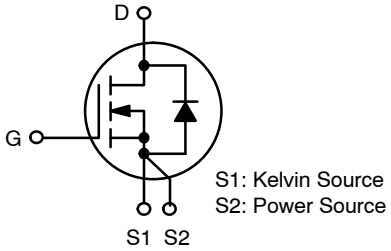
$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
650 V	105 mΩ @ 18 V	31 A

Features

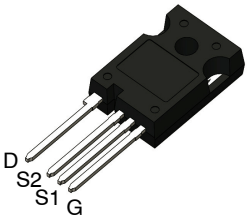
- Typ. $R_{DS(on)}$ = 70 mΩ @ V_{GS} = 18 V
  Typ. $R_{DS(on)}$ = 95 mΩ @ V_{GS} = 15 V
- Ultra Low Gate Charge ($Q_{G(tot)}$ = 50 nC)
- Low Output Capacitance (C_{oss} = 89 pF)
- 100% Avalanche Tested
- T_J = 175°C
- This Device is Pb−Free and is RoHS Compliant

Typical Applications

- SMPS (Switching Mode Power Supplies)
- Solar Inverters
- UPS (Uninterruptable Power Supplies)
- Energy Storage



N−CHANNEL MOSFET



TO247−4L
CASE 340CJ

MARKING DIAGRAM

H4L095065SC1 = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Lot Traceability

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

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	650	V
Gate−to−Source Voltage			V_{GS}	−8/+22	V
Recommended Operation Values of Gate−to−Source Voltage		T_C < 175°C	V_{GSop}	−5/+18	V
Continuous Drain Current (Note 1)	Steady State	T_C = 25°C	I_D	31	A
Power Dissipation (Note 1)	Steady State	T_C = 25°C	P_D	129	W
Continuous Drain Current (Note 1)	Steady State	T_C = 100°C	I_D	22	A
Power Dissipation (Note 1)	Steady State	T_C = 100°C	P_D	64	W
Pulsed Drain Current (Note 2)		T_C = 25°C	I_{DM}	97	A
Operating Junction and Storage Temperature Range			T_J, T_{stg}	−55 to +175	°C
Source Current (Body Diode)			I_S	26	A
Single Pulse Drain−to−Source Avalanche Energy ($I_{L(pk)}$ = 9.4 A, L = 1 mH) (Note 3)			E_{AS}	44	mJ
Maximum Lead Temperature for Soldering (1/8″ from case for 5 s)			T_L	260	°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. Repetitive rating, limited by max junction temperature.
3. EAS of 44 mJ is based on starting T_J = 25°C; L = 1 mH, I_{AS} = 9.4 A, V_{DD} = 50 V, V_{GS} = 18 V.

ORDERING INFORMATION

Device	Package	Shipping
NTH4L095N065SC1	TO247−4L	30 Units / Tube

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THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Max	Unit
Junction−to−Case − Steady State (Note 1)	$R_{\theta JC}$	1.16	°C/W
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	40	

