

MOSFET – Power, Single N-Channel

40 V, 1.07 mΩ, 531 A

NVMJST0D9N04C

Features

- Small Footprint (5x7 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- TCPAK57 Top Cool Package (TCPAK10)
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

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

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	V_{DSS}	40	V	
Gate-to-Source Voltage	V_{GS}	± 20	V	
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	Steady State	$T_C = 25^\circ\text{C}$	I_D 531	A
		$T_C = 100^\circ\text{C}$	376	
Power Dissipation $R_{\theta JC}$ (Note 1)		$T_C = 25^\circ\text{C}$	P_D 555	W
		$T_C = 100^\circ\text{C}$	278	
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	I_{DM} 900	A	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +175	$^\circ\text{C}$	
Source Current (Body Diode)	I_S	463	A	
Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 34 \text{ A}$)	E_{AS}	578	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	$^\circ\text{C}$	

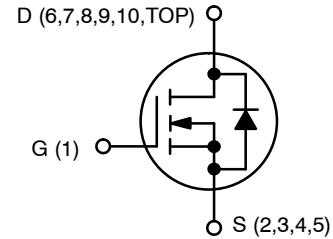
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS

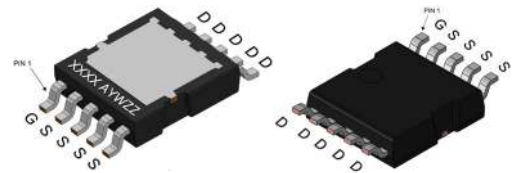
Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State	$R_{\theta JC}$	0.27	$^\circ\text{C}/\text{W}$
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	28.5	
Junction-to-Drain Lead	Ψ_{JL}	4.7	
Junction-to-Source Lead	Ψ_{JL}	5.1	
Junction-to-Heatsink Top (Note 2)	Ψ_{JH}	1.3	

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. 2s2p JEDEC51-7 standard PCB mounted to a 25x25x3 (mm) aluminum heatsink with a 12 w/mK TIM interface.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

$V_{(BR)DSS}$	$R_{DS(ON) MAX}$	$I_D MAX$
40 V	1.07 mΩ @ 10 V	531 A

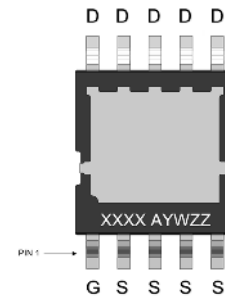


N-CHANNEL MOSFET



TCPAK10 5.1x7.5
CASE 760AG

MARKING DIAGRAM



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

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

NVMJST0D9N04C

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			16		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}$	$T_J = 25\ ^\circ\text{C}$		10	μA
			$T_J = 125^\circ\text{C}$		100	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA

ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 190\ \mu\text{A}$	2.5		3.5	V
Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			-7		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		0.92	1.07	m Ω
Forward Transconductance	g_{FS}	$V_{DS} = 15\text{ V}, I_D = 50\text{ A}$		190		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 25\text{ V}$		6100		pF
Output Capacitance	C_{OSS}			3400		
Reverse Transfer Capacitance	C_{RSS}			70		
Total Gate Charge	$Q_G(TOT)$	$V_{GS} = 10\text{ V}, V_{DS} = 32\text{ V}; I_D = 50\text{ A}$		86		nC
Threshold Gate Charge	$Q_G(TH)$			18		
Gate-to-Source Charge	Q_{GS}			28		
Gate-to-Drain Charge	Q_{GD}			14		
Plateau Voltage	V_{GP}			4.9		

SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 32\text{ V}, I_D = 50\text{ A}, R_G = 2.5\ \Omega$		54		ns
Rise Time	t_r			162		
Turn-Off Delay Time	$t_{d(OFF)}$			227		
Fall Time	t_f			173		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 50\text{ A}$	$T_J = 25^\circ\text{C}$		0.8	1.2	V
			$T_J = 125^\circ\text{C}$		0.65		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 50\text{ A}$		91		ns	
Charge Time	t_a			42			
Discharge Time	t_b			49			
Reverse Recovery Charge	Q_{RR}			159			nC

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.

4. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

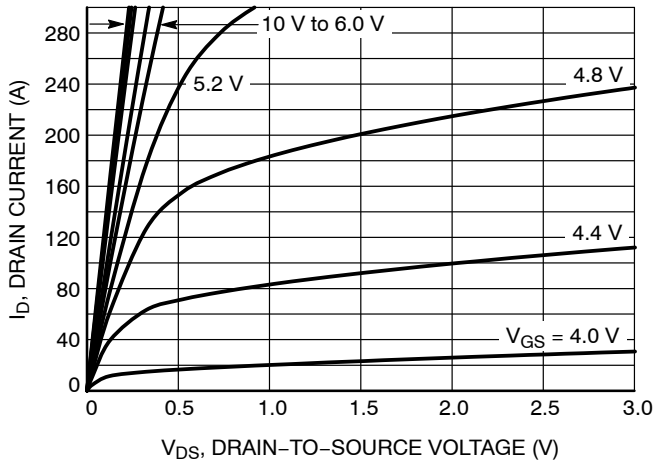


Figure 1. On-Region Characteristics

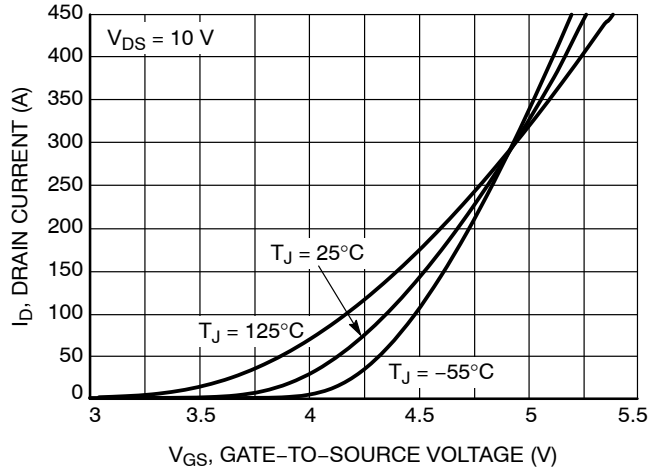


Figure 2. Transfer Characteristics

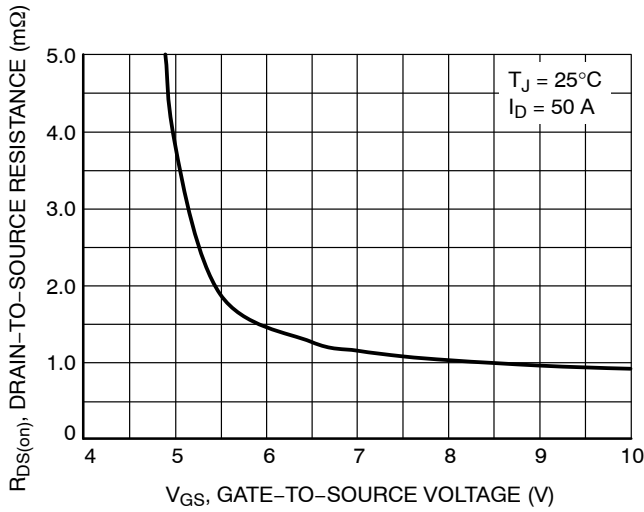


Figure 3. On-Resistance vs. Gate-to-Source Voltage

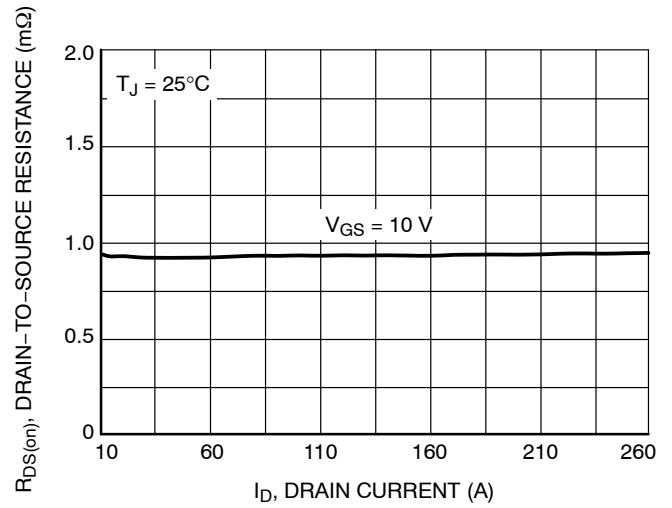


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

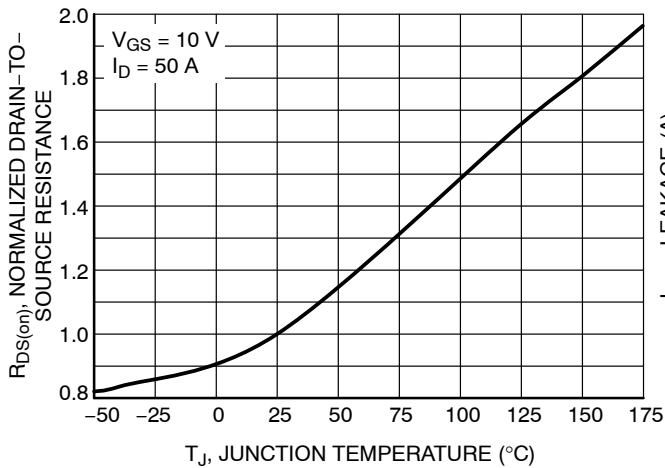


Figure 5. On-Resistance Variation with Temperature

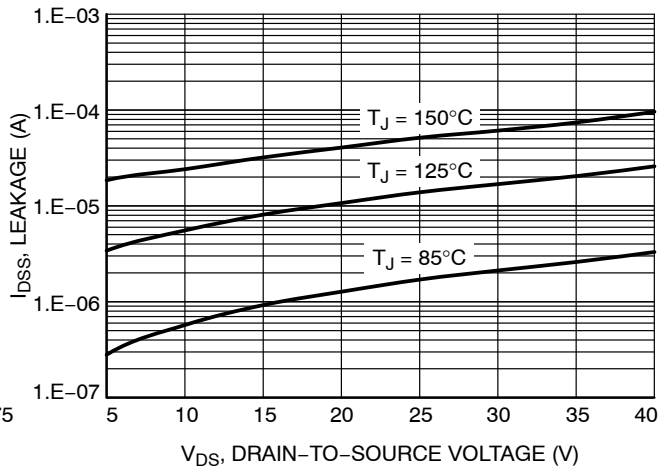


