

# NVA4153N, NVE4153N

## Small Signal MOSFET

20 V, 952 mA, Single N-Channel  
with ESD Protection, SC-75 and SC-89

### Features

- Low  $R_{DS(on)}$  Improving System Efficiency
- Low Threshold Voltage, 1.5 V Rated
- ESD Protected Gate
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### 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		$V_{DS}$	20	V	
Gate-to-Source Voltage		$V_{GS}$	$\pm 6.0$	V	
Continuous Drain Current (Note 1)	Steady State	$I_D$	$T_A = 25^\circ\text{C}$	952	mA
			$T_A = 85^\circ\text{C}$	737	
Power Dissipation (Note 1)	Steady State	$P_D$	361	mW	
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$	3.8	A	
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 175	$^\circ\text{C}$	
Continuous Source Current (Body Diode)		$I_S$	328	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	$^\circ\text{C}/\text{W}$

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.

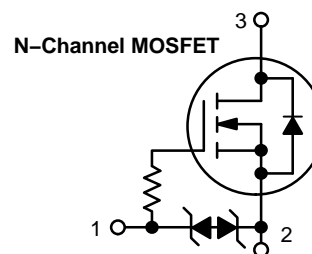
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).



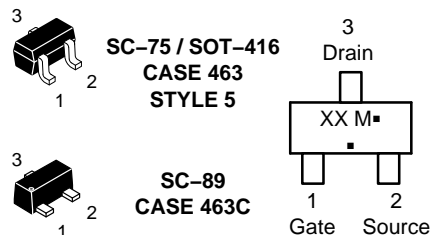
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$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	$I_D$ MAX
20 V	0.127 $\Omega$ @ 4.5 V	952 mA
	0.170 $\Omega$ @ 2.5 V	
	0.242 $\Omega$ @ 1.8 V	
	0.500 $\Omega$ @ 1.5 V	



### MARKING DIAGRAM & PIN ASSIGNMENT

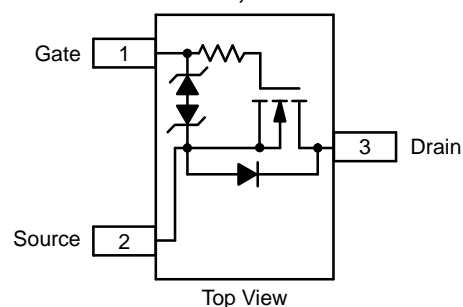


XX = Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(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 in the package dimensions section on page 2 of this data sheet.

# NVA4153N, NVE4153N

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise stated)

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

Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	20	26		V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			18.4		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 16 V			100	nA
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±4.5 V			±1.0	μA

### ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	0.45	0.76	1.1	V
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			-2.15		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 600 mA		127	230	mΩ
		V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 500 mA		170	275	
		V <sub>GS</sub> = 1.8 V, I <sub>D</sub> = 350 mA		242	700	
		V <sub>GS</sub> = 1.5 V, I <sub>D</sub> = 40 mA		500	9500	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 400 mA		1.4		S

### CHARGES AND CAPACITANCES

Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = 16 V		110		pF
Output Capacitance	C <sub>OSS</sub>			16		
Reverse Transfer Capacitance	C <sub>RSS</sub>			12		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.2 A		1.82		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			0.2		
Gate-to-Source Charge	Q <sub>GS</sub>			0.3		
Gate-to-Drain Charge	Q <sub>GD</sub>			0.42		

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	t <sub>d(ON)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DD</sub> = 10 V, I <sub>D</sub> = 0.2 A, R <sub>G</sub> = 10 Ω		3.7		ns
Rise Time	t <sub>r</sub>			4.4		
Turn-Off Delay Time	t <sub>d(OFF)</sub>			25		
Fall Time	t <sub>f</sub>			7.6		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 200 mA	T <sub>J</sub> = 25°C	0.67	1.1	V
			T <sub>J</sub> = 125°C	0.54		

2. Pulse Test: pulse width ≤ 300μs, duty cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

### ORDERING INFORMATION

Device	Marking (XX)	Package	Shipping†
NVA4153NT1G	VR	SC-75 / SOT-416 (Pb-Free)	3000 / Tape & Reel
NVE4153NT1G	VP	SC-89 (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.