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		650	–	–	V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	I_D = 20 mA, referenced to 25°C		–	0.15	–	V/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 650 V	T_J = 25°C	–	–	10	μA
			T_J = 175°C	–	–	1	mA
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = +18/−5 V, V_{DS} = 0 V		–	–	250	nA
ON CHARACTERISTICS (Note 2)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 4 mA		1.8	2.8	4.3	V
Recommended Gate Voltage	V_{GOP}			−5	–	+18	V
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 15 V, I_D = 12 A, T_J = 25°C		–	95	–	mΩ
		V_{GS} = 18 V, I_D = 12 A, T_J = 25°C		–	70	105	
		V_{GS} = 18 V, I_D = 12 A, T_J = 175°C		–	85	–	
Forward Transconductance	g_{FS}	V_{DS} = 10 V, I_D = 12 A		–	6.9	–	S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 325 V		–	956	–	pF
Output Capacitance	C_{OSS}			–	89	–	
Reverse Transfer Capacitance	C_{RSS}			–	7.8	–	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −5/18 V, V_{DS} = 520 V, I_D = 12 A		–	50	–	nC
Gate−to−Source Charge	Q_{GS}			–	14	–	
Gate−to−Drain Charge	Q_{GD}			–	15	–	
Gate−Resistance	R_G	f = 1 MHz		–	7.6	–	Ω
SWITCHING CHARACTERISTICS							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −5/18 V, V_{DS} = 400 V, I_D = 12 A, R_G = 2.2 Ω inductive load		–	8	–	ns
Rise Time	t_r			–	12	–	
Turn−Off Delay Time	$t_{d(OFF)}$			–	20	–	
Fall Time	t_f			–	9	–	
Turn−On Switching Loss	E_{ON}			–	34	–	μJ
Turn−Off Switching Loss	E_{OFF}			–	11	–	
Total Switching Loss	E_{tot}			–	45	–	
DRAIN−SOURCE DIODE CHARACTERISTICS							
Continuous Drain−Source Diode Forward Current	I_{SD}	V_{GS} = −5 V, T_J = 25°C		–	–	26	A
Pulsed Drain−Source Diode Forward Current (Note 2)	I_{SDM}			–	–	97	
Forward Diode Voltage	V_{SD}	V_{GS} = −5 V, I_{SD} = 12 A, T_J = 25°C		–	4.5	–	V

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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} = −5/18 V, I_{SD} = 12 A, dI_S/dt = 1000 A/μs	–	15	–	ns
Reverse Recovery Charge	Q_{RR}		–	62	–	nC
Reverse Recovery Energy	E_{REC}		–	6.5	–	μJ
Peak Reverse Recovery Current	I_{RRM}		–	8	–	A
Charge time	Ta		–	8	–	ns
Discharge time	Tb		–	7	–	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.

