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March 2018

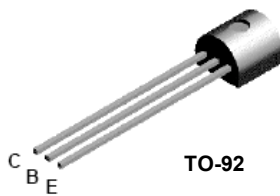
ON Semiconductor®

# 2N5551 / MMBT5551 NPN General-Purpose Amplifier

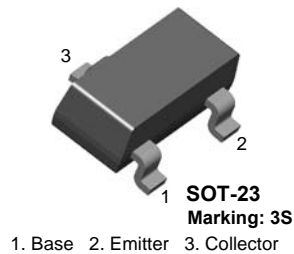
## Description

This device is designed for general-purpose high-voltage amplifiers and gas discharge display drivers.

2N5551



MMBT5551



## Ordering Information<sup>(1)</sup>

Part Number	Top Mark	Package	Packing Method
2N5551TA	5551	TO-92 3L	Ammo
2N5551TFR	5551	TO-92 3L	Tape and Reel
2N5551TF	5551	TO-92 3L	Tape and Reel
2N5551BU	5551	TO-92 3L	Bulk
MMBT5551	3S	SOT-23 3L	Tape and Reel

### Note:

- Suffix "-C" means Center Collector in 2N5551 (1. Emitter 2. Collector 3. Base)  
Suffix "-Y" means  $h_{FE}$  180~240 in 2N5551 (Test condition:  $I_C = 10$  mA,  $V_{CE} = 5.0$  V)

2N5551 / MMBT5551 — NPN General-Purpose Amplifier

## Absolute Maximum Ratings<sup>(2)</sup>

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Value	Units
$V_{CEO}$	Collector-Emitter Voltage	160	V
$V_{CBO}$	Collector-Base Voltage	180	V
$V_{EBO}$	Emitter-Base Voltage	6	V
$I_C$	Collector current - Continuous	600	mA
$T_J, T_{stg}$ <sup>(3)</sup>	Junction and Storage Temperature	-55 to +150	$^\circ\text{C}$

### Notes:

- These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
- These ratings are based on a maximum junction temperature of  $150^\circ\text{C}$ .  
These are steady-state limits. ON Semiconductor should be consulted on applications involving pulsed or low-duty cycle operations.

## Thermal Characteristics<sup>(4)</sup>

Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Maximum		Units
		2N5551	MMBT5551	
$P_D$	Total Device Dissipation	625	350	mW
	Derate above $25^\circ\text{C}$	5.0	2.8	mW/ $^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	$^\circ\text{C}/\text{W}$

### Note:

- PCB board size FR-4 76 x 114 x 0.6 T mm<sup>3</sup> (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.

**Electrical Characteristics<sup>(5)</sup>**Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Test Condition	Min.	Max.	Units
<b>Off Characteristics</b>					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 1.0\text{ mA}, I_B = 0$	160		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 100\text{ }\mu\text{A}, I_E = 0$	180		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10\text{ }\mu\text{A}, I_C = 0$	6.0		V
$I_{CBO}$	Collector Cut-Off Current	$V_{CB} = 120\text{ V}, I_E = 0$		50	nA
		$V_{CB} = 120\text{ V}, I_E = 0, T_A = 100^\circ\text{C}$		50	$\mu\text{A}$
$I_{EBO}$	Emitter Cut-Off Current	$V_{EB} = 4.0\text{ V}, I_C = 0$		50	nA
<b>On Characteristics</b>					
$h_{FE}$	DC Current Gain	$I_C = 1.0\text{ mA}, V_{CE} = 5.0\text{ V}$	80		
		$I_C = 10\text{ mA}, V_{CE} = 5.0\text{ V}$	80	250	
		$I_C = 50\text{ mA}, V_{CE} = 5.0\text{ V}$	30		
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$		0.15	V
		$I_C = 50\text{ mA}, I_B = 5.0\text{ mA}$		0.20	V
$V_{BE(sat)}$	Base-Emitter On Voltage	$I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$		1.0	V
		$I_C = 50\text{ mA}, I_B = 5.0\text{ mA}$		1.0	V
<b>Small-Signal Characteristics</b>					
$f_T$	Current Gain Bandwidth Product	$I_C = 10\text{ mA}, V_{CE} = 10\text{ V},$ $f = 100\text{ MHz}$	100		MHz
$C_{obo}$	Output Capacitance	$V_{CB} = 10\text{ V}, I_E = 0, f = 1.0\text{ MHz}$		6.0	pF
$C_{ibo}$	Input Capacitance	$V_{BE} = 0.5\text{ V}, I_C = 0, f = 1.0\text{ MHz}$		20	pF
$H_{fe}$	Small-Signal Current Gain	$I_C = 1.0\text{ mA}, V_{CE} = 10\text{ V}, f = 1.0\text{ kHz}$	50	250	
NF	Noise Figure	$I_C = 250\text{ }\mu\text{A}, V_{CE} = 5.0\text{ V},$ $R_S = 1.0\text{ k}\Omega, f = 10\text{ Hz to }15.7\text{ kHz}$		8.0	dB