# NVA4153N, NVE4153N

## TYPICAL ELECTRICAL CHARACTERISTICS

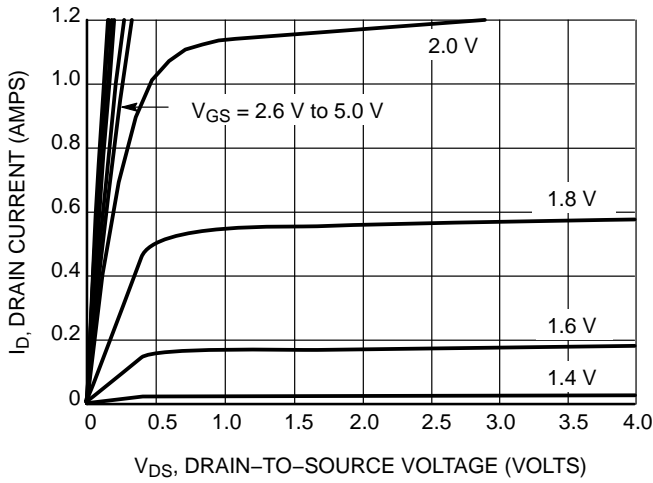


Figure 1. On-Region Characteristics

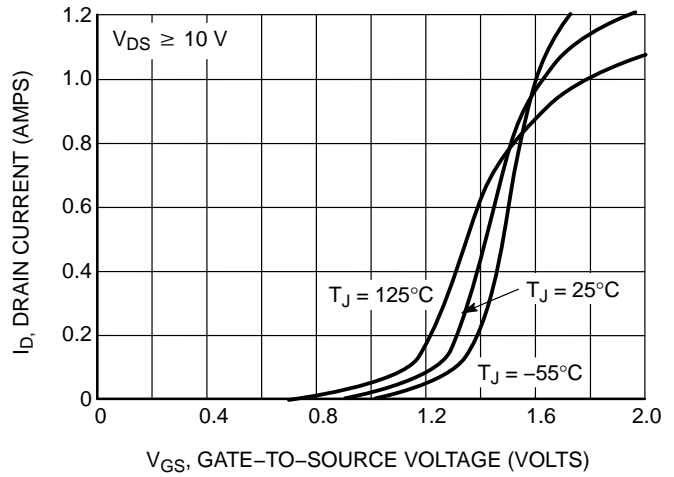


Figure 2. Transfer Characteristics

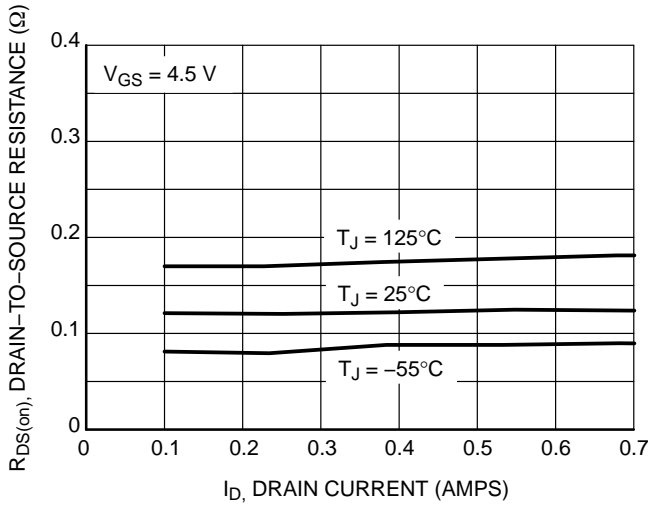


Figure 3. On-Resistance vs. Drain Current and Temperature