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NVMJST0D9N04C

TYPICAL CHARACTERISTICS

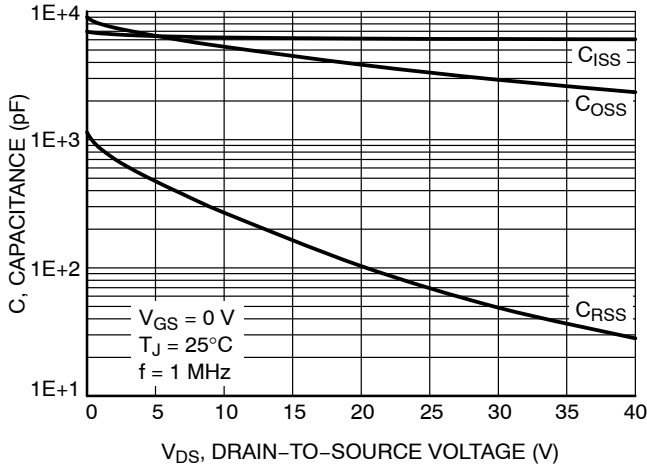


Figure 7. Capacitance Variation

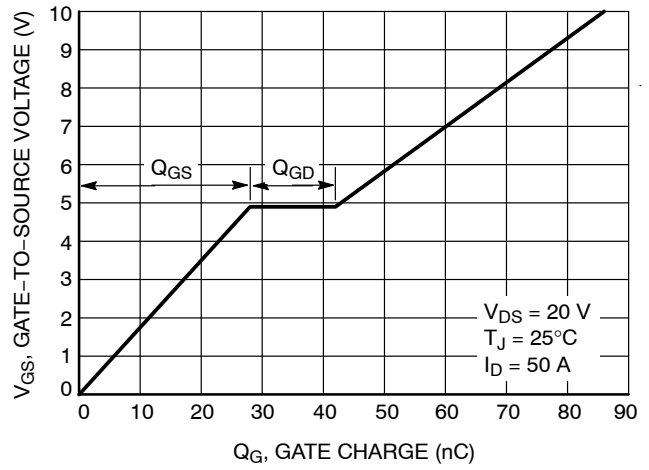


Figure 8. Gate-to-Source Voltage vs. Charge

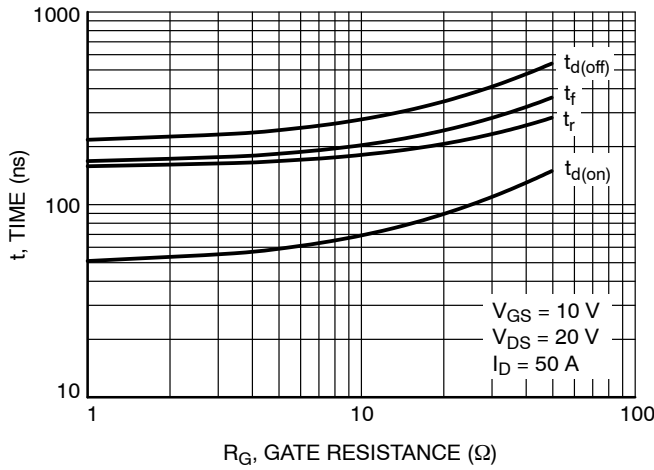


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

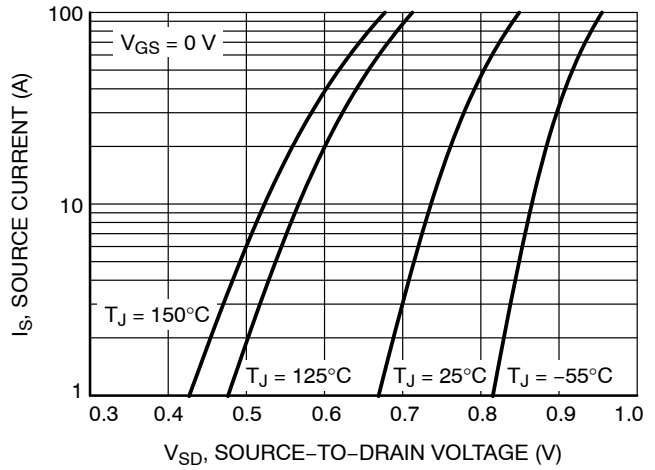


Figure 10. Diode Forward Voltage vs. Current

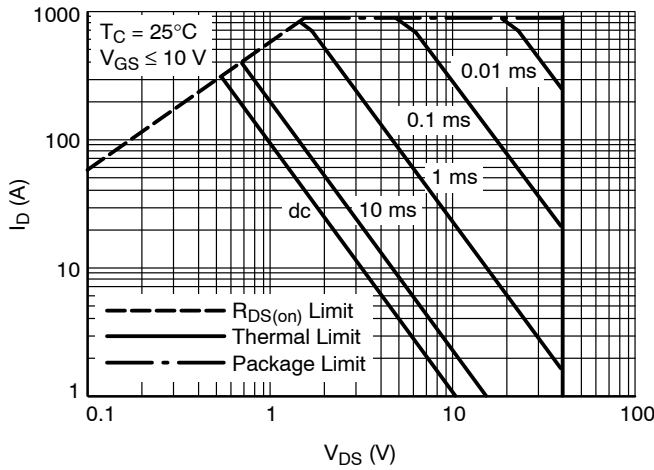


Figure 11. Safe Operating Area

