

MOSFET - N-Channel Silicon Carbide

650 V, 15.3 mΩ, 176 A



ON Semiconductor®

www.onsemi.com

Product Preview NTBG015N065SC1

MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	650	V
Gate-to-Source Voltage	V_{GS}	+23/-8	V
Continuous Drain Current $R_{\theta JC}$	I_{DC}	176	A
Power Dissipation $R_{\theta JC}$			
Continuous Drain Current $R_{\theta JC}$	I_{DC}	137	A
Power Dissipation $R_{\theta JC}$			
Continuous Drain Current $R_{\theta JA}$	I_{DA}	TBD	A
Power Dissipation $R_{\theta JA}$			
Continuous Drain Current $R_{\theta JA}$	I_{DA}	TBD	A
Power Dissipation $R_{\theta JA}$			
Pulsed Drain Current $R_{\theta JC}$	I_{DM}	873	A
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +175	°C
Source Current (Body Diode)	I_S	194	A
Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^\circ\text{C}$, $V_{GS} = 18\text{ V}$, $I_{L(pk)} = 1\text{ A}$, $L = 0.1\text{ mH}$, $R_G = 25\ \Omega$)	E_{AS}	TBD	mJ
Lead Temperature for Soldering Purposes	T_L	TBD	°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.

THERMAL RESISTANCE

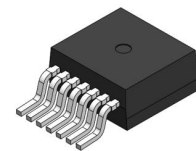
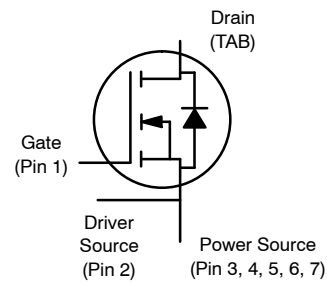
Parameter	Symbol	Value	Unit
Junction-to-Case (Note 1)	$R_{\theta JC}$	0.173	°C/W
Junction-to-Ambient (Note 1)	$R_{\theta JA}$	TBD	

- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

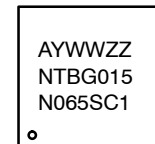
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
650 V	15.3 mΩ @ $V_{GS} = 18\text{ V}$	176 A

N-CHANNEL MOSFET



D2PAK-7L
CASE 418BJ

MARKING DIAGRAM



A = Assembly Location
Y = Year
WW = Work Week
ZZ = Lot Traceability
NTBG015N065SC1 = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

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ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 2.50\text{e} - 04\text{A}, T_C = 25^\circ\text{C}$	650			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$V_{GS} = 0\text{ V}, I_D = 2.50\text{e} - 04\text{A}, T_{Jmax} = 175^\circ\text{C}$		-0.012		V/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 650\text{ V}, T_C = 25^\circ\text{C}$			100	μA
		$V_{DS} = 650\text{ V}, T_C = 175^\circ\text{C}$			1	mA
Gate-to-Source Leakage Current	I_{GSS}	$V_{GS} = +18/-8\text{ V}, V_{DS} = 0\text{ V}$			± 1	μA

ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_G = 18\text{ V}, I_D = 60\text{ A}, T_C = 25^\circ\text{C}$		15.34		m Ω
		$V_G = 18\text{ V}, I_D = 60\text{ A}, T_C = 175^\circ\text{C}$		18.44		
Gate Threshold Voltage	$V_{GS(th)}$	$V_G = V_D, I_D = 0.015\text{ A}$		3.19		V
Gate Threshold Voltage Temperature Coefficient	$V_{GS(th)}/T_J$			-6.42		mV/°C
Forward Transconductance	g_{FS}	$V_D = 10\text{ V}, I_D = 60\text{ A}$		32.59		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Gate Resistance	R_G	$V_D = 325\text{ V}, V_G = 0\text{ V}, f = 1\text{e}6$		1.15		Ω	
Input Capacitance	C_{ISS}			5516			pF
Output Capacitance	C_{OSS}			397			
Reverse Transfer Capacitance	C_{RSS}			39.42			
Effective Output Capacitance	C_{OSSef}	$V_{DS} = 0\text{ to }325\text{ V}, V_G = 0\text{ V}, f = 1\text{e}6$		774		pF	
Energy Related Output Capacitance	C_{OSSer}			522			
Coss Stored Energy	E_{OSS}			27.59			μJ
Total Gate Charge	$Q_{G(tot)}$	$V_D = 520\text{ V}, I_D = 60\text{ A}, V_G = -5/18\text{ V}$		250		nC	
Gate-to-Source Charge	Q_{GS}			80.4			
Gate-to-Drain Charge	Q_{GD}			76.8			

