

Silicon Carbide (SiC) MOSFET - EliteSiC, 56 mohm, 650 V, M2, TOLL NTBL075N065SC1

Features

- Typ. $R_{DS(on)} = 56 \text{ m}\Omega$ @ $V_{GS} = 18 \text{ V}$
- Typ. $R_{DS(on)} = 75 \text{ m}\Omega$ @ $V_{GS} = 15 \text{ V}$
- Ultra Low Gate Charge ($Q_{G(tot)} = 59 \text{ nC}$)
- Low Effective Output Capacitance ($C_{oss} = 109 \text{ pF}$)
- 100% Avalanche Tested
- $T_J = 175^\circ\text{C}$
- RoHS Compliant

Typical Applications

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

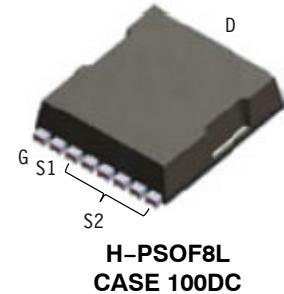
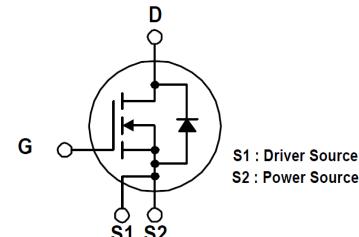
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V_{DSS}	650	V
Gate-to-Source Voltage		V_{GS}	-8/+22.6	V
Recommended Operation Values of Gate – Source Voltage	$T_C < 175^\circ\text{C}$	V_{GSop}	-5/+18	V
Continuous Drain Current (Note 2)		I_D	37	A
Power Dissipation (Note 2)	$T_C = 25^\circ\text{C}$	P_D	139	W
Continuous Drain Current (Note 2)		I_D	26	A
Power Dissipation (Note 2)	$T_C = 100^\circ\text{C}$	P_D	69	W
Pulsed Drain Current (Note 3)		I_{DM}	101	A
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +175		°C
Source Current (Body Diode)	I_S	37		A
Single Pulse Drain-to-Source Avalanche Energy ($I_L = 12.9 \text{ A}_{pk}$, $L = 1 \text{ mH}$) (Note 4)	E_{AS}	83		mJ
Maximum Lead Temperature for Soldering (1/8" from Case for 5 Seconds)	T_L	260		°C

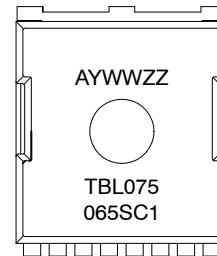
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface mounted on a FR-4 board using 1 in2 pad of 2 oz copper.
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. E_{AS} of 83 mJ is based on starting $T_J = 25^\circ\text{C}$; $L = 1 \text{ mH}$, $I_{AS} = 12.9 \text{ A}$, $V_{DD} = 50 \text{ V}$, $V_{GS} = 18 \text{ V}$.

V_{DSS}	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
650 V	85 mΩ @ 18 V	37 A



MARKING DIAGRAM



A = Assembly Location
 Y = Year
 WW = Work Week
 ZZ = Assembly Lot Code
 TBL075065SC1 = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

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THERMAL CHARACTERISTICS

Parameter	Symbol	Max	Units
Junction-to-Case – Steady State (Note 2)	$R_{\theta JC}$	1.08	°C/W
Junction-to-Ambient – Steady State (Notes 1, 2)	$R_{\theta JA}$	43	°C/W

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ C$ unless otherwise stated)

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	$V_{(BR)DSS}/T_J$	$I_D = 20 mA$	refer to $25^\circ C$ (Note 5)		0.12		V/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0 V$ $V_{DS} = 650 V$	$T_J = 25^\circ C$			10	μA
			$T_J = 175^\circ C$ (Note 5)			1	mA
Gate-to-Source Leakage Current	I_{GSS}	$V_{GS} = +18/-5 V$	$V_{DS} = 0 V$			250	nA