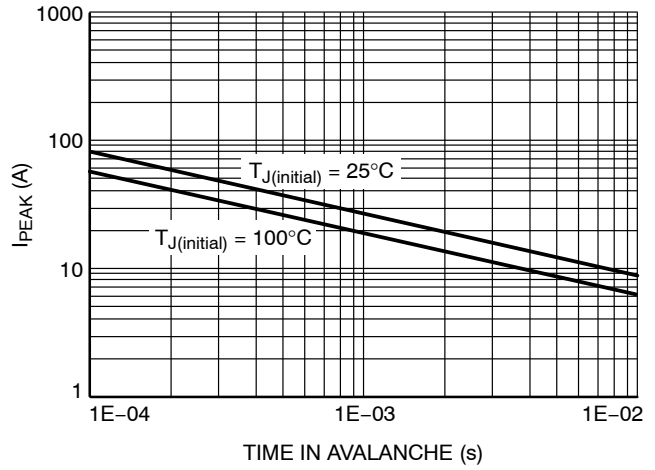


Figure 12. I_{PEAK} vs. Time in Avalanche

NVMJST0D9N04C

TYPICAL CHARACTERISTICS

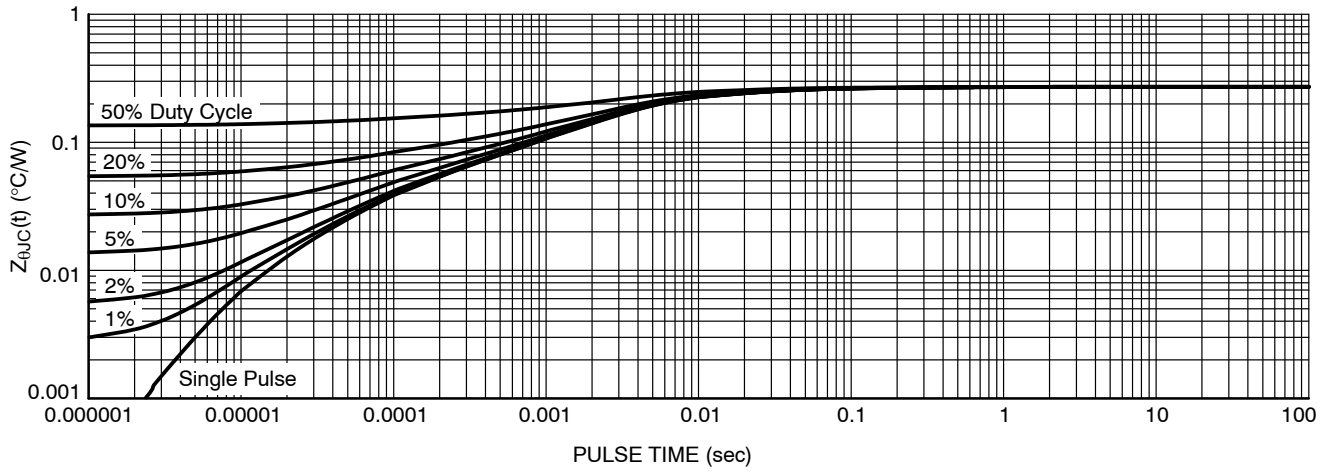


Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

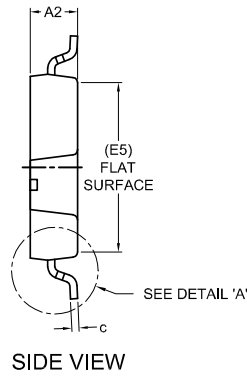
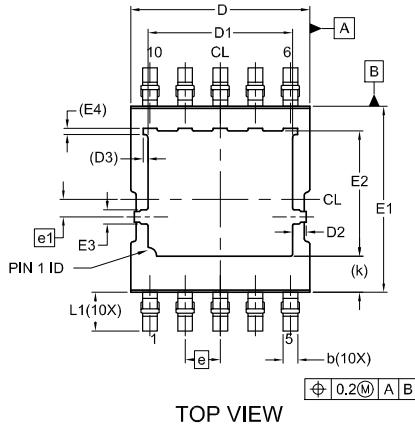
Device	Marking	Package	Shipping [†]
NVMJST0D9N04CTXG	0D94C	TCPAK10 (Pb-Free)	3000 / Tape & Reel

[†]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.

NVMJST0D9N04C

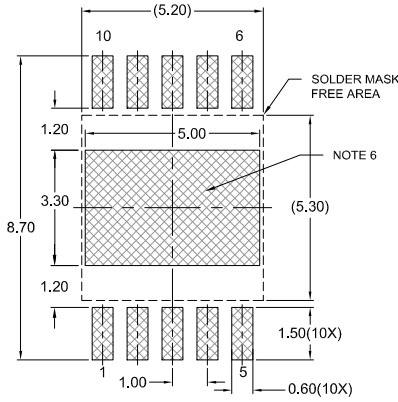
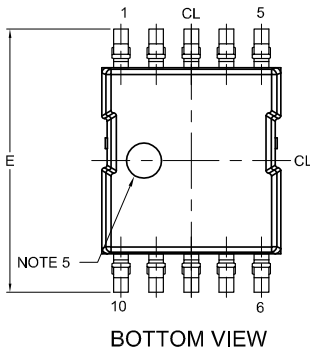