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = -5/18\text{ V}, V_D = 520\text{ V}, I_D = 60\text{ A}, R_G = 6\ \Omega$		48.65		ns
Turn-Off Delay Time	$t_{d(off)}$			69.3		
Rise Time	t_r			14.32		
Fall Time	t_f			13.48		
Turn-On Switching Loss	E_{ON}			0.751		mJ
Turn-Off Switching Loss	E_{OFF}			0.225		
Total Switching Loss	E_{TOT}			0.976		

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = -5\text{ V}, I_D = 60\text{ A}, T_C = 25^\circ\text{C}$		4.31		V
		$V_{GS} = -5\text{ V}, I_D = 60\text{ A}, T_C = 175^\circ\text{C}$		3.84		
Reverse Recovery Time	t_{RR}	$V_{GS} = -5\text{ V}, I_S = 60\text{ A}, dl/dt = 1000\text{ A}/\mu\text{s}, V_{DS} = 520\text{ V}$		48.90		ns
Reverse Recovery Charge	Q_{RR}			428		nC
Reverse Recovery Energy	E_{REC}			31.59		μJ
Peak Reverse Recovery Current	I_{RRM}			15.80		A

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

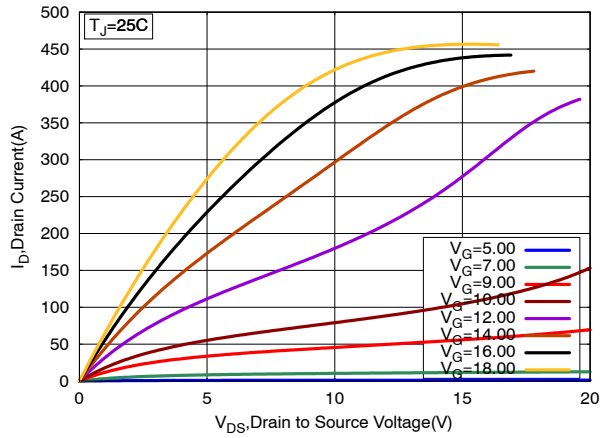


Figure 1. On-Region Characteristics

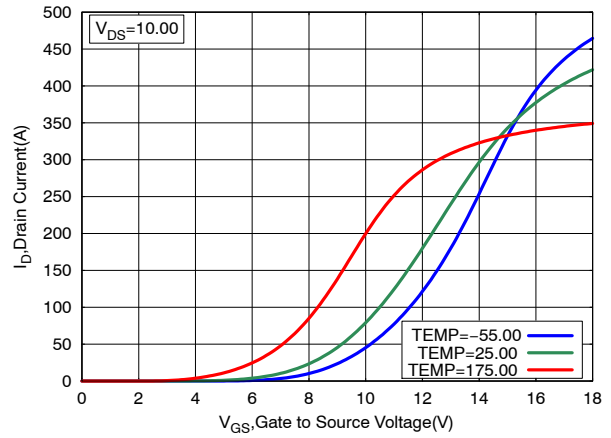


Figure 2. Transfer Characteristics

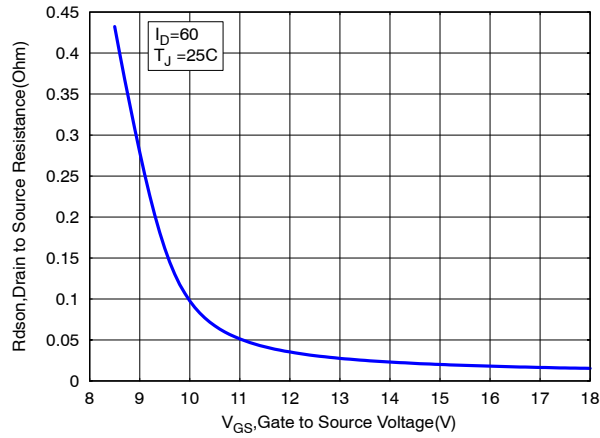


Figure 3. On-Resistance vs. VGS

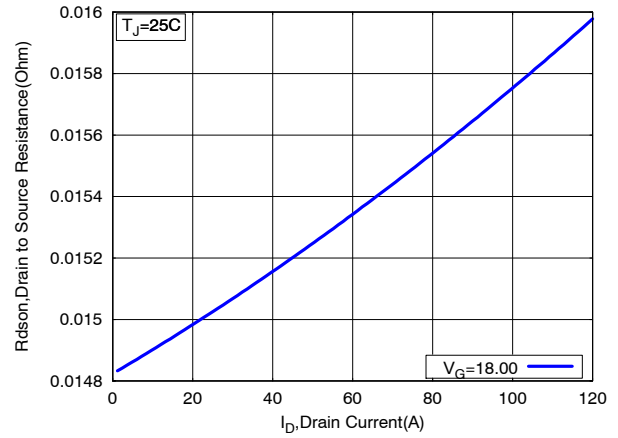


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

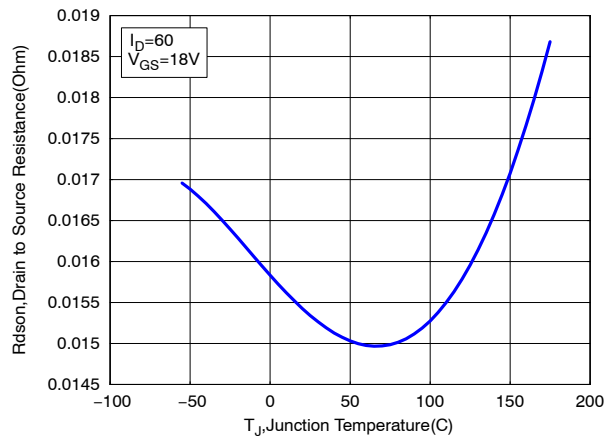


Figure 5. On-Resistance Variation with Temperature

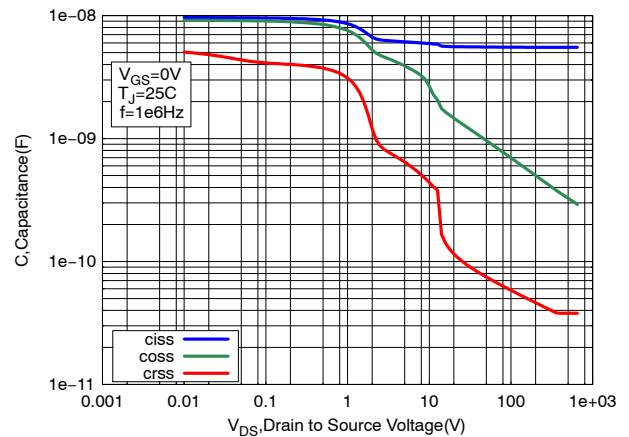


