

# NTA4153N, NTE4153N, NVA4153N, NVE4153N

## MOSFET – Single, N-Channel with ESD Protection, Small Signal, SC-75 and SC-89 20 V, 915 mA

### Features

- Low  $R_{DS(on)}$  Improving System Efficiency
- Low Threshold Voltage, 1.5 V Rated
- ESD Protected Gate
- NV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- Pb-Free Packages are Available

### Applications

- Load/Power Switches
- Power Supply Converter Circuits
- Battery Management
- Portables like Cell Phones, PDAs, Digital Cameras, Pagers, etc.

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

Parameter		Symbol	Value	Units	
Drain-to-Source Voltage		$V_{DSS}$	20	V	
Gate-to-Source Voltage		$V_{GS}$	$\pm 6.0$	V	
Continuous Drain Current (Note 1)	Steady State	$I_D$	$T_A = 25^\circ\text{C}$	915	mA
			$T_A = 85^\circ\text{C}$	660	
Power Dissipation (Note 1)	Steady State	$P_D$	300	mW	
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$	1.3	A	
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$	
Continuous Source Current (Body Diode)		$I_S$	280	mA	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260	$^\circ\text{C}$	

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Units
Junction-to-Ambient – Steady State (Note 1) SC-75 / SOT-416 SC-89	$R_{\theta JA}$	416 400	$^\circ\text{C/W}$

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.

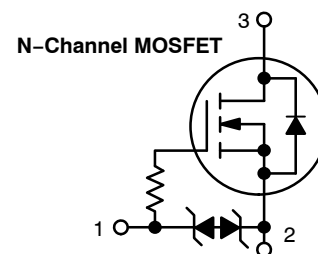
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).



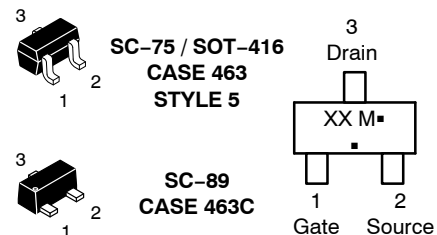
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$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	$I_D$ MAX
20 V	0.127 $\Omega$ @ 4.5 V	915 mA
	0.170 $\Omega$ @ 2.5 V	
	0.242 $\Omega$ @ 1.8 V	
	0.500 $\Omega$ @ 1.5 V	



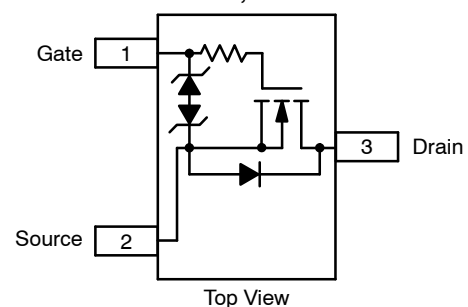
### MARKING DIAGRAM & PIN ASSIGNMENT



XX = Device Code  
M = Date Code\*  
■ = Pb-Free Package  
(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

### SC-75, SC-89



### ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

# NTA4153N, NTE4153N, NVA4153N, NVE4153N

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	20	26		V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			18.4		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 16\text{ V}$			100	nA
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$			$\pm 1.0$	$\mu\text{A}$

### ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	0.45	0.76	1.1	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			-2.15		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 600\text{ mA}$		127	230	m $\Omega$
		$V_{GS} = 2.5\text{ V}, I_D = 500\text{ mA}$		170	275	
		$V_{GS} = 1.8\text{ V}, I_D = 350\text{ mA}$		242	700	
		$V_{GS} = 1.5\text{ V}, I_D = 40\text{ mA}$		500	950	
Forward Transconductance	$g_{FS}$	$V_{DS} = 10\text{ V}, I_D = 400\text{ mA}$		1.4		S

### CHARGES AND CAPACITANCES

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 16\text{ V}$		110		pF
Output Capacitance	$C_{OSS}$			16		
Reverse Transfer Capacitance	$C_{RSS}$			12		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, I_D = 0.2\text{ A}$		1.82		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.2		
Gate-to-Source Charge	$Q_{GS}$			0.3		
Gate-to-Drain Charge	$Q_{GD}$			0.42		

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DD} = 10\text{ V}, I_D = 0.2\text{ A}, R_G = 10\ \Omega$		3.7		ns
Rise Time	$t_r$			4.4		
Turn-Off Delay Time	$t_{d(OFF)}$			25		
Fall Time	$t_f$			7.6		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 200\text{ mA}$	$T_J = 25^\circ\text{C}$		0.67	1.1	V
			$T_J = 125^\circ\text{C}$		0.54		

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.

