

**RADIATION HARDENED  
 NPN SILICON SWITCHING TRANSISTOR**  
*Qualified per MIL-PRF-19500/255*

**DEVICES**

<b>2N2221A</b>	<b>2N2222A</b>
<b>2N2221AL</b>	<b>2N2222AL</b>
<b>2N2221AUA</b>	<b>2N2222AUA</b>
<b>2N2221AUB</b>	<b>2N2222AUB</b>
<b>2N2221AUBC</b>	<b>2N2222AUBC</b>

**LEVELS**

<b>JANSM – 3K Rads (Si)</b>
<b>JANSD – 10K Rads (Si)</b>
<b>JANSP – 30K Rads (Si)</b>
<b>JANSL – 50K Rads (Si)</b>
<b>JANSR – 100K Rads (Si)</b>
<b>JANSF – 300K Rads (Si)</b>
<b>JANSG – 500K Rads (Si)</b>
<b>JANSH – 1MEG Rads (Si)</b>

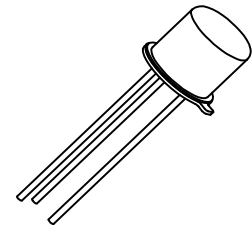
**ABSOLUTE MAXIMUM RATINGS ( $T_C = +25^\circ\text{C}$  unless otherwise noted)**

Parameters / Test Conditions	Symbol	Value	Unit	
Collector-Emitter Voltage	$V_{CE0}$	50	Vdc	
Collector-Base Voltage	$V_{CBO}$	75	Vdc	
Emitter-Base Voltage	$V_{EBO}$	6.0	Vdc	
Collector Current	$I_C$	800	mAdc	
Total Power Dissipation @ $T_A = +25^\circ\text{C}$				
2N2221A, L	2N2222A, L	$P_T$	0.5	W
2N2221AUA	2N2222AUA		0.65	
2N2221AUB, UBC	2N2222AUB, UBC		0.50	
Operating & Storage Junction Temperature Range	$T_{op}, T_{stg}$	-65 to +200	$^\circ\text{C}$	

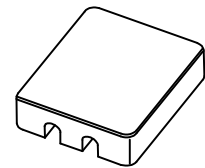
**THERMAL CHARACTERISTICS**

Parameters / Test Conditions	Symbol	Max.	Unit	
Thermal Resistance, Junction-to-Ambient				
2N2221A, L	2N2222A, L	$R_{\theta JA}$	325	$^\circ\text{C}/\text{W}$
2N2221AUA	2N2222AUA		210	
2N2221AUB, UBC	2N2222AUB, UBC		325	

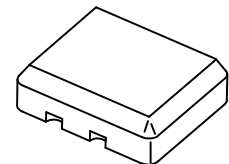
- Derate linearly 3.08 mW/ $^\circ\text{C}$  above  $T_A > +37.5^\circ\text{C}$
- Derate linearly 4.76 mW/ $^\circ\text{C}$  above  $T_A > +63.5^\circ\text{C}$



**TO-18 (TO-206AA)**  
 2N2221A, 2N2222A



**4 PIN**  
 2N2221AUA, 2N2222AUA



**3 PIN**  
 2N2221AUB, 2N2222AUB  
 2N2221AUBC, 2N2222AUBC  
 (UBC = Ceramic Lid Version)



6 Lake Street, Lawrence, MA 01841  
 1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803  
 Website: <http://www.microsemi.com>

# TECHNICAL DATA SHEET

## RADIATION HARDENED NPN SILICON SWITCHING TRANSISTOR *Qualified per MIL-PRF-19500/255*

### ELECTRICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ , unless otherwise noted)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage $I_C = 10\text{mA}$	$V_{(BR)CEO}$	50		Vdc
Collector-Base Cutoff Current $V_{CB} = 75\text{Vdc}$ $V_{CB} = 60\text{Vdc}$	$I_{CBO}$		10 10	$\mu\text{A}$ $\eta\text{A}$
Emitter-Base Cutoff Current $V_{EB} = 6.0\text{Vdc}$ $V_{EB} = 4.0\text{Vdc}$	$I_{EBO}$		10 10	$\mu\text{A}$ $\eta\text{A}$
Collector-Emitter Cutoff Current $V_{CE} = 50\text{Vdc}$	$I_{CES}$		50	$\eta\text{A}$
<b>ON CHARACTERISTICS <sup>(3)</sup></b>				
Forward-Current Transfer Ratio $I_C = 0.1\text{mA}$ , $V_{CE} = 10\text{Vdc}$		2N2221A, L, UA, UB, UBC 2N2222A, L, UA, UB, UBC	30 50	
$I_C = 1.0\text{mA}$ , $V_{CE} = 10\text{Vdc}$		2N2221A, L, UA, UB, UBC 2N2222A, L, UA, UB, UBC	35 75	150 325
$I_C = 10\text{mA}$ , $V_{CE} = 10\text{Vdc}$		2N2221A, L, UA, UB, UBC 2N2222A, L, UA, UB, UBC	40 100	
$I_C = 150\text{mA}$ , $V_{CE} = 10\text{Vdc}$		2N2221A, L, UA, UB, UBC 2N2222A, L, UA, UB, UBC	40 100	120 300
$I_C = 500\text{mA}$ , $V_{CE} = 10\text{Vdc}$		2N2221A, L, UA, UB, UBC 2N2222A, L, UA, UB, UBC	20 30	
Collector-Emitter Saturation Voltage $I_C = 150\text{mA}$ , $I_B = 15\text{mA}$ $I_C = 500\text{mA}$ , $I_B = 50\text{mA}$	$V_{CE(sat)}$		0.3 1.0	Vdc
Base-Emitter Voltage $I_C = 150\text{mA}$ , $I_B = 15\text{mA}$ $I_C = 500\text{mA}$ , $I_B = 50\text{mA}$	$V_{BE(sat)}$	0.6	1.2 2.0	Vdc



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### DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 1.0\text{mA}$ , $V_{CE} = 10\text{Vdc}$ , $f = 1.0\text{kHz}$ 2N2221A, L, UA, UB, UBC 2N2222A, L, UA, UB, UBC	$h_{fe}$		30 50	
Magnitude of Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 20\text{mA}$ , $V_{CE} = 20\text{Vdc}$ , $f = 100\text{MHz}$	$ h_{fe} $		2.5	
Output Capacitance $V_{CB} = 10\text{Vdc}$ , $I_E = 0$ , $100\text{kHz} \leq f \leq 1.0\text{MHz}$	$C_{obo}$		8.0	pF
Input Capacitance $V_{EB} = 0.5\text{Vdc}$ , $I_C = 0$ , $100\text{kHz} \leq f \leq 1.0\text{MHz}$	$C_{ibo}$		25	pF

### SWITCHING CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Turn-On Time See figure 8 of MIL-PRF-19500/255	$t_{on}$		35	ns
Turn-Off Time See Figure 9 of MIL-PRF-19500/255	$t_{off}$		300	ns

(3) Pulse Test: Pulse Width = 300µs, Duty Cycle ≤ 2.0%.