Figure 6. Capacitance Variation

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TYPICAL CHARACTERISTICS

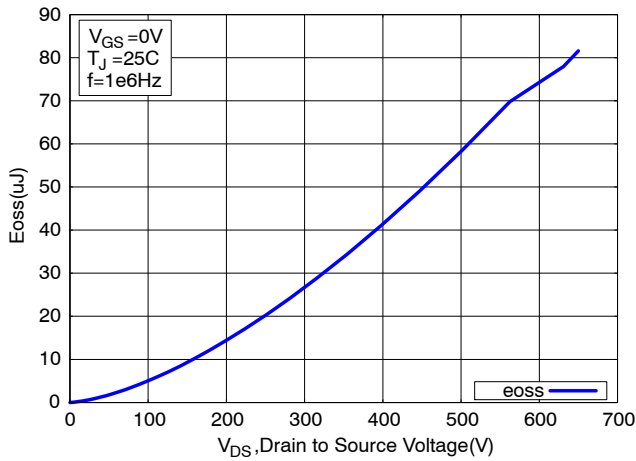


Figure 7. Eoss vs. Drain-to-Source Voltage

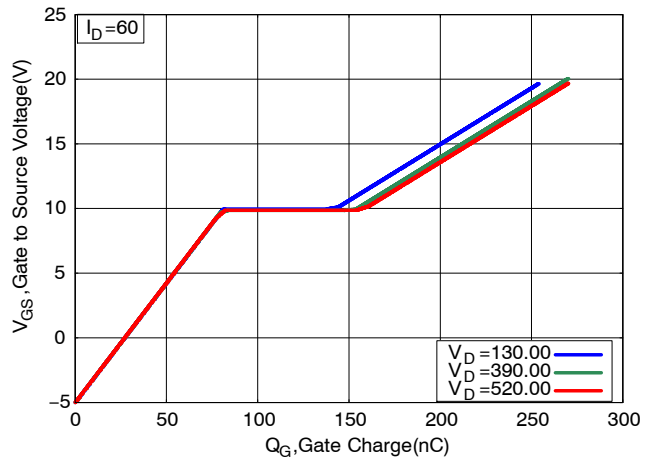


Figure 8. Gate-to-Source Voltage vs. Total Charge

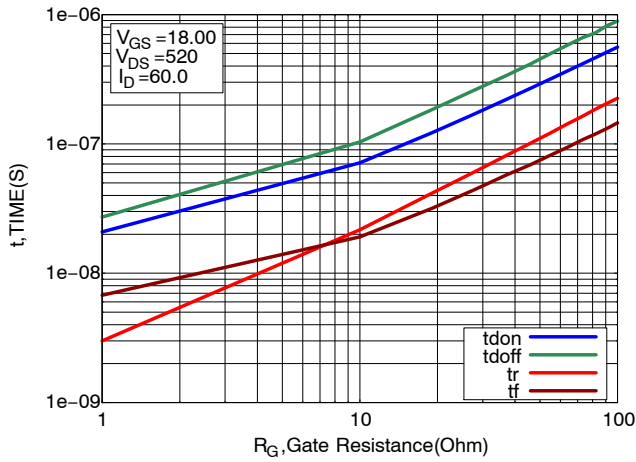


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

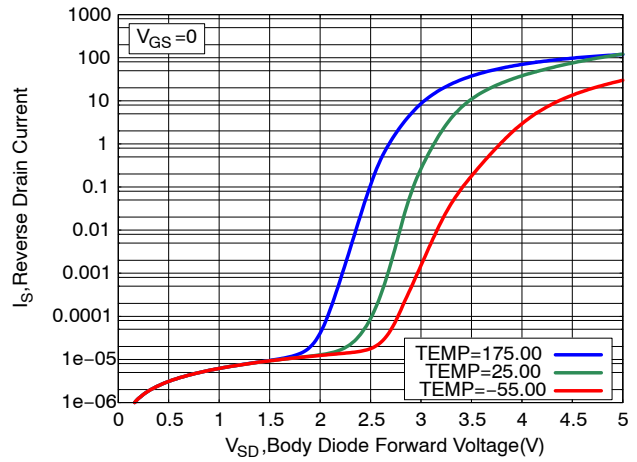


Figure 10. Diode Forward Voltage vs. Current

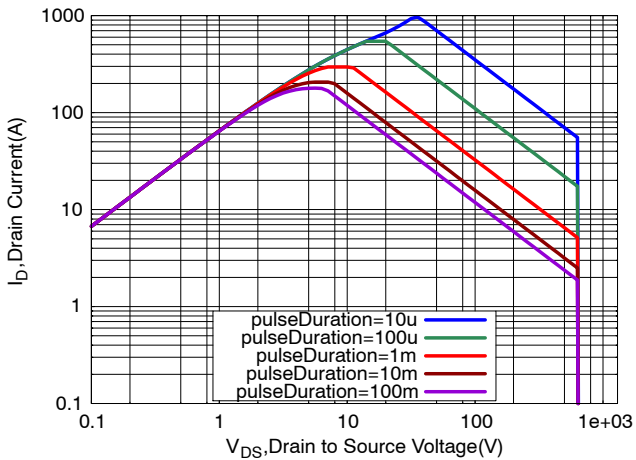


Figure 11. Maximum Rated Forward Biased Safe Operating Area

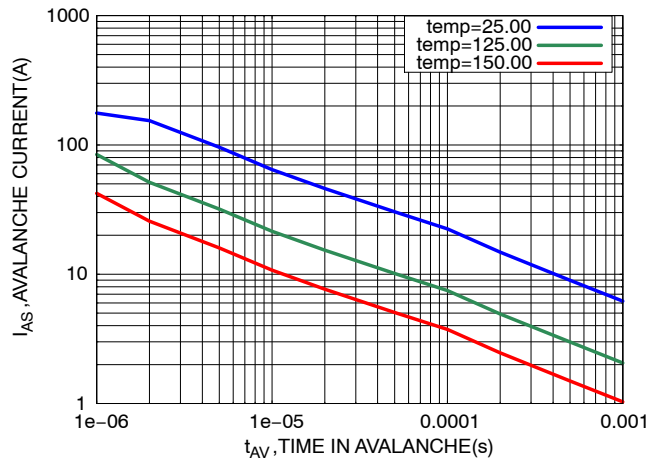


Figure 12. Ipeak vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