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

3. Switching characteristics are independent of operating junction temperatures.

TYPICAL ELECTRICAL CHARACTERISTICS

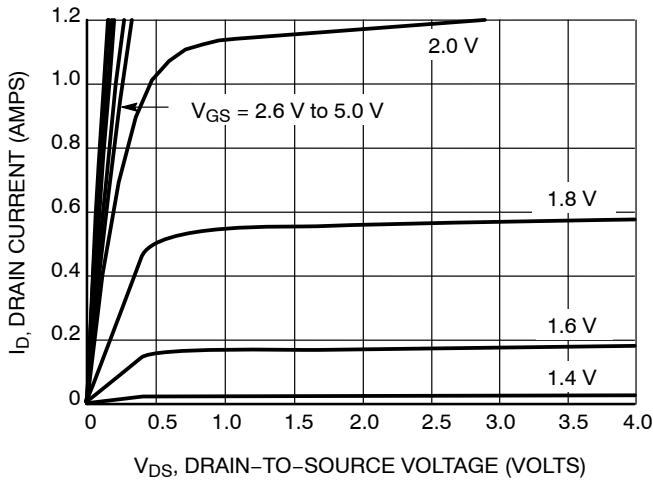


Figure 1. On-Region Characteristics

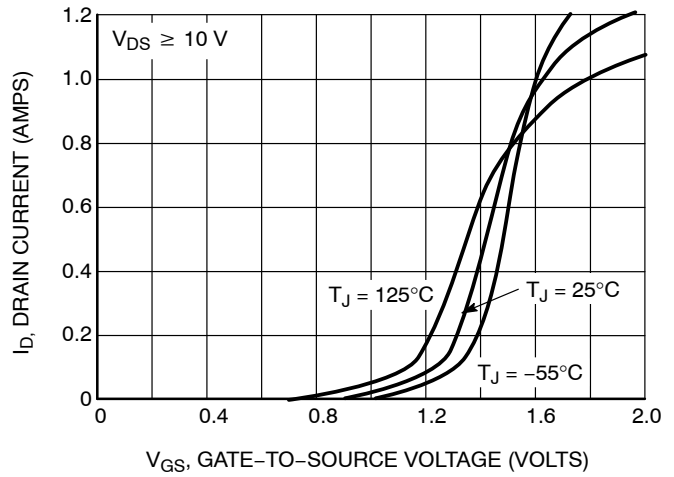


Figure 2. Transfer Characteristics

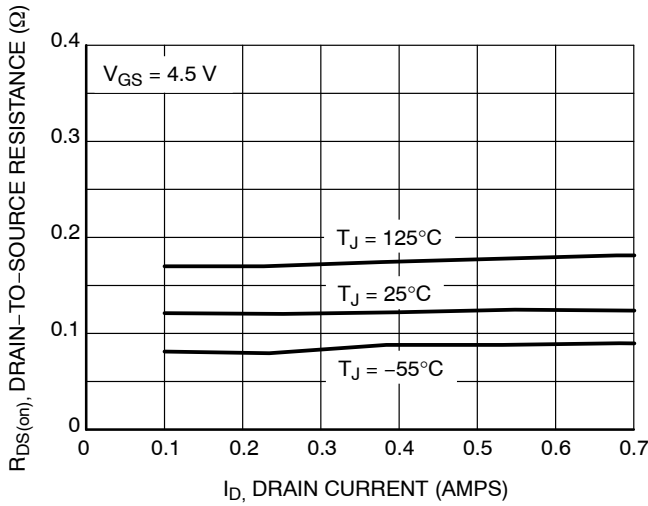