**Note:**5. Pulse test: pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2.0\%$ .

## Typical Performance Characteristics

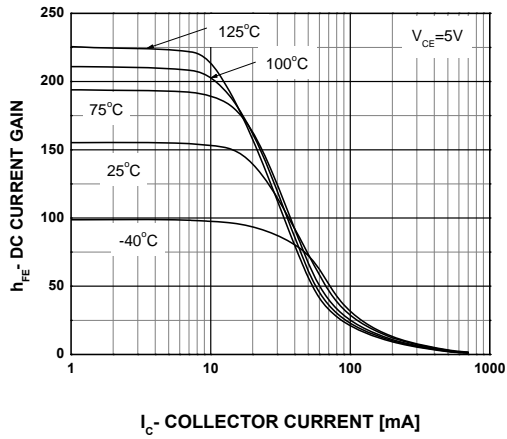


Figure 1. Typical Pulsed Current Gain vs. Collector Current

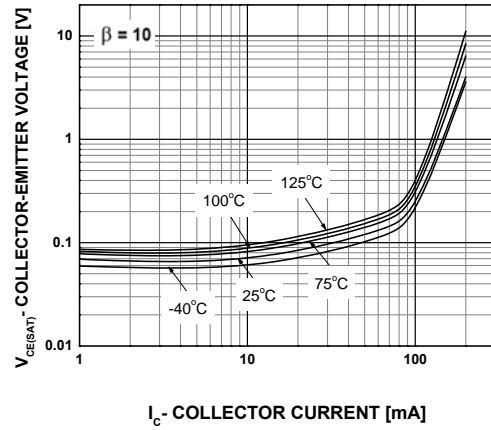


Figure 2. Collector-Emitter Saturation Voltage vs. Collector Current

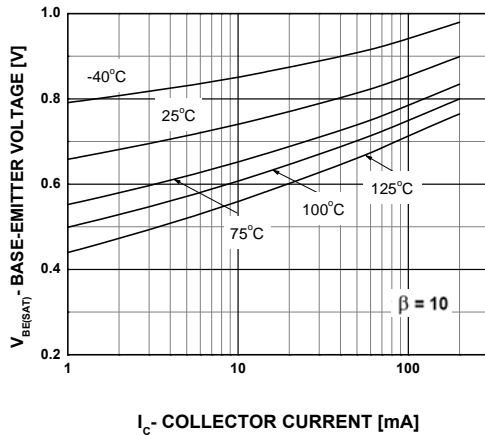


Figure 3. Base-Emitter Saturation Voltage vs. Collector Current

