

2N2218S,AS, 2N2219S,AS, 2N2221,A(SILICON) 2N2222,A, 2N5581, 2N5582

NPN SILICON ANNULAR HERMETIC TRANSISTORS

widely used "Industry Standard" transistors for applications as medium-speed switches and as amplifiers from audio to VHF frequencies.

- DC Current Gain Specified – 1.0 to 500 mAdc
- Low Collector-Emitter Saturation Voltage –
VCE(sat) @ IC = 500 mAdc
= 1.6 Vdc (Max) – Non-A Suffix
= 1.0 Vdc (Max) – A-Suffix
- High Current-Gain-Bandwidth Product –
fT = 250 MHz (Min) @ IC = 20 mAdc – All Types Except
= 300 MHz (Min) @ IC = 20 mAdc – 2N2219A, 2N2222A, 2N5582
- Complements to PNP 2N2904,A thru 2N2907,A
- JAN,JTX Available in all devices
- JTXV Available on 2N2222,A Series
- 2N2218 and 2N2219 available in TO-39 Package With 1/2" Leads (1)

NPN SILICON SWITCHING AND AMPLIFIER TRANSISTORS

SELECTION GUIDE

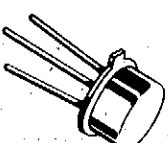
Device Type	Characteristic			Package
	BVCEO IC = 10 mAdc Volts	IC = 150 mAdc Min/Max	hFE IC = 500 mAdc Min	
2N2218	30	40/120	20	TO-5
2N2219	30	100/300	30	TO-5
2N2221	30	40/120	20	TO-18
2N2222	30	100/300	30	TO-18
2N5581	40	40/120	25	TO-46
2N5582	40	100/300	40	TO-46
2N2218A	40	40/120	25	TO-5
2N2219A	40	100/300	40	TO-5
2N2221A	40	40/120	25	TO-18
2N2222A	40	100/300	40	TO-18

*MAXIMUM RATINGS

Rating	Symbol	2N2218 2N2219 2N2221 2N2222	2N2218A 2N2219A 2N2221A 2N2222A	2N5581 2N5582	Unit
Collector-Emitter Voltage	VCEO	30	40	40	Vdc
Collector-Base Voltage	VCB	60	75	75	Vdc
Emitter-Base Voltage	VEB	5.0	6.0	6.0	Vdc
Collector Current – Continuous	IC	800	800	800**	mAdc
Total Device Dissipation @ TA = 25°C	PD	0.8	0.5	0.5	Watt
Derate above 25°C		5.33	3.33	3.33	mW/°C
Total Device Dissipation @ TC = 25°C	PD	3.0	1.8	2.0	Watts
Derate above 25°C		20	12	11.43	mW/°C
Operating and Storage Junction Temperature Range	TJ,Tstg	-65 to +200			°C

*Indicates JEDEC Registered Data.

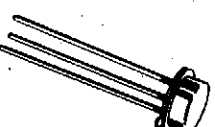
**Motorola Guarantees this Data in Addition to JEDEC Registered Data.



CASE 79-02
TO-39
2N2218,A
2N2219,A



CASE 22-03
TO-18
2N2221,A
2N2222,A



CASE 26-03
TO-46
2N5581
2N5582

[illegible]

2N2218S,AS, 2N2219S,AS, 2N2221,A, 2N2222,A, 2N5581, 2N5582 (continued)

* ELECTRICAL CHARACTERISTICS (Continued)

Characteristic	Symbol	Min	Max	Unit
SMALL-SIGNAL CHARACTERISTICS				
Current-Gain-Bandwidth Product ⁽²⁾ ($I_C = 20 \text{ mAdc}$, $V_{CE} = 20 \text{ Vdc}$, $f = 100 \text{ MHz}$)	f_T	250 300	—	MHz
Output Capacitance ⁽³⁾ ($V_{CB} = 10 \text{ Vdc}$, $I_E = 0$, $f = 100 \text{ kHz}$)	C_{ob}	—	8.0	pF
Input Capacitance ⁽³⁾ ($V_{EB} = 0.5 \text{ Vdc}$, $I_C = 0$, $f = 100 \text{ kHz}$)	C_{ib}	—	30 25	pF
Input Impedance ($I_C = 1.0 \text{ mAdc}$, $V_{CE} = 10 \text{ Vdc}$, $f = 1.0 \text{ kHz}$)	h_{ie}	1.0 2.0 0.2	3.5 8.0 1.0	k ohms
($I_C = 10 \text{ mAdc}$, $V_{CE} = 10 \text{ Vdc}$, $f = 1.0 \text{ kHz}$)		0.25	1.25	
Voltage Feedback Ratio ($I_C = 1.0 \text{ mAdc}$, $V_{CE} = 10 \text{ Vdc}$, $f = 1.0 \text{ kHz}$)	h_{fe}	—	5.0 8.0	$\times 10^{-4}$
($I_C = 10 \text{ mAdc}$, $V_{CE} = 10 \text{ Vdc}$, $f = 1.0 \text{ kHz}$)		—	2.5 4.0	
Small-Signal Current Gain ($I_C = 1.0 \text{ mAdc}$, $V_{CE} = 10 \text{ Vdc}$, $f = 1.0 \text{ kHz}$)	h_{fe}	30 50 50	150 300 300	—
($I_C = 10 \text{ mAdc}$, $V_{CE} = 10 \text{ Vdc}$, $f = 1.0 \text{ kHz}$)		75	300 375	
Output Admittance ($I_C = 1.0 \text{ mAdc}$, $V_{CE} = 10 \text{ Vdc}$, $f = 1.0 \text{ kHz}$)	h_{oe}	3.0 5.0	.15 35	μmhos
($I_C = 10 \text{ mAdc}$, $V_{CE} = 10 \text{ Vdc}$, $f = 1.0 \text{ kHz}$)		10	100	
Collector-Base Time Constant ($I_E = 20 \text{ mAdc}$, $V_{CB} = 20 \text{ Vdc}$, $f = 31.8 \text{ MHz}$)	t_{bC_c}	—	150	ps
Noise Figure ($I_C = 100 \mu\text{Adc}$, $V_{CE} = 10 \text{ Vdc}$, $R_S = 1.0 \text{ k ohm}$, $f = 1.0 \text{ kHz}$)	NF	—	4.0	dB

SWITCHING CHARACTERISTICS (A-Suffix, 2N5581 and 2N5582)

Delay Time	t_d	—	10	ns
Rise Time	t_r	—	25	ns
Storage Time	t_s	—	225	ns
Fall Time	t_f	—	60	ns
Active Region Time Constant** ($I_C = 150 \text{ mAdc}$, $V_{CE} = 30 \text{ Vdc}$)	T_A	—	2.5	ns

** Indicates JEDEC Registered Data.

** Motorola Guarantees this Data in Addition to JEDEC Registered Data.

(1) Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

(2) f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

(3) 2N5581 and 2N5582 are Listed C_{cb} and C_{eb} for these conditions and values.