PACKAGE DIMENSIONS

TCPAK10 5.1x7.5, 1.0P CASE 760AG ISSUE D



NOTES:

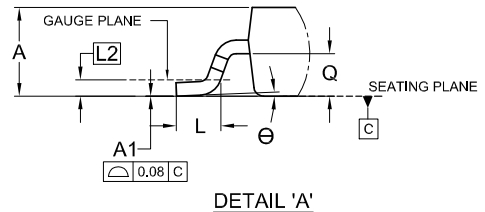
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. UNIT DIMENSION: MILLIMETERS
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.150mm PER SIDE.
4. DIMENSIONS D AND E1 ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY. OPTIONAL MOLD FEATURE.
5. DIMENSION A1 IS THE LEAD STAND-OFF FROM THE BOTTOM SURFACE OF THE PACKAGE BODY.



LAND PAD RECOMMENDATION

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

MILLIMETERS			
DIM	MIN	NOM	MAX
A	1.30	1.35	1.45
A1	-0.05	0.00	0.05
A2	1.30	1.35	1.40
b	0.36	0.41	0.46
c	0.16	0.21	0.26
D	5.00	5.10	5.20
D1	4.02	4.12	4.22
D2	0.30	0.40	0.50
D3	0.14 REF		
E	7.40	7.50	7.60
E1	5.20	5.30	5.40
E2	3.47	3.57	3.67
E3	0.30	0.40	0.50
E4	0.17 REF		
E5	4.82 REF		
e	1.00 BSC		
e1	0.50 BSC		
k	1.03 REF		
L	0.49	0.69	0.89
L1	0.90	1.10	1.30
L2	0.25 BSC		
Q	0.60	0.65	0.70
Θ	0°	2.5°	5°



NVMJST0D9N04C

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:
Voice Mail: 1 800-282-9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative