

# Bipolar Transistor

## 100 V, 2.5 A, Low $V_{CE(sat)}$ NPN

### Single LPAK

# NSS1002CL

This device is bipolar junction transistor featuring high current, low saturation voltage, and high speed switching.

Suitable for automotive applications. AEC-Q101 qualified and PPAP capable. (NSVS1002CLTWG)

#### Features

- Complement to NSS1001CL
- Large Current Capacity
- Low Collector to Emitter Saturation Voltage
- Thin Profile LPAK8 3.3 x 3.3 mm Package
- High-Speed Switching
- High Allowable Power Dissipation
- AEC-Q101 Qualified and PPAP Capable (NSVS1002CLTWG)
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### Typical Applications

- Load Switch
- Gate Driver Buffer
- DC-DC Converters

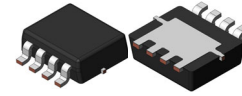
#### Specifications

##### ABSOLUTE MAXIMUM RATING at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Value	Unit
Collector-to-Base Voltage	$V_{CBO}$	120	V
Collector-to-Emitter Voltage	$V_{CEO}$	100	V
Emitter-to-Base Voltage	$V_{EBO}$	6.5	V
Collector Current	$I_C$	2.5	A
Collector Current (Pulse)	$I_{CP}$	4	A
Collector Dissipation	$P_C$ (Note 1)	0.8	W
	$P_C$ (Note 2)	2.2	
Junction Temperature	$T_J$	175	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55 to +175	$^\circ\text{C}$

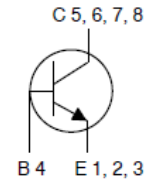
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Mounted on FRB with minimum pad of Copper 2 oz
2. Mounted on FRB with 1 in/sq pad of Copper 2 oz

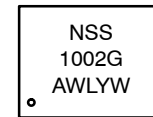


LPAK8 3.3x3.3, 0.65P  
CASE 760AD

#### ELECTRICAL CONNECTION



#### MARKING DIAGRAM



NSS1002 = Specific Device Code  
 A = Assembly Location  
 WL = Wafer Lot  
 Y = Year  
 W = Work Week  
 G = Pb-Free Package

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# NSS1002CL

## ELECTRICAL CHARACTERISTICS at Ta = 25°C

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Collector Cutoff Current	$I_{CBO}$	$V_{CB} = 120\text{ V}$ $I_E = 0\text{ A}$			0.1	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = 6.5\text{ V}$ $I_C = 0\text{ A}$			0.1	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE} = 5\text{ V}$ $I_C = 100\text{ mA}$	140		400	
Gain-Bandwidth Product	$f_T$	$V_{CE} = 10\text{ V}$ $I_C = 100\text{ mA}$		200		MHz
Output Capacitance	$C_{ob}$	$V_{CB} = 10\text{ V}$ $f = 1\text{ MHz}$		12		pF
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)1}$	$I_C = 100\text{ mA}$ $I_B = 10\text{ mA}$		0.018	0.036	V
	$V_{CE(sat)2}$	$I_C = 1\text{ A}$ $I_B = 100\text{ mA}$		0.08	0.15	V
	$V_{CE(sat)3}$	$I_C = 2.5\text{ A}$ $I_B = 250\text{ mA}$		0.18	0.36	V
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 1\text{ A}$ $I_B = 100\text{ mA}$		0.85	1.2	V
Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = 10\text{ }\mu\text{A}$ , $I_E = 0\text{ A}$	120			V
Collector-to-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 1\text{ mA}$ , $R_{BE} = \infty$	100			V
Emitter to Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 10\text{ }\mu\text{A}$ , $I_C = 0\text{ A}$	6.5			V
Turn-On Time	$t_{on}$	See Figure 1		15		ns
Storage Time	$t_{stg}$			790		ns
Fall Time	$t_f$			46		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.