Figure 3. On-Resistance vs. Drain Current and Temperature

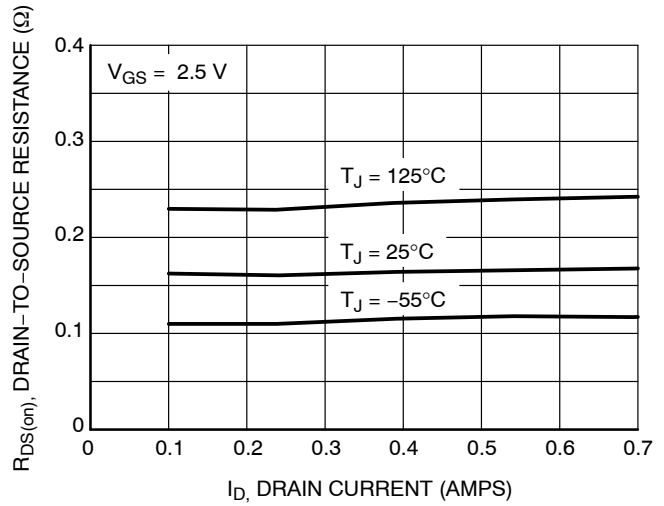


Figure 4. On-Resistance vs. Drain Current and Temperature

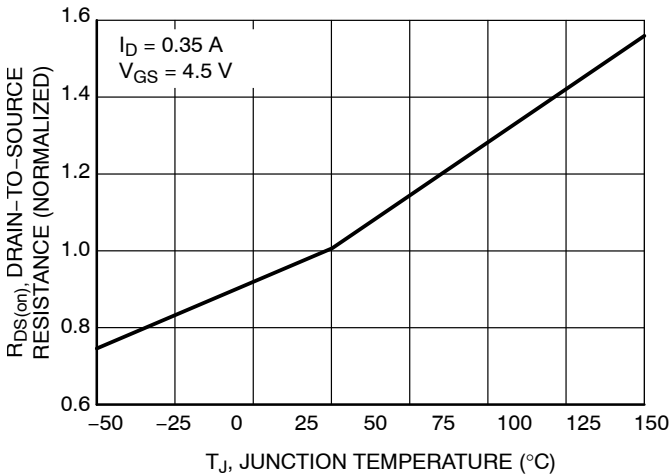


Figure 5. On-Resistance Variation with Temperature

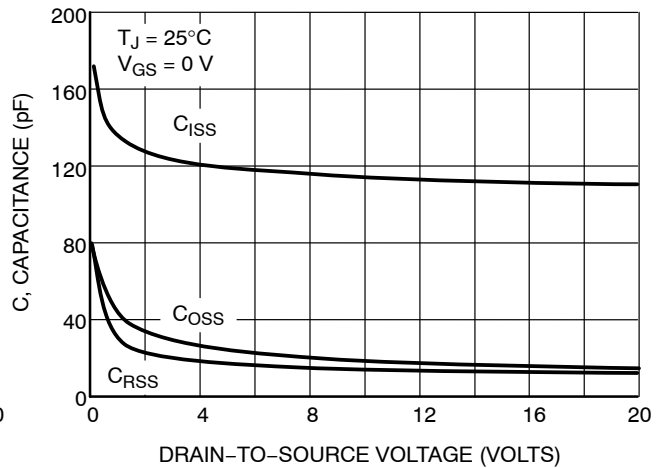
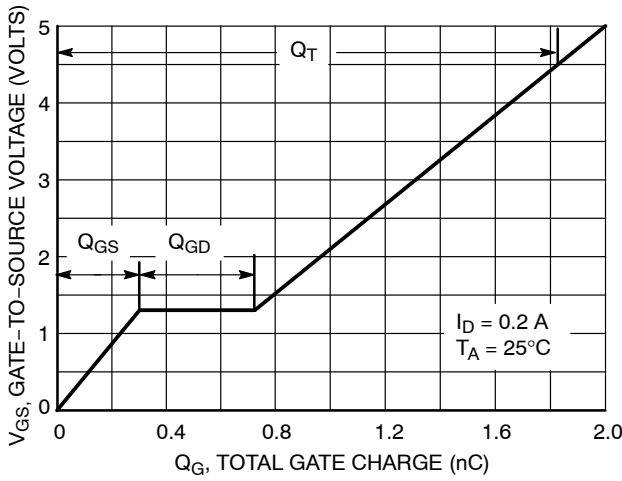