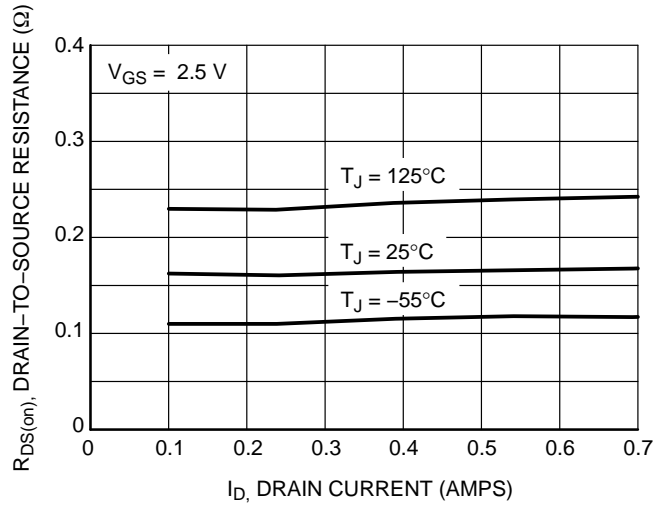


Figure 4. On-Resistance vs. Drain Current and Temperature

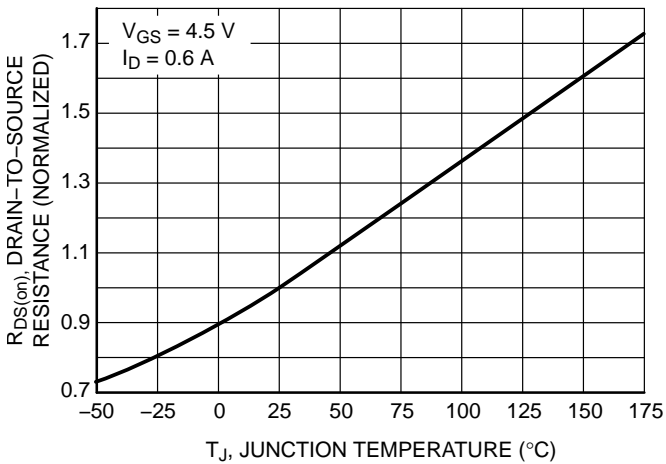


Figure 5. On-Resistance Variation with Temperature

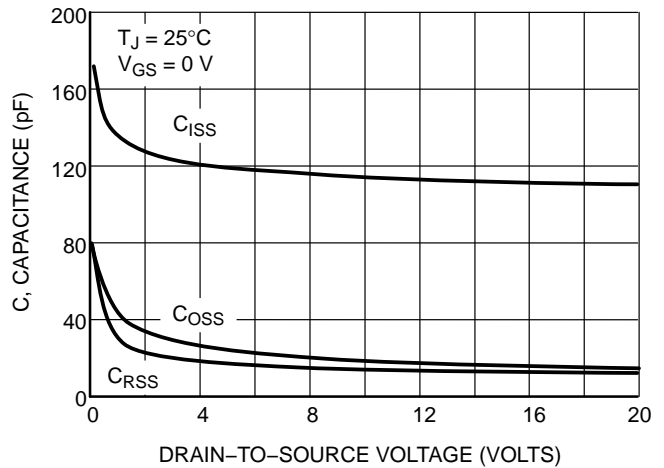
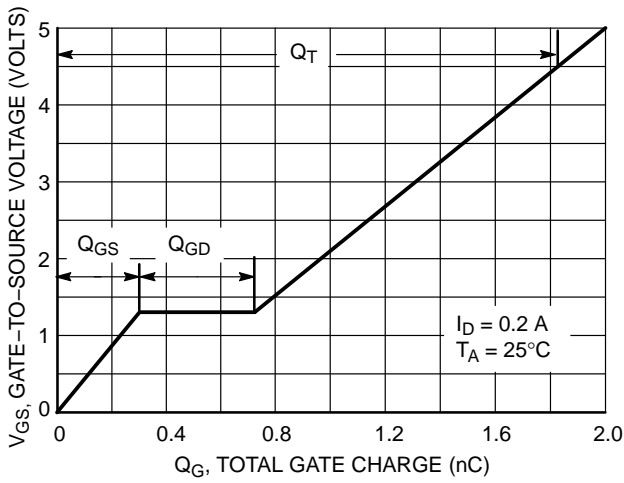