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TYPICAL CHARACTERISTICS

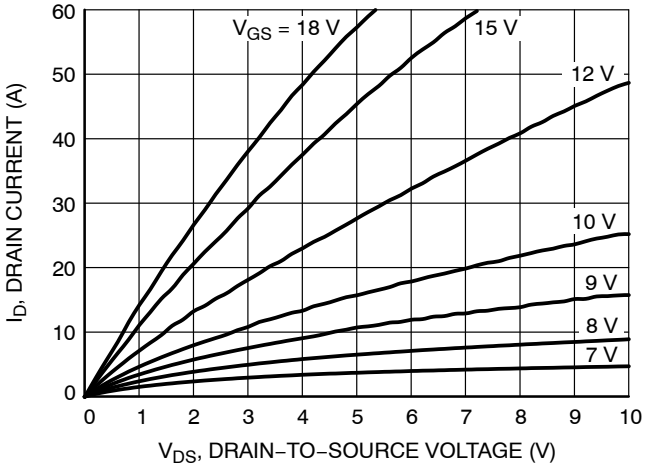

Figure 1. On−Region Characteristics

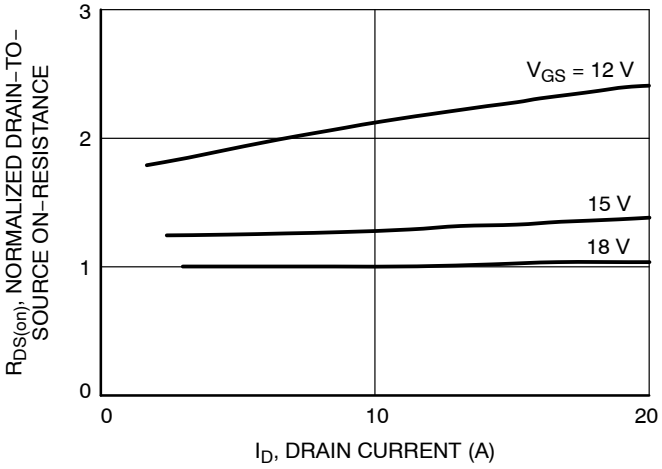

Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

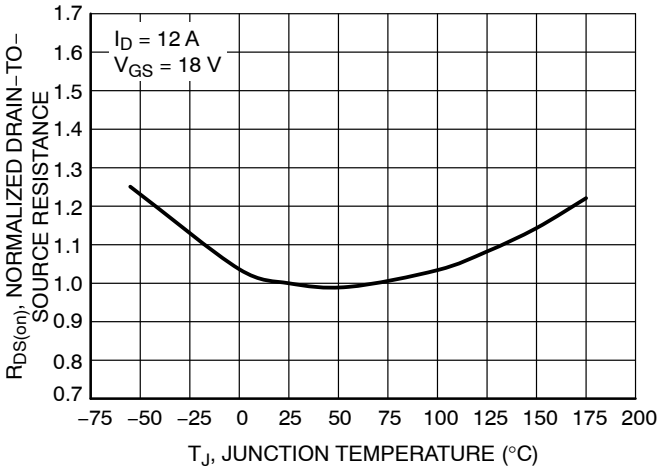

Figure 3. On−Resistance Variation with Temperature

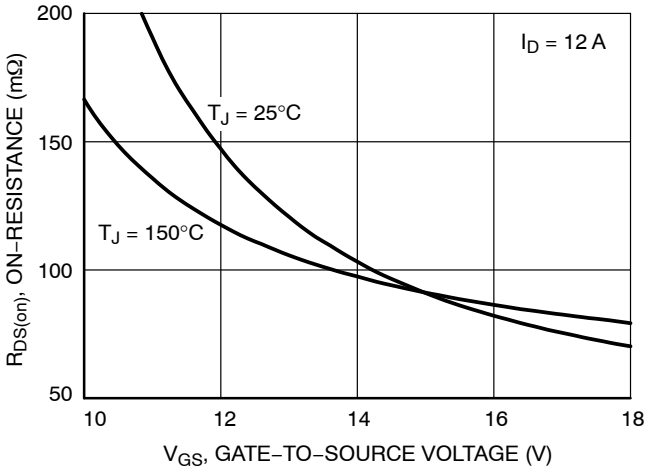

Figure 4. On−Resistance vs. Gate−to−Source Voltage