ON CHARACTERISTICS

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$, $I_D = 5 mA$	1.8	2.8	4.3	V
Recommended Gate Voltage	V_{GOP}		-5		+18	V
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 15 V$, $I_D = 15 A$, $T_J = 25^\circ C$		75		mΩ
		$V_{GS} = 18 V$, $I_D = 15 A$, $T_J = 25^\circ C$		56	85	
		$V_{GS} = 18 V$, $I_D = 15 A$, $T_J = 175^\circ C$ (Note 5)		70		
Forward Transconductance	g_{FS}	$V_{DS} = 10 V$, $I_D = 15 A$ (Note 5)		8		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0 V$, $f = 1 MHz$, $V_{DS} = 325 V$ (Note 5)		1191		pF
Output Capacitance	C_{OSS}			109		
Reverse Transfer Capacitance	C_{RSS}			11		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -5/18 V$, $V_{DS} = 520 V$, $I_D = 15 A$ (Note 5)		59		nC
Gate-to-Source Charge	Q_{GS}			17		
Gate-to-Drain Charge	Q_{GD}			20		
Gate-Resistance	R_G	$f = 1 MHz$		5.6		Ω

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -5/18 V$, $V_{DS} = 400 V$, $I_D = 15 A$, $R_G = 2.2 \Omega$, Inductive Load (Note 5)		9		ns
Rise Time	t_r			12		
Turn-Off Delay Time	$t_{d(OFF)}$			20		
Fall Time	t_f			8		
Turn-On Switching Loss	E_{ON}			35		
Turn-Off Switching Loss	E_{OFF}			12		
Total Switching Loss	E_{TOT}			47		

SOURCE-DRAIN DIODE CHARACTERISTICS

Continuous Source-Drain Diode Forward Current	I_{SD}	$V_{GS} = -5 V$, $T_J = 25^\circ C$ (Note 5)			37	A
Pulsed Source-Drain Diode Forward Current (Note 3)	I_{SDM}	$V_{GS} = -5 V$, $T_J = 25^\circ C$ (Note 5)			101	A
Forward Diode Voltage	V_{SD}	$V_{GS} = -5 V$, $I_{SD} = 15 A$, $T_J = 25^\circ C$		4.4		V

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
SOURCE-DRAIN DIODE CHARACTERISTICS						
Reverse Recovery Time	t _{RR}	$V_{GS} = -5/18 \text{ V}$, $I_{SD} = 15 \text{ A}$, $dI_S/dt = 1000 \text{ A}/\mu\text{s}$ (Note 5)		16		ns
Reverse Recovery Charge	Q _{RR}			66		nC
Reverse Recovery Energy	E _{REC}			2.6		μJ
Peak Reverse Recovery Current	I _{RRM}			8.4		A
Charge time	T _a			8.6		ns
Discharge time	T _b			7.1		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. Defined by design, not subject to production test.