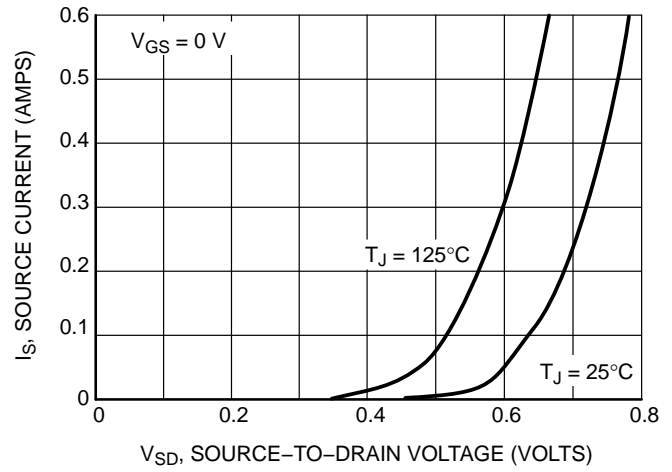
Figure 6. Capacitance Variation

# NVA4153N, NVE4153N

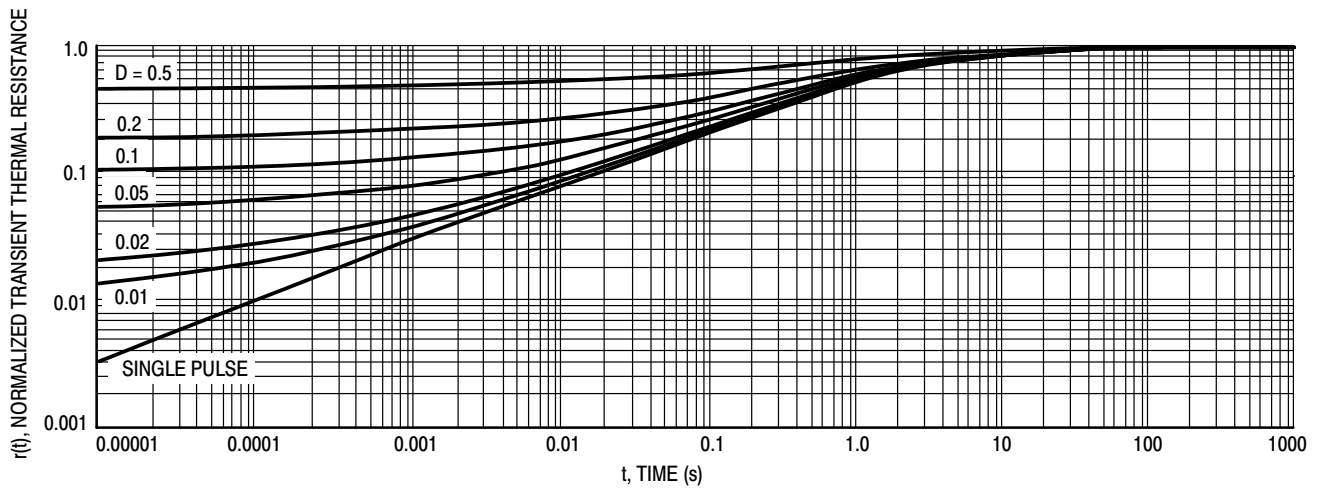
## TYPICAL ELECTRICAL CHARACTERISTICS



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



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

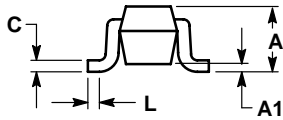
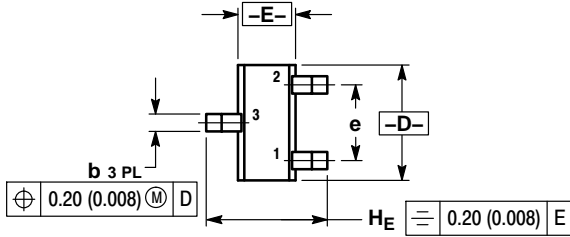


**Figure 9. Normalized Thermal Response**

# NVA4153N, NVE4153N

## PACKAGE DIMENSIONS

SC-75/SOT-416  
CASE 463  
ISSUE F

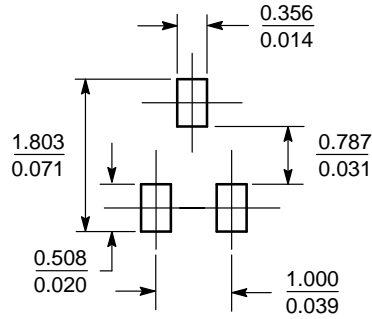


- NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: MILLIMETER.

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	0.059	0.063	0.067
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
HE	1.50	1.60	1.70	0.061	0.063	0.065

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

### SOLDERING FOOTPRINT\*



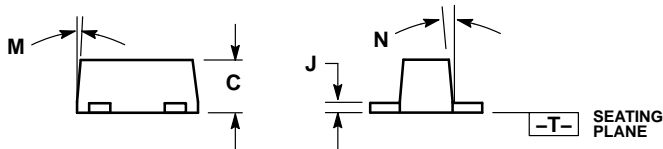
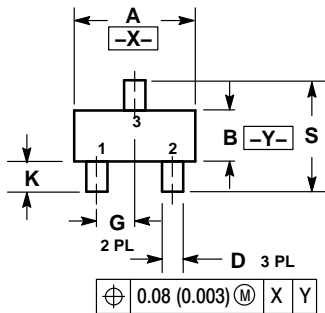
SCALE 10:1 ( $\frac{\text{mm}}{\text{inches}}$ )

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

# NVA4153N, NVE4153N

## PACKAGE DIMENSIONS

SC-89  
CASE 463C-03  
ISSUE C

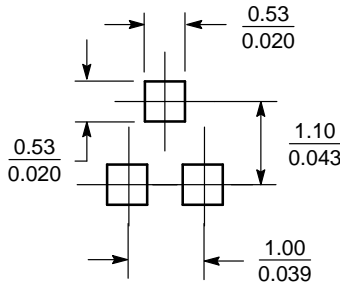


NOTES:

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

### SOLDERING FOOTPRINT\*



SCALE 10:1 (mm / inches)

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

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