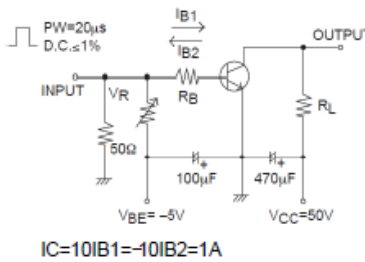


Figure 1. Switching Time Test Circuit

## ESD RATING

Parameter	Symbol	Value	Unit	Class
Electrostatic Discharge – Human Body Model	HBM	>2000, <4000	V	2
Electrostatic Discharge – Machine Model	MM	>400	V	M4

TYPICAL CHARACTERISTICS

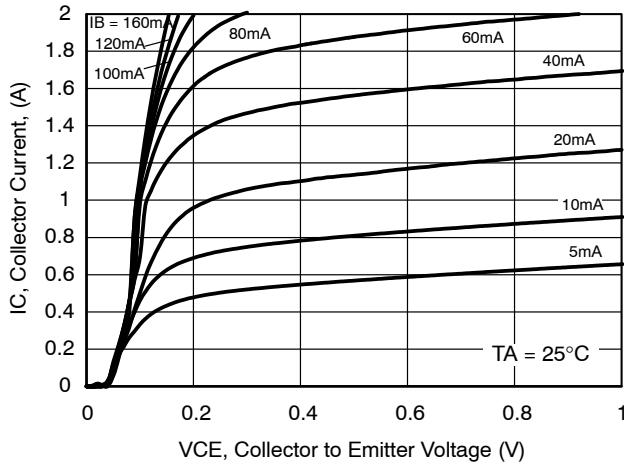


Figure 2.  $I_C - V_{CE}$

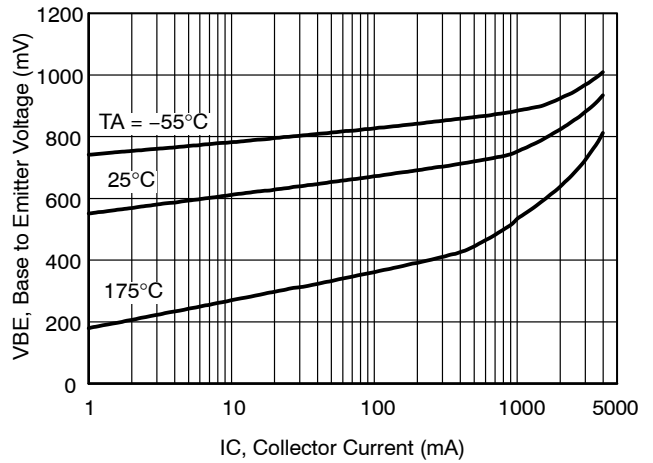


Figure 3.  $V_{BE} - I_C$

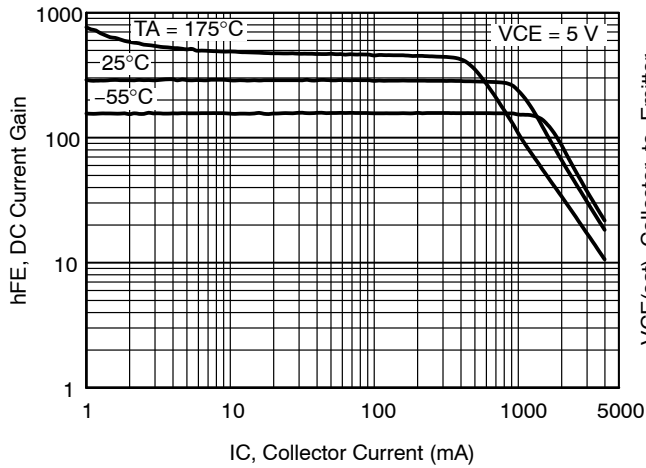


Figure 4.  $h_{FE} - I_C$

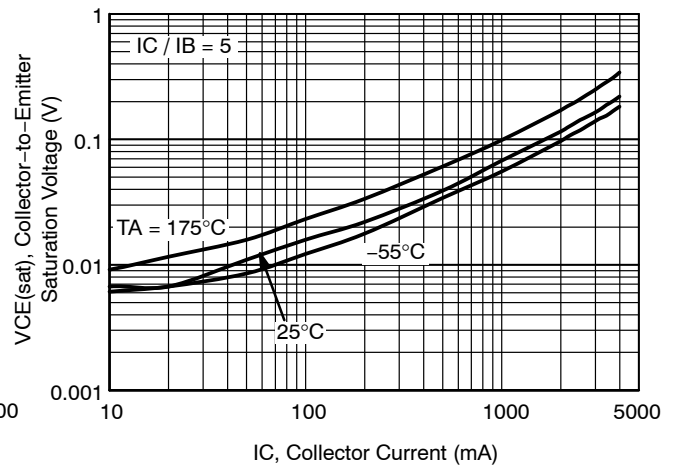


Figure 5.  $V_{CE(sat)} - I_C$

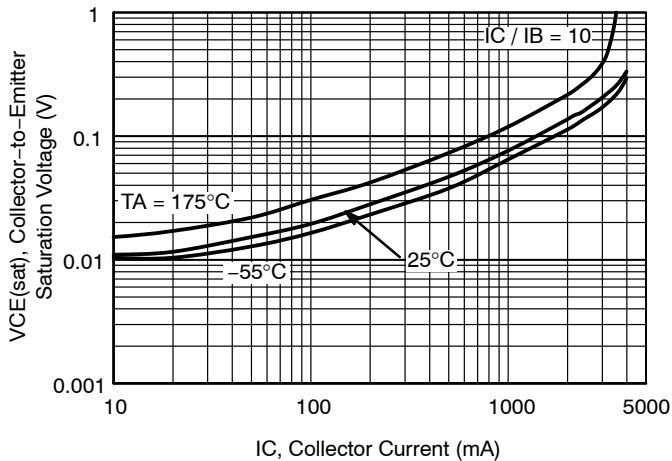


Figure 6.  $V_{CE(sat)} - I_C$

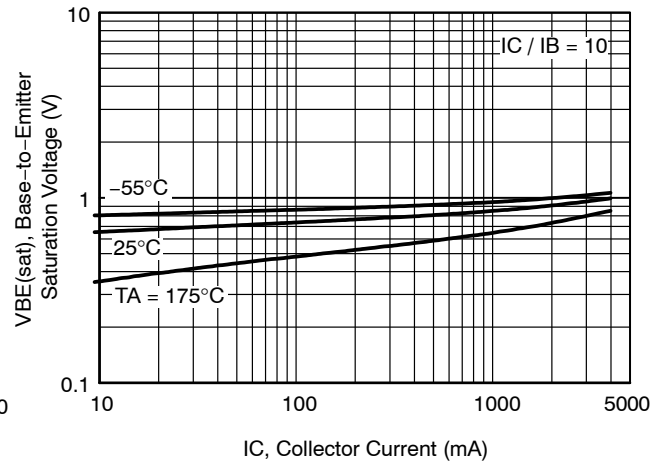


Figure 7.  $V_{BE(sat)} - I_C$

TYPICAL CHARACTERISTICS

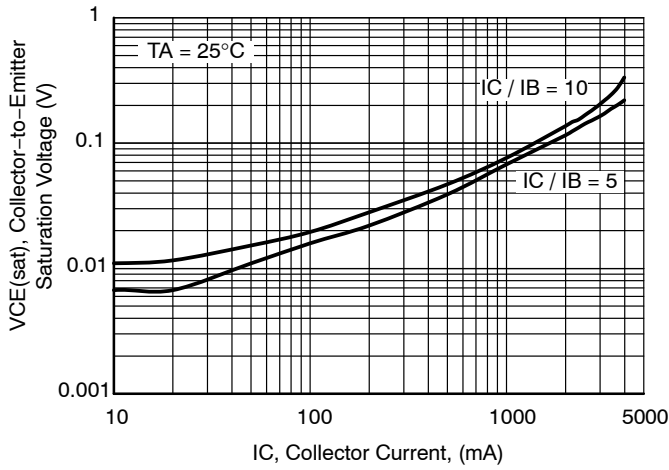


Figure 8.  $V_{CE(sat)}$  –  $I_C$

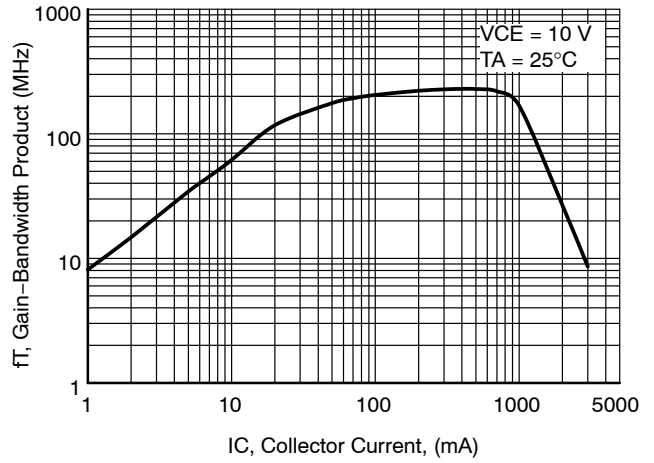


Figure 9.  $f_T$  –  $I_C$

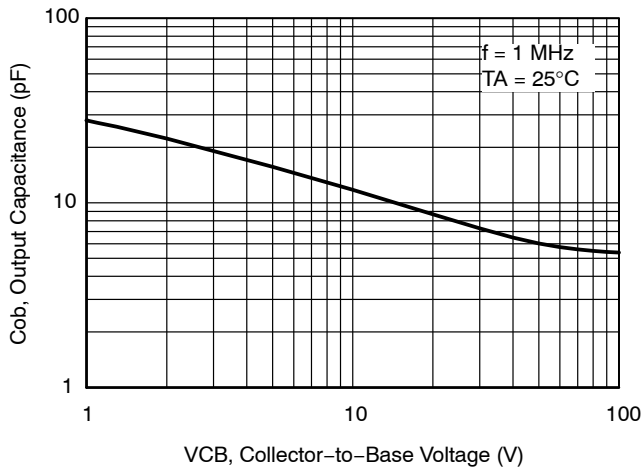


Figure 10.  $C_{ob}$  –  $V_{CB}$

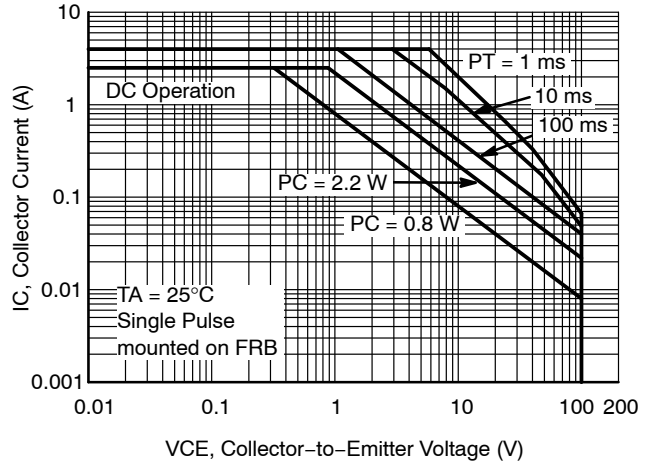


Figure 11. Safe Operating Area

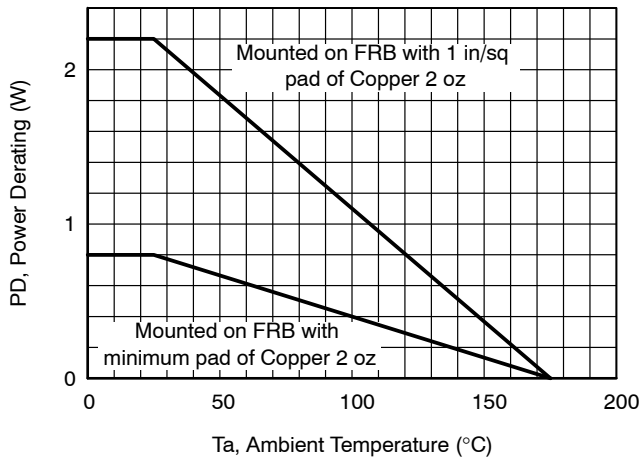


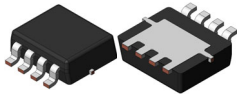
Figure 12. Power Derating

# NSS1002CL

## ORDERING INFORMATION

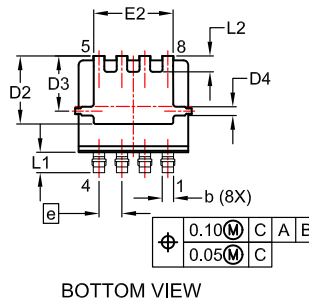
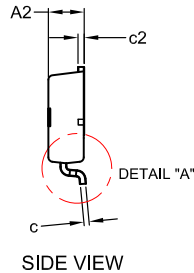
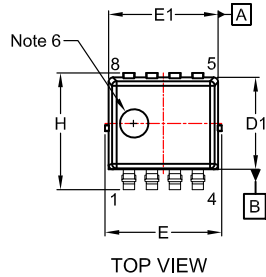