TYPICAL CHARACTERISTICS

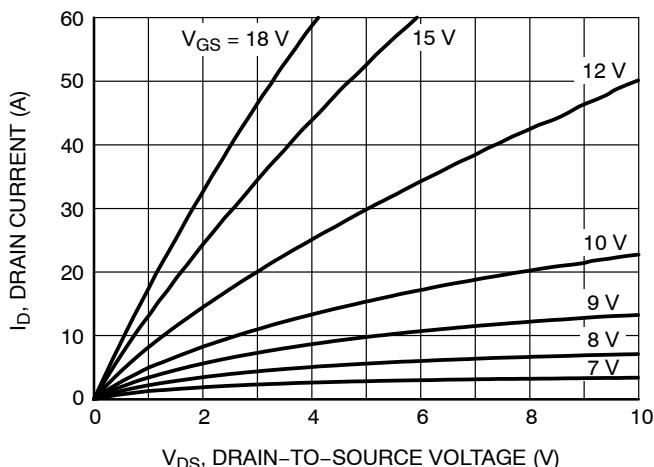


Figure 1. On-Region Characteristics

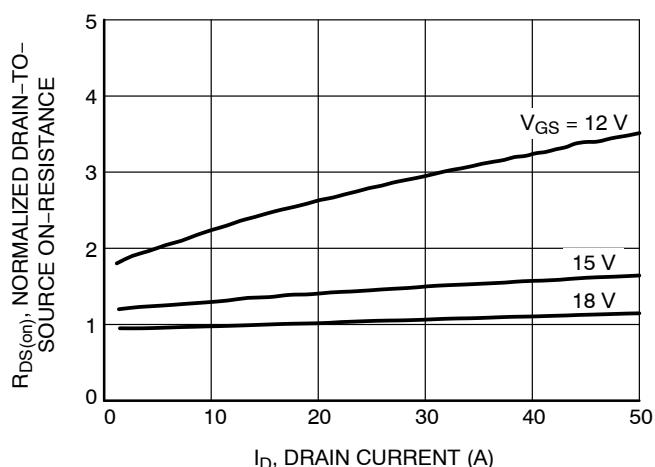


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

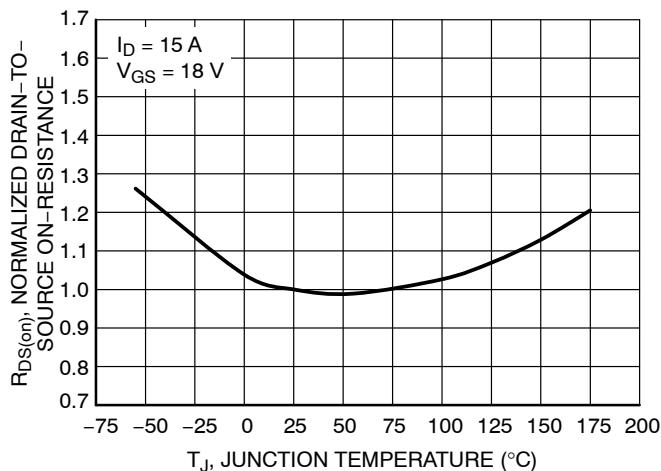


Figure 3. On-Resistance Variation with Temperature

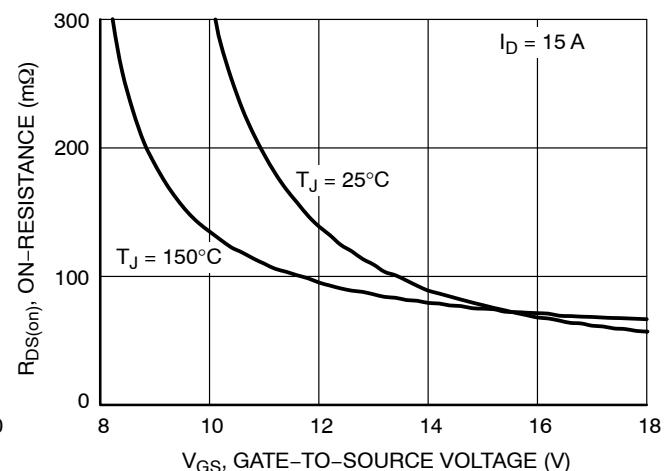