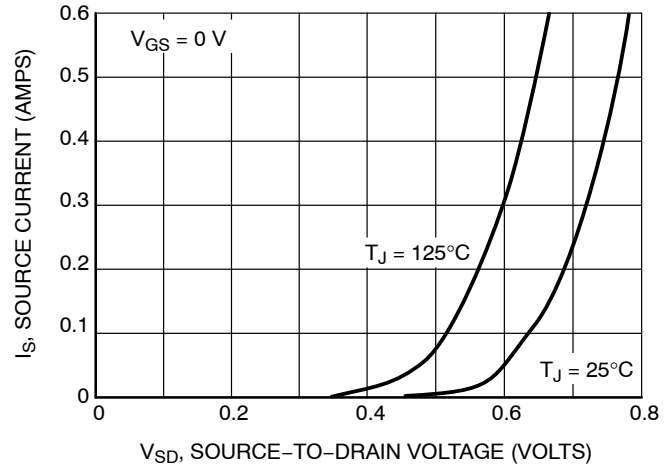
Figure 6. Capacitance Variation

# NTA4153N, NTE4153N, NVA4153N, NVE4153N

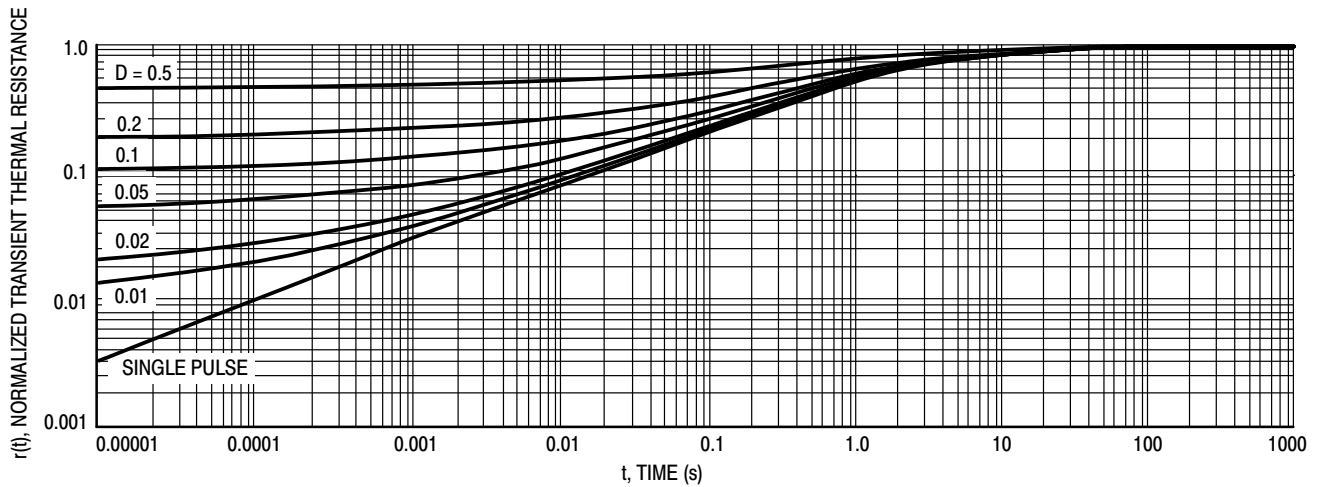
## TYPICAL ELECTRICAL CHARACTERISTICS



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



**Figure 8. Diode Forward Voltage vs. Current**



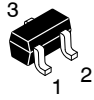
**Figure 9. Normalized Thermal Response**

### ORDERING INFORMATION

Device	Marking	Package	Shipping <sup>†</sup>
NTA4153NT1	TR	SC-75 / SOT-416	3000 / Tape & Reel
NTA4153NT1G	TR	SC-75 / SOT-416 (Pb-Free)	3000 / Tape & Reel
NTE4153NT1G	TP	SC-89 (Pb-Free)	3000 / Tape & Reel
NVA4153NT1G	VR	SC-75 / SOT-416 (Pb-Free)	3000 / Tape & Reel
NVE4153NT1G	VP	SC-89 (Pb-Free)	3000 / Tape & Reel

<sup>†</sup>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.