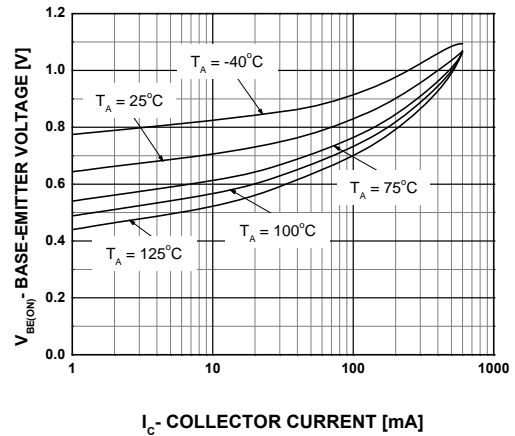


Figure 4. Base-Emitter On Voltage vs. Collector Current

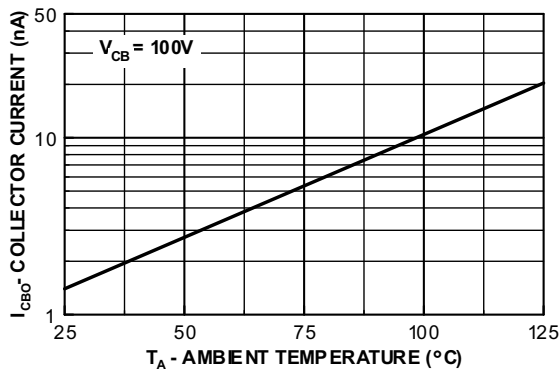


Figure 5. Collector Cut-Off Current vs. Ambient Temperature

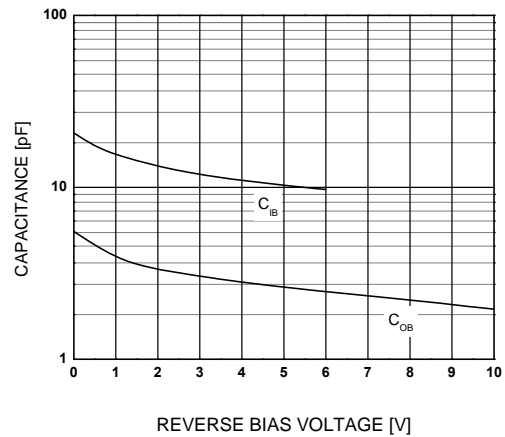
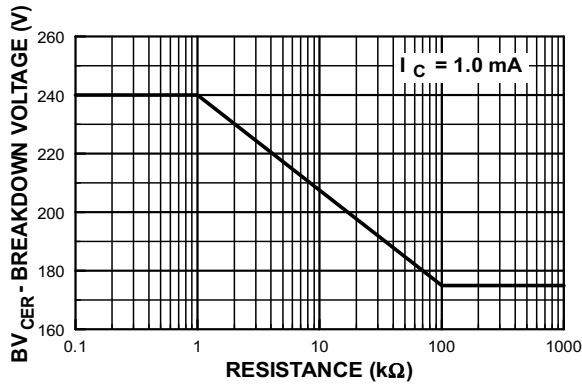
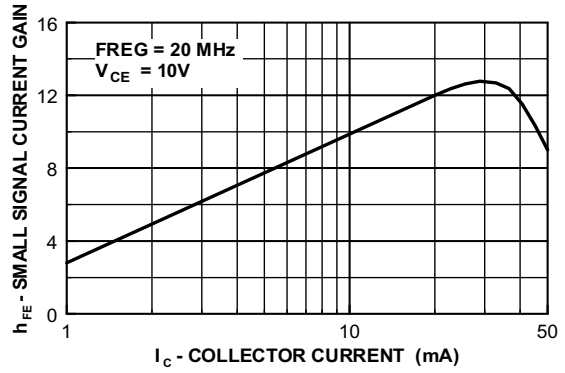


Figure 6. Input and Output Capacitance vs. Reverse Voltage

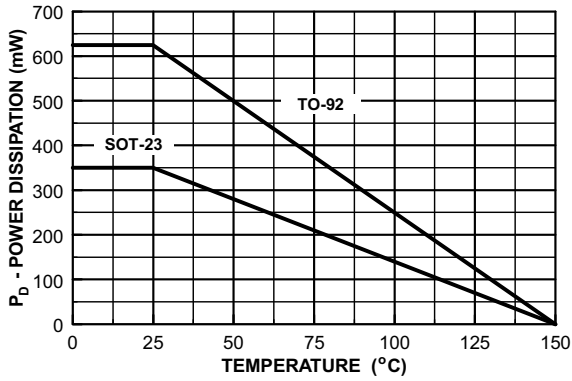
**Typical Performance Characteristics** (Continued)