Figure 4. On-Resistance vs. Gate-to-Source Voltage

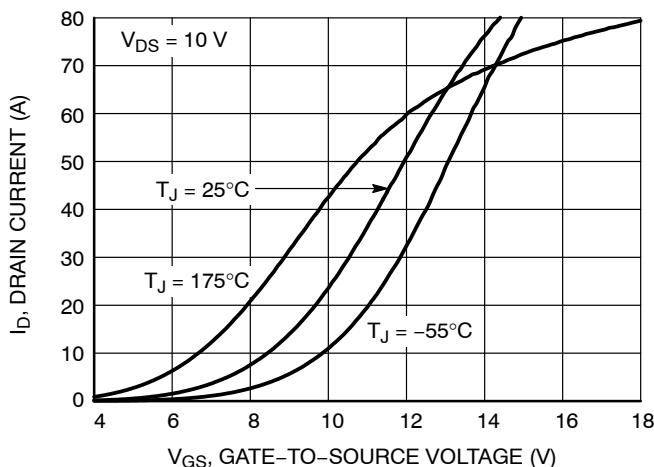


Figure 5. Transfer Characteristics

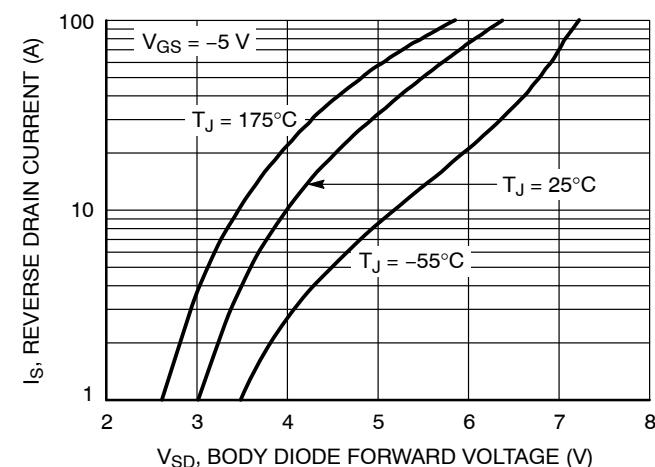


Figure 6. Diode Forward Voltage vs. Current

TYPICAL CHARACTERISTICS

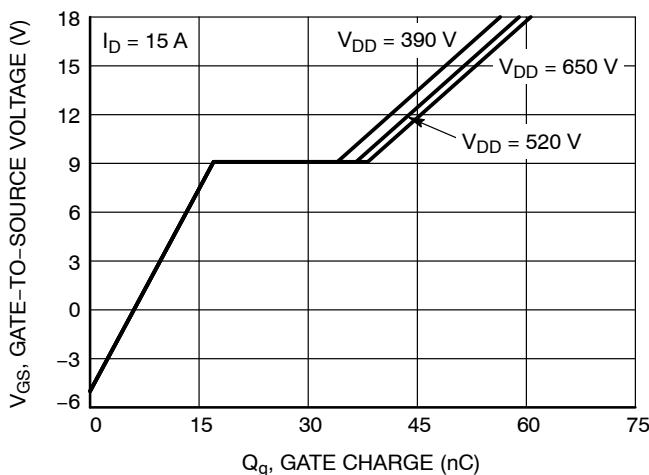


Figure 7. Gate-to-Source Voltage vs. Total Charge

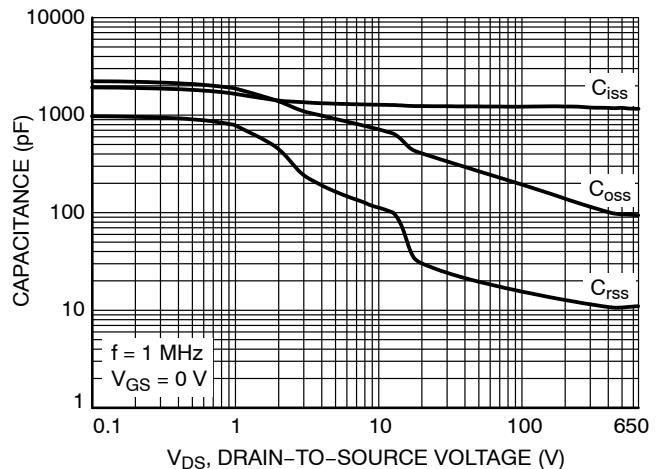


Figure 8. Capacitance vs. Drain-to-Source Voltage

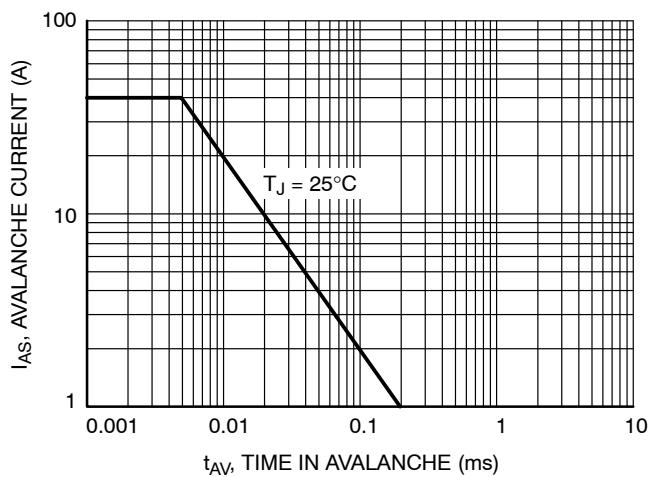


Figure 9. Unclamped Inductive Switching Capability

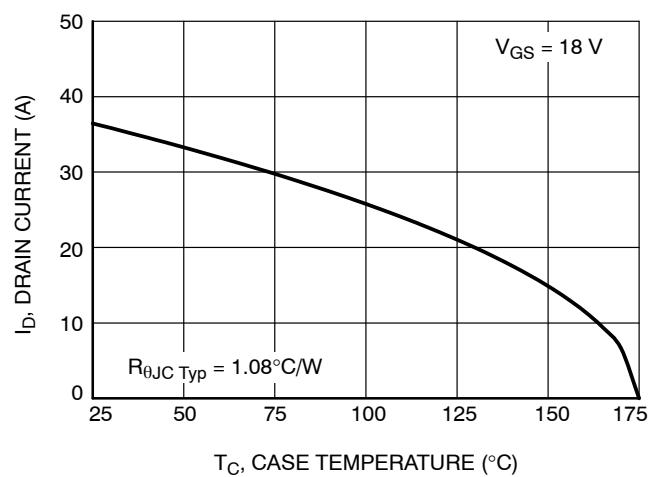


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

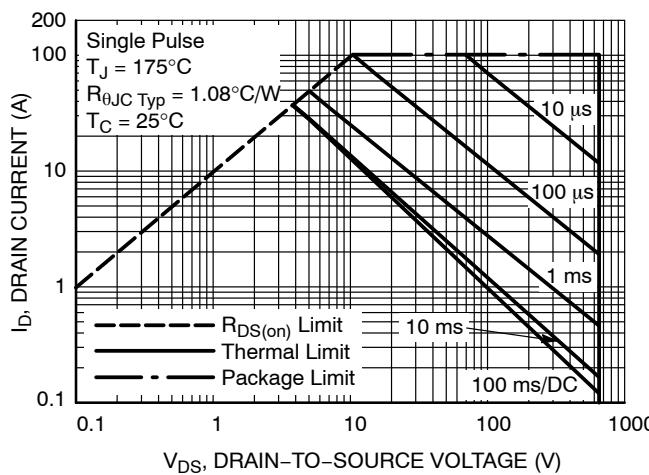


Figure 11. Safe Operating Area

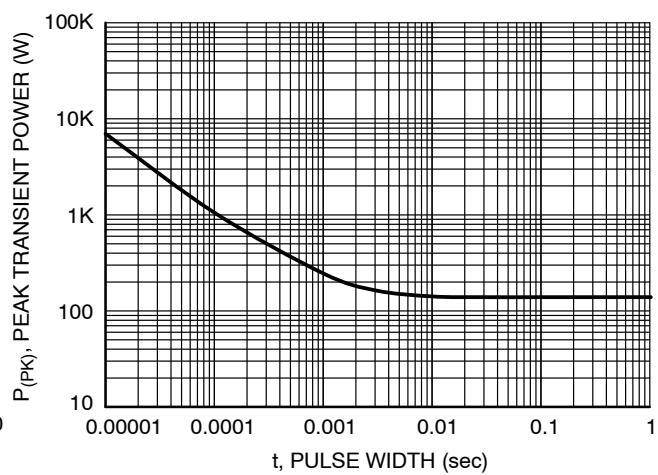