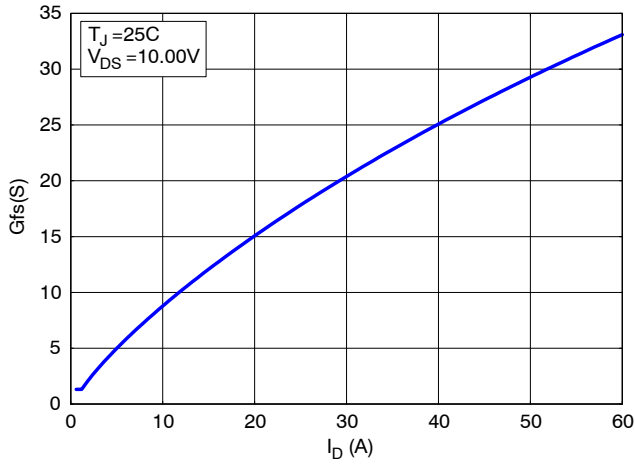


Figure 13. GFS vs. ID

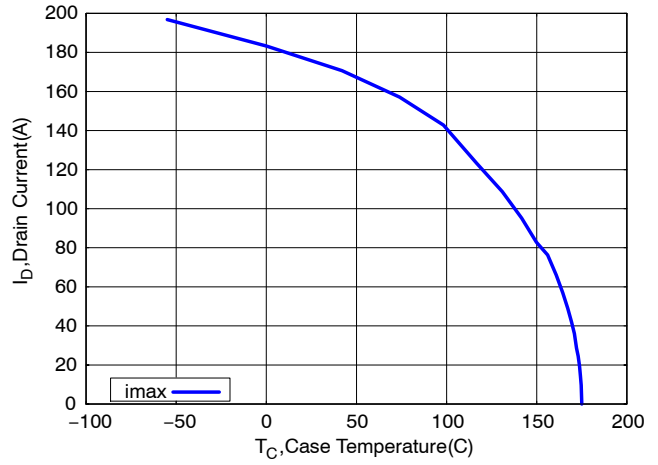


Figure 14. Maximum Current vs. Case Temperature

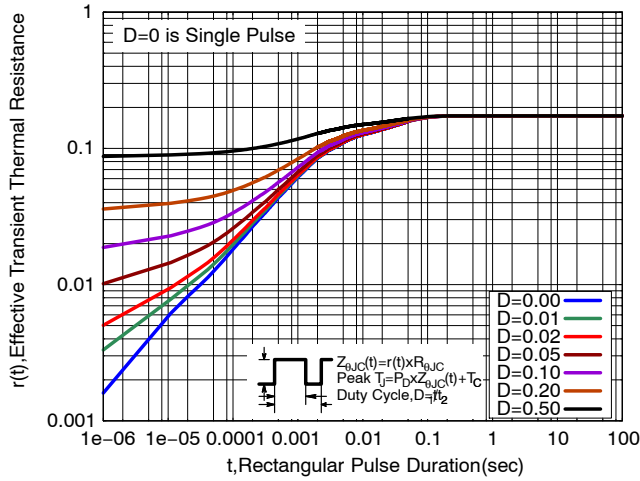


Figure 15. Thermal Response

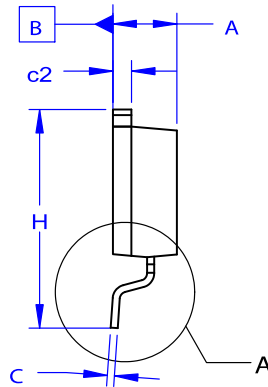
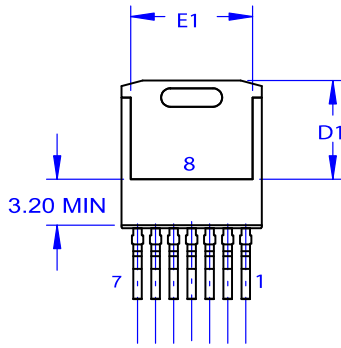
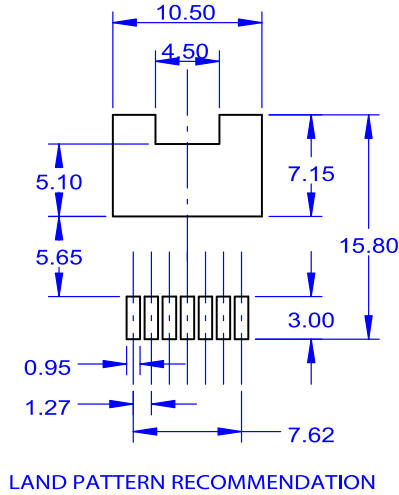
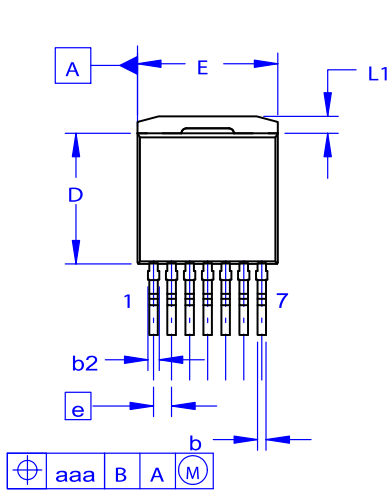
PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Marking	Package	Packing Method	Reel Size	Tape Width	Quantity
NTBG015N065SC1	NTBG015N065SC1	D2PAK	Tape & Reel	TBD	TBD	800 Units

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PACKAGE DIMENSIONS