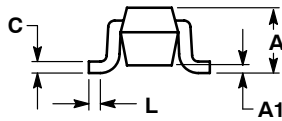
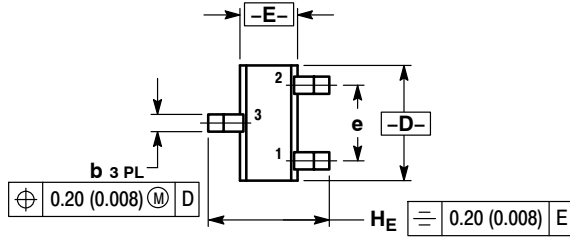
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 4:1

SC-75/SOT-416  
CASE 463  
ISSUE G

DATE 07 AUG 2015



STYLE 1:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

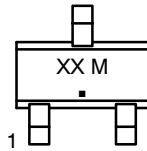
STYLE 2:  
PIN 1. ANODE  
2. N/C  
3. CATHODE

STYLE 3:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 4:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 5:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN

### GENERIC MARKING DIAGRAM\*



XX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

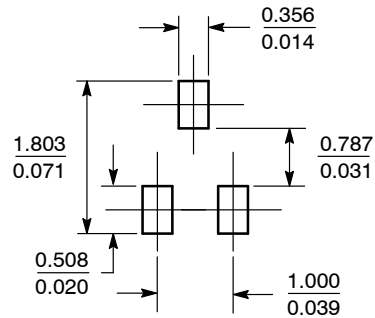
\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.80	0.90	0.027	0.031	0.035
A1	0.00	0.05	0.10	0.000	0.002	0.004
b	0.15	0.20	0.30	0.006	0.008	0.012
C	0.10	0.15	0.25	0.004	0.006	0.010
D	1.55	1.60	1.65	0.061	0.063	0.065
E	0.70	0.80	0.90	0.027	0.031	0.035
e	1.00 BSC			0.04 BSC		
L	0.10	0.15	0.20	0.004	0.006	0.008
H <sub>E</sub>	1.50	1.60	1.70	0.060	0.063	0.067

### RECOMMENDED SOLDERING FOOTPRINT\*



SCALE 10:1 (mm/inches)

\*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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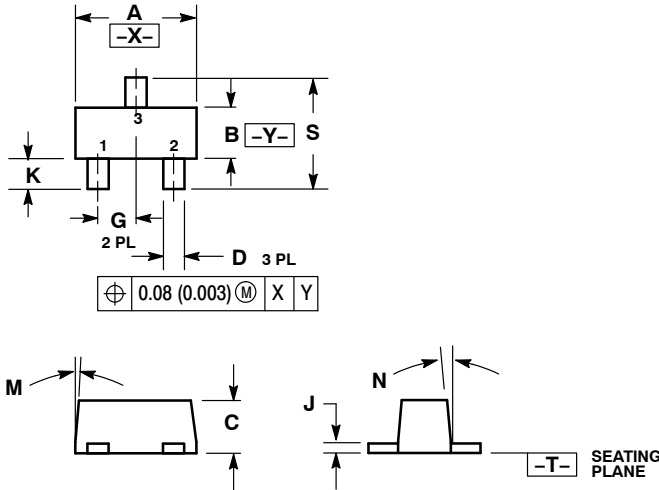
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 4:1

SC-89, 3 LEAD  
CASE 463C-03  
ISSUE C

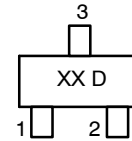
DATE 31 JUL 2003



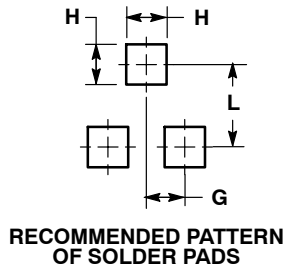
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETERS
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
  4. 463C-01 OBSOLETE, NEW STANDARD 463C-02.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.50	1.60	1.70	0.059	0.063	0.067
B	0.75	0.85	0.95	0.030	0.034	0.040
C	0.60	0.70	0.80	0.024	0.028	0.031
D	0.23	0.28	0.33	0.009	0.011	0.013
G	0.50 BSC			0.020 BSC		
H	0.53 REF			0.021 REF		
J	0.10	0.15	0.20	0.004	0.006	0.008
K	0.30	0.40	0.50	0.012	0.016	0.020
L	1.10 REF			0.043 REF		
M	---	---	10	---	---	10
N	---	---	10	---	---	10
S	1.50	1.60	1.70	0.059	0.063	0.067

### GENERIC MARKING DIAGRAM\*



XX = Specific Device Code  
D = Date Code



- |   |  |  |  |
|---|--|--|--|
| STYLE 1:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 2:<br>PIN 1. ANODE<br>2. N/C<br>3. CATHODE | STYLE 3:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE | STYLE 4:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE |
|---|--|--|--|

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

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