**Figure 7. Collector-Emitter Breakdown Voltage with Resistance between Emitter-Base**



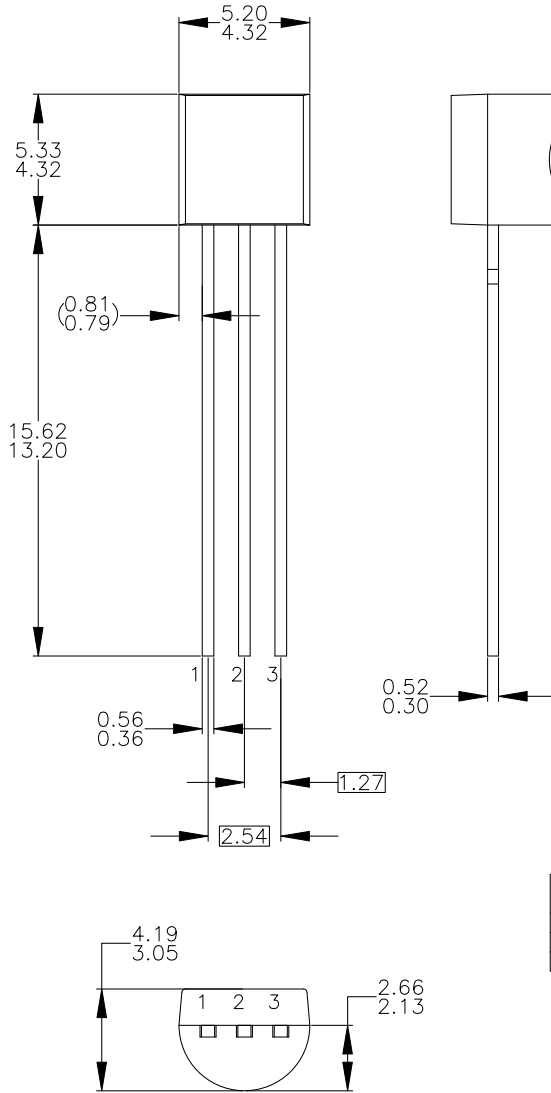
**Figure 8. Small Signal Current Gain vs. Collector Current**



**Figure 9. Power Dissipation vs. Ambient Temperature**

Physical Dimensions

TO-92 (Bulk)



NOTES: UNLESS OTHERWISE SPECIFIED

- A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DRAWING CONFORMS TO ASME Y14.5M-1994.
- D) TO-92 (92,94,96,97,98) PIN CONFIGURATION:

PIN	92			94			96			97			98		
	P	F	M	P	F	M	B	F	M	P	F	M	P	F	M
1	E	S	S	E	S	S	B	D	G	C	G	D	C	G	D
2	B	D	G	C	G	D	E	S	S	B	D	G	E	S	S
3	C	G	D	B	D	G	C	G	D	E	S	S	B	D	G

LEGEND:

- P - BIPOLAR
- F - JFET
- M - DMOS
- E - EMITTER
- B - BASE
- C - COLLECTOR
- D - DRAIN
- S - SOURCE
- G - GATE

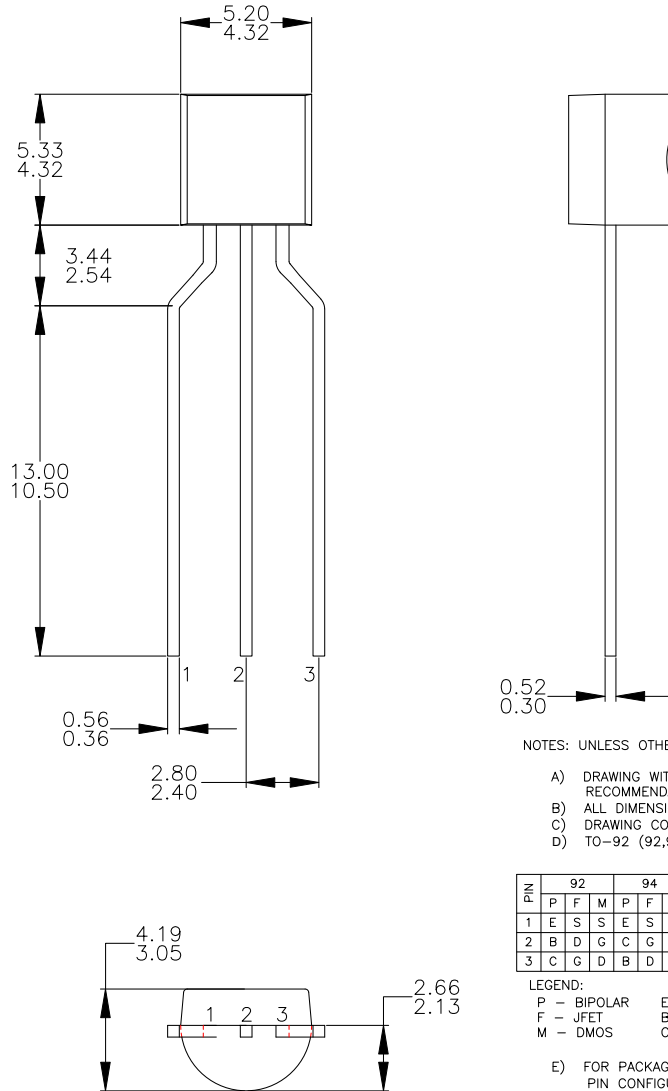
- E) FOR PACKAGE 92, 94, 96, 97 AND 98: PIN CONFIGURATION DRAIN "D" AND SOURCE "S" ARE INTERCHANGEABLE AT JFET "F" OPTION.
- F) DRAWING FILENAME: MKT-ZA03DREV3.