D²PAK7 (TO-263-7L HV) CASE 418BJ ISSUE A

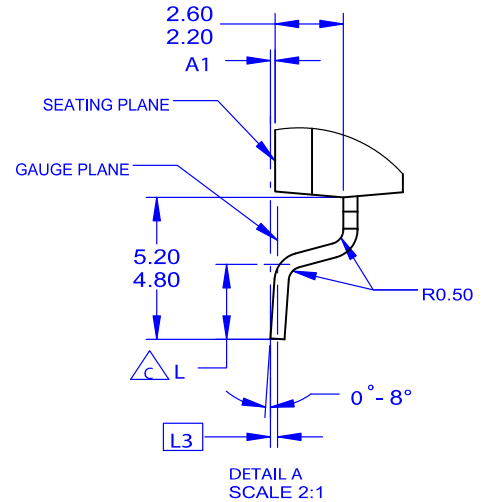


NOTES:


- A. PACKAGE CONFORMS TO JEDEC TO-263 VARIATION CB EXCEPT WHERE NOTED.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.

- △ OUT OF JEDEC STANDARD VALUE.
- D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
- E. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	0.00	0.10	0.20
b2	0.60	0.70	0.80
b	0.51	0.60	0.70
c	0.40	0.50	0.60
c2	1.20	1.30	1.40
D	9.00	9.20	9.40
D1	6.75	6.95	7.15
E	9.70	9.90	10.20
E1	7.70	7.90	8.10
e	~	1.27	~
H	15.10	15.40	15.70
L	2.44	2.64	2.84
L1	1.00	1.20	1.40
L3	~	0.25	~
aaa	~	~	0.25



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