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS

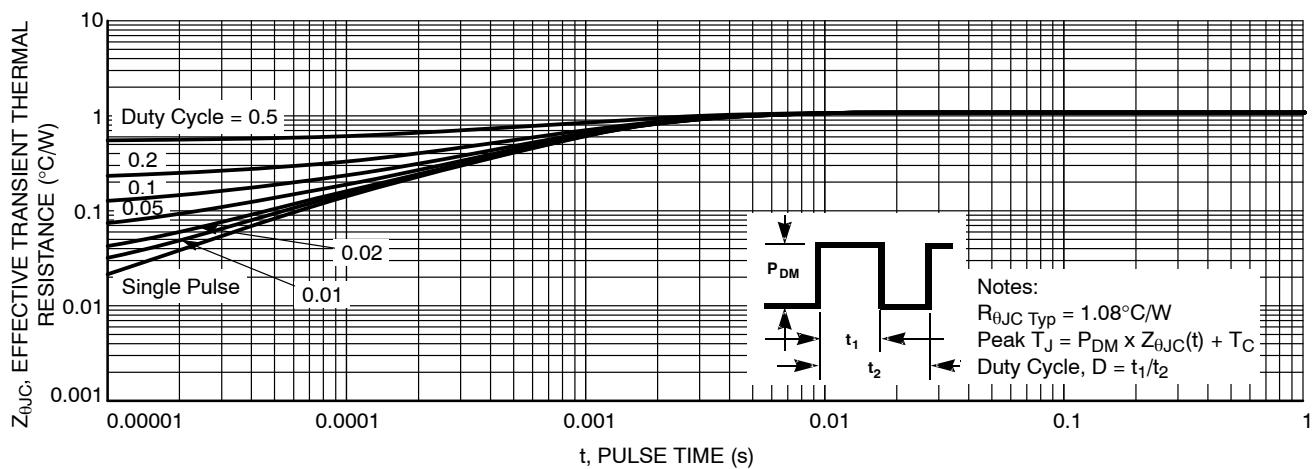


Figure 13. Junction-to-Case Transient Thermal Response

DEVICE ORDERING INFORMATION

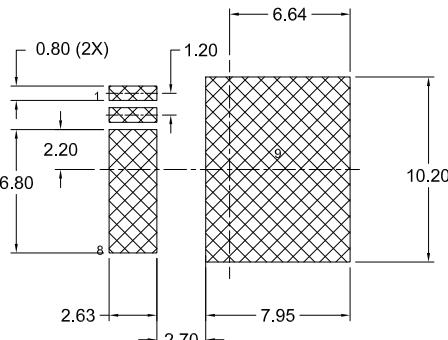
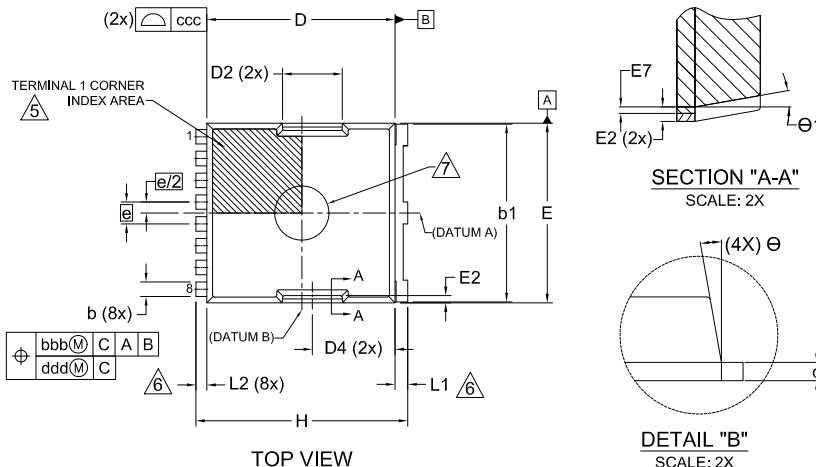
Device	Package	Shipping [†]
NTBL075N065SC1	H-PSOF8L	2000 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