Device	Marking	Package	Shipping (Qty / Packing) <sup>†</sup>
NSVS1002CLTWG	NSS1002G	LFPAK8 (Pb-Free / Halogen Free)	3,000 / Tape & Reel
NSS1002CLTWG	NSS1002G	LFPAK8 (Pb-Free / Halogen Free)	3,000 / Tape & Reel

<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

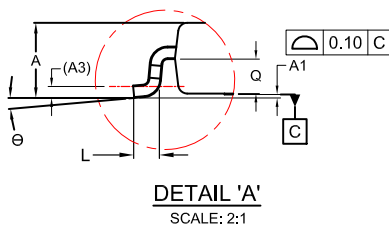


**LFPAK8 3.3x3.3, 0.65P**  
CASE 760AD  
ISSUE E

DATE 16 NOV 2020

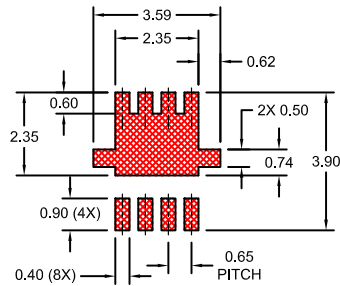


DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.95	1.05	1.15
A1	0.00	0.05	0.10
A2	0.95	1.00	1.05
A3	0.15 REF		
b	0.27	0.32	0.37
c	0.12	0.17	0.22
c2	0.12	0.17	0.22
D1	2.50	2.60	2.70
D2	1.82	1.92	2.02
D3	1.46	1.56	1.66
D4	0.20	0.25	0.30
E	3.20	3.30	3.40
E1	3.00	3.10	3.20
E2	2.15	2.25	2.35
e	0.65 BSC		
H	3.20	3.30	3.40
L	0.25	0.37	0.50
L1	0.48	0.58	0.68
L2	0.35	0.45	0.55
Q	0.45	0.50	0.55
θ	0°	4°	8°



NOTES:

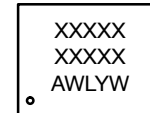
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS OR BURRS SHALL NOT EXCEED 0.150mm PER SIDE.
4. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
6. OPTIONAL MOLD FEATURE.



LAND PATTERN  
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.

**GENERIC MARKING DIAGRAM\***



- XXXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = Year
- W = Work Week

\*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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