Figure 10. 3-LEAD, TO92, JEDEC TO-92 COMPLIANT STRAIGHT LEAD CONFIGURATION (OLD TO92AM3) (ACTIVE)

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**Physical Dimensions** (Continued)

**TO-92 (Tape and Reel, Ammo)**



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- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DRAWING CONFORMS TO ASME Y14.5M-1994.
- D) TO-92 (92,94,96,97,98) PIN CONFIGURATION:

PIN	92			94			96			97			98		
	P	F	M	P	F	M	B	F	M	P	F	M	P	F	M
1	E	S	S	E	S	S	B	D	G	C	G	D	C	G	D
2	B	D	G	C	G	D	E	S	S	B	D	G	E	S	S
3	C	G	D	B	D	G	C	G	D	E	S	S	B	D	G

LEGEND:  
P - BIPOLAR      E - EMITTER      D - DRAIN  
F - JFET          B - BASE              S - SOURCE  
M - DMOS        C - COLLECTOR      G - GATE

- E) FOR PACKAGE 92, 94, 96, 97 AND 98: PIN CONFIGURATION DRAIN "D" AND SOURCE "S" ARE INTERCHANGEABLE AT JFET "F" OPTION.
- F) DRAWING FILENAME: MKT-ZA03FREV2.

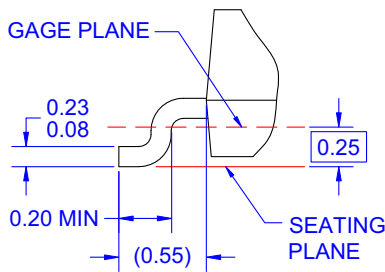
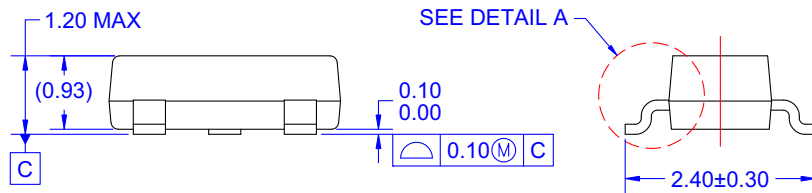
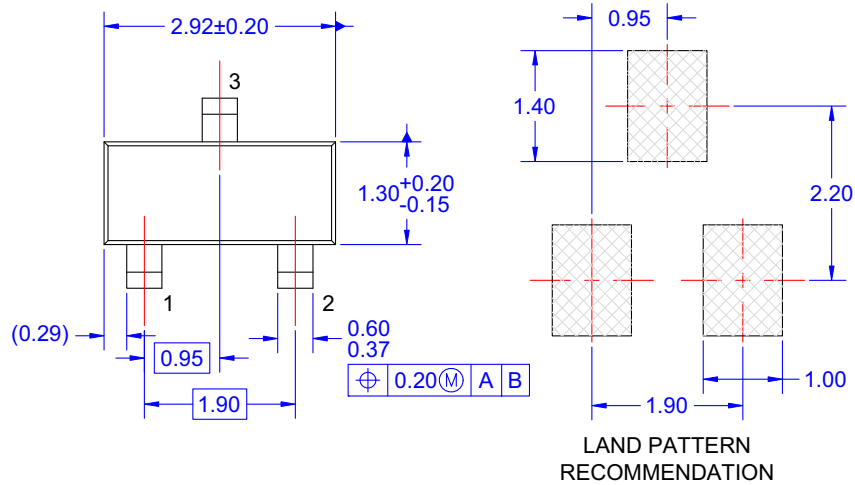
**Figure 11. 3-LEAD, TO92, MOLDED, 0.200 IN-LINE SPACING LD FORM(J62Z OPTION) (ACTIVE)**

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**Physical Dimensions** (Continued)

**SOT-23**




NOTES: UNLESS OTHERWISE SPECIFIED

- A) REFERENCE JEDEC REGISTRATION TO-236, VARIATION AB, ISSUE H.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE INCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M - 1994.
- E) DRAWING FILE NAME: MA03DREV10

**DETAIL A**  
SCALE: 2X

**Figure 12. 3-LEAD, SOT23, JEDEC TO-236, LOW PROFILE (ACTIVE)**

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