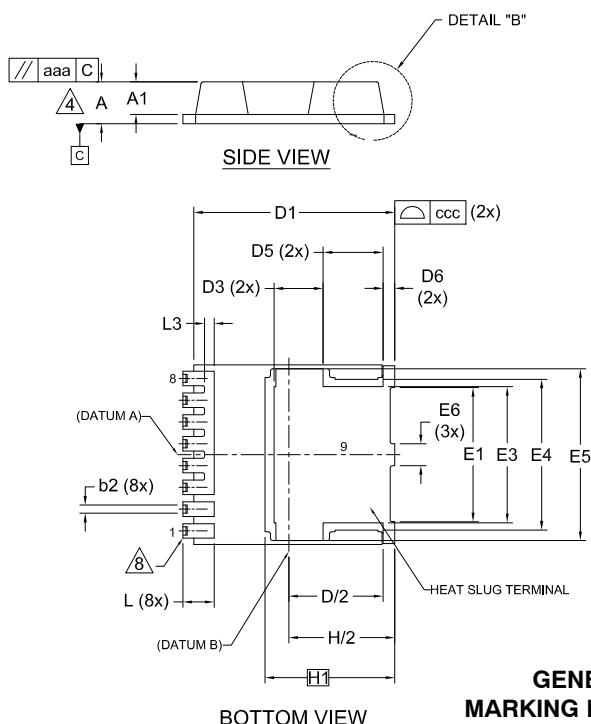


H-PSOF8L 9.90x10.38x2.30, 1.20P
CASE 100DC
ISSUE C

DATE 31 MAY 2024



*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.



DIM	MILLIMETERS			DIM	MILLIMETERS		
	MIN.	NOM.	MAX.		MIN.	NOM.	MAX.
A	2.20	2.30	2.40	E5	9.36	9.46	9.47
A1	1.70	1.80	1.90	E6	1.10	1.20	1.30
b	0.70	0.80	0.90	E7	0.15	0.18	0.21
b1	9.70	9.80	9.90	e	1.20	1.20	1.20
b2	0.35	0.45	0.55	e/2	0.60	0.60	0.60
c	0.40	0.50	0.60	H	11.58	11.68	11.78
D	10.28	10.38	10.48	H/2	5.74	5.84	5.94
D/2	5.09	5.19	5.29	H1	7.15	7.15	7.15
D1	10.98	11.08	11.18	L	1.63	1.73	1.83
D2	3.20	3.30	3.40	L1	0.60	0.70	0.80
D3	2.60	2.70	2.80	L2	0.50	0.60	0.70
D4	4.45	4.55	4.65	L3	0.43	0.53	0.63
D5	3.20	3.30	3.40	Θ	10°	REF	REF
D6	0.55	0.65	0.75	Θ1	10°	REF	REF
E	9.80	9.90	10.00	aaa	0.20		
E1	7.30	7.40	7.50	bbb	0.25		
E2	0.30	0.40	0.50	ccc	0.20		
E3	7.40	7.50	7.60	ddd	0.20		
E4	8.20	8.30	8.40	eee	0.10		

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



*This information is generic. Please refer to device data sheet for actual part marking.
Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

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