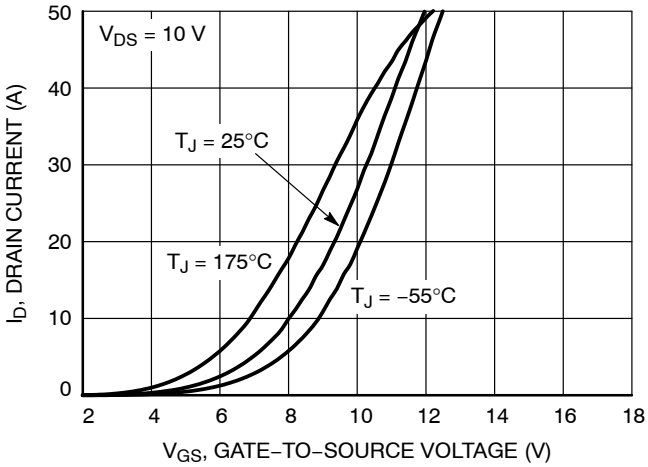

Figure 5. Transfer Characteristics

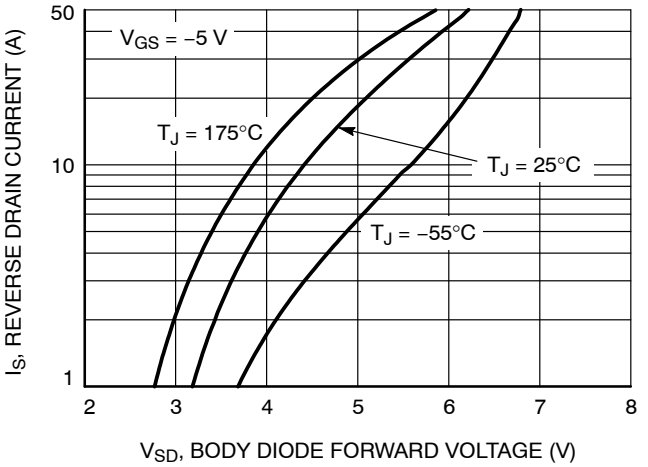

Figure 6. Diode Forward Voltage vs. Current

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TYPICAL CHARACTERISTICS

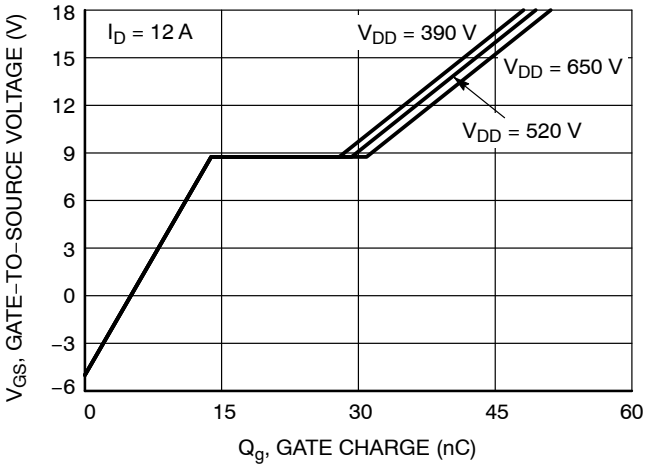

Figure 7. Gate−to−Source Voltage vs. Total Charge

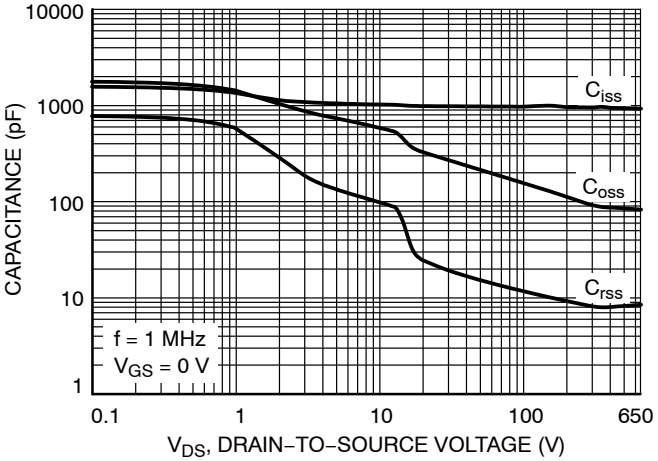

Figure 8. Capacitance vs. Drain−to−Source Voltage

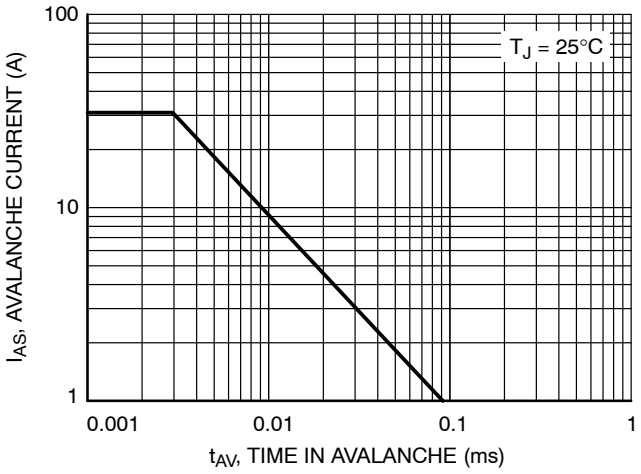

Figure 9. Unclamped Inductive Switching Capability

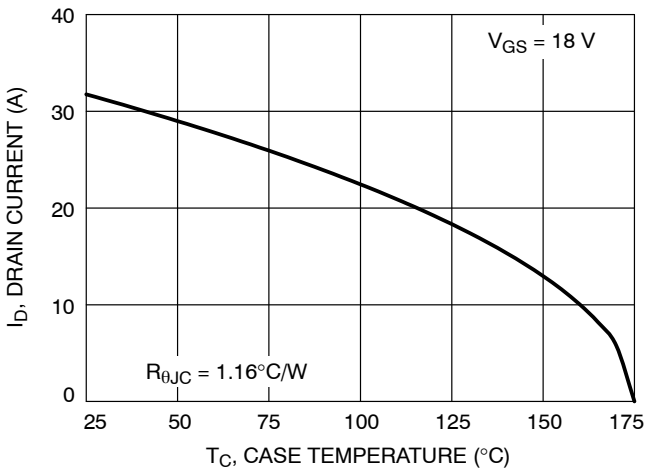

Figure 10. Maximum Continuous Drain Current vs. Case Temperature

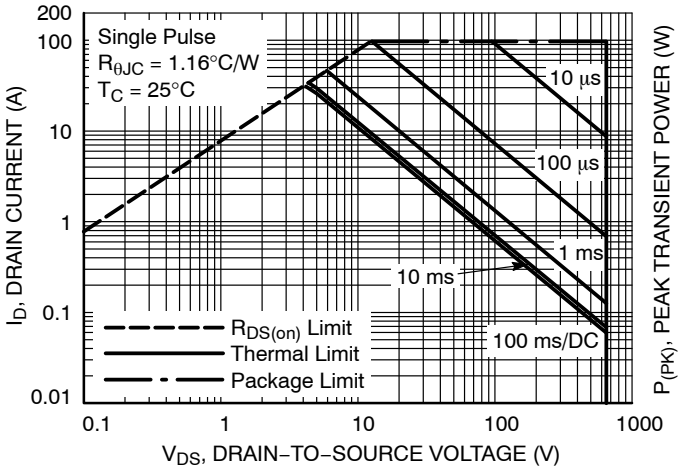

Figure 11. Safe Operating Area

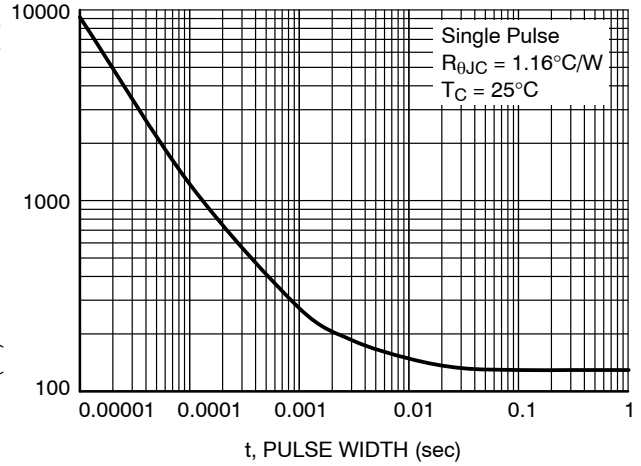

Figure 12. Single Pulse Maximum Power Dissipation

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TYPICAL CHARACTERISTICS

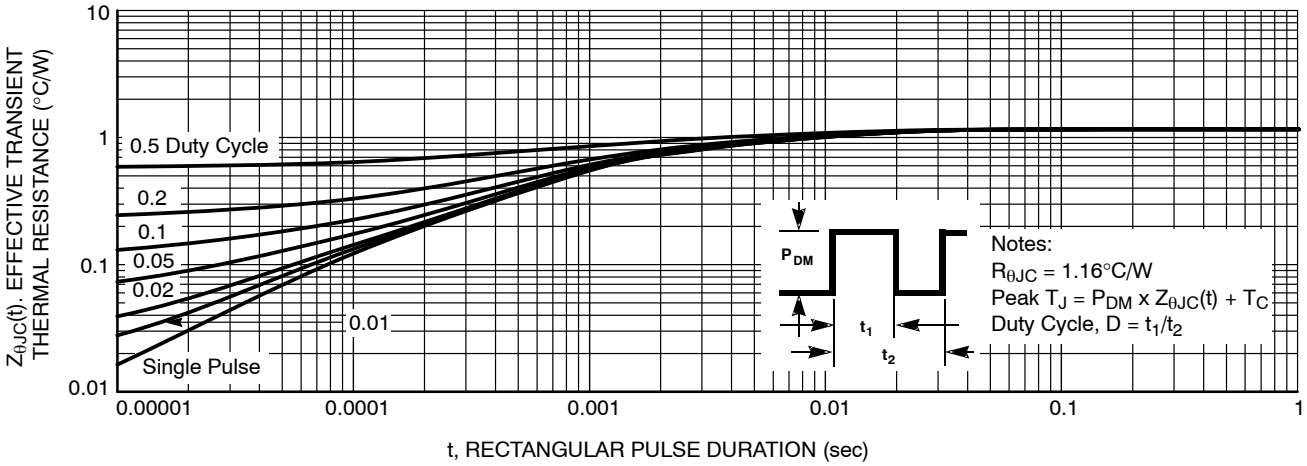

Figure 13. Junction−to−Case Thermal Response

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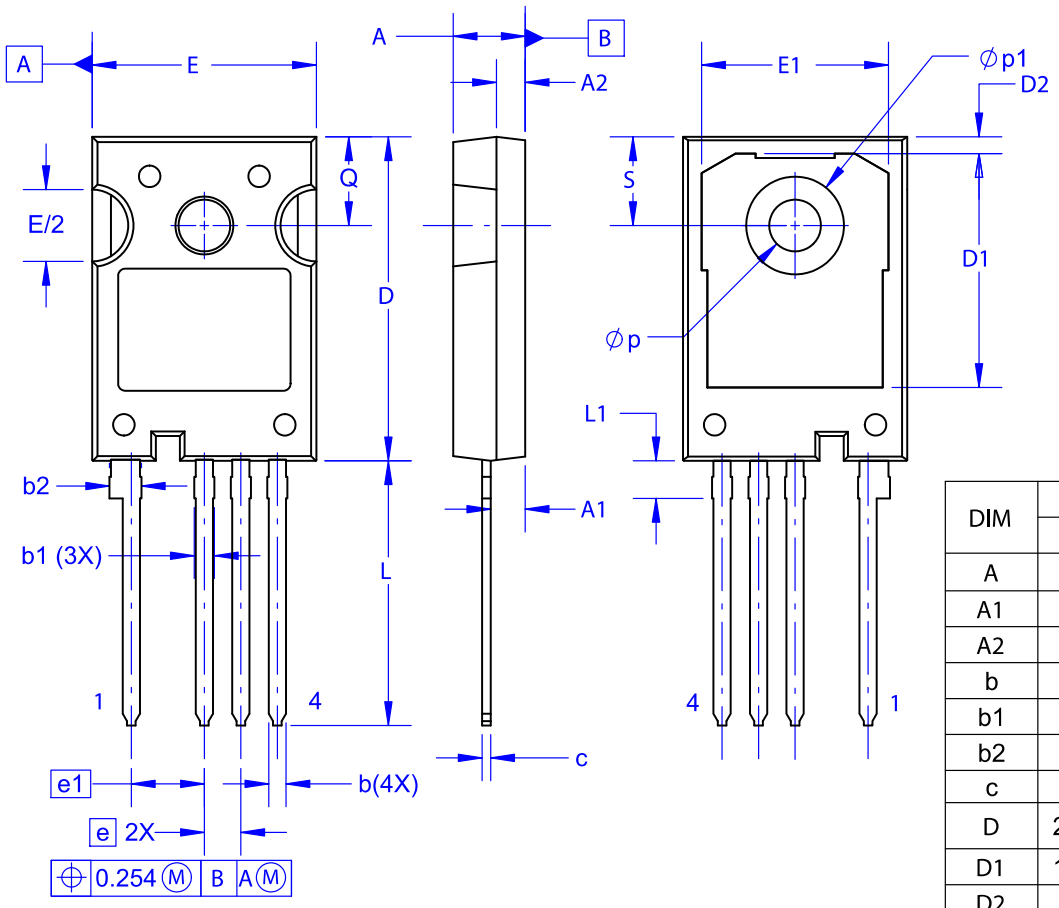
CASE 340CJ
ISSUE A

DATE 16 SEP 2019



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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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