

## MULTIPLE (QUAD) NPN SILICON DUAL IN-LINE AND FLATPACK SWITCHING TRANSISTOR

Qualified per MIL-PRF-19500/559

### Devices

2N6989  
2N6989U

2N6990

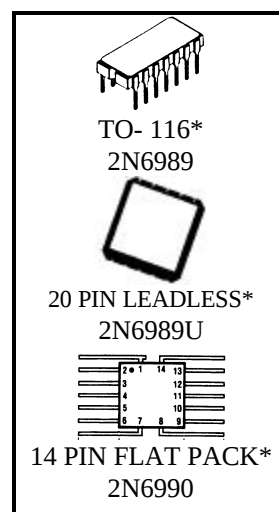
### Qualified Level

JAN  
JANTX  
JANTXV  
JANS

### MAXIMUM RATINGS <sup>(1)</sup>

| Ratings                                                                                                                           | Symbol            | Value             | Units              |
|-----------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|--------------------|
| Collector-Emitter Voltage <sup>(3)</sup>                                                                                          | $V_{CEO}$         | 50                | Vdc                |
| Collector-Base Voltage <sup>(3)</sup>                                                                                             | $V_{CBO}$         | 75                | Vdc                |
| Emitter-Base Voltage <sup>(3)</sup>                                                                                               | $V_{EBO}$         | 6.0               | Vdc                |
| Collector Current <sup>(3)</sup>                                                                                                  | $I_C$             | 800               | mAdc               |
| Total Power Dissipation @ $T_A = +25^{\circ}\text{C}$<br>2N6989 <sup>(2)</sup><br>2N6989U <sup>(2)</sup><br>2N6990 <sup>(2)</sup> | $P_D$             | 1.5<br>1.0<br>0.4 | W                  |
| Operating & Storage Junction Temperature Range                                                                                    | $T_{op}, T_{stg}$ | -65 to +200       | $^{\circ}\text{C}$ |

- 1) Maximum voltage between transistors shall be  $\geq 500$  Vdc
- 2) Derate linearly 8.57 mW/ $^{\circ}\text{C}$  above  $T_A = +25^{\circ}\text{C}$  for 2N6989 and 2N6989U  
Derate linearly 2.286 mW/ $^{\circ}\text{C}$  above  $T_A = +25^{\circ}\text{C}$  for 2N6990  
Ratings apply to total package.
- 3) Ratings apply to each transistor in the array.



\*See appendix A for package outline

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

| Characteristics                                                                               | Symbol        | Min. | Max.     | Unit                    |
|-----------------------------------------------------------------------------------------------|---------------|------|----------|-------------------------|
| <b>OFF CHARACTERISTICS</b>                                                                    |               |      |          |                         |
| Collector-Emitter Breakdown Voltage<br>$I_C = 10$ mAdc                                        | $V_{(BR)CEO}$ | 50   |          | Vdc                     |
| Collector-Base Cutoff Current<br>$V_{CB} = 60$ Vdc<br>$V_{CB} = 75$ Vdc; $I_C = 10$ $\mu$ Adc | $I_{CBO}$     |      | 10<br>10 | $\eta$ Adc<br>$\mu$ Adc |
| Emitter-Base Cutoff Current<br>$V_{EB} = 4.0$ Vdc<br>$V_{EB} = 6.0$ Vdc; $I_C = 10$ $\mu$ Adc | $I_{EBO}$     |      | 10<br>10 | $\eta$ Adc<br>$\mu$ Adc |

**ELECTRICAL CHARACTERISTICS (con't)**

| Characteristics                                                                                                                                                                                                                                                                                        | Symbol        | Min.                         | Max.       | Unit |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------------------|------------|------|
| <b>ON CHARACTERISTICS <sup>(4)</sup></b>                                                                                                                                                                                                                                                               |               |                              |            |      |
| Forward-Current Transfer Ratio<br>$I_C = 0.1 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$<br>$I_C = 1.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$<br>$I_C = 10 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$<br>$I_C = 150 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$<br>$I_C = 500 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$ | $h_{FE}$      | 50<br>75<br>100<br>100<br>30 | 325<br>300 |      |
| Collector-Emitter Saturation Voltage<br>$I_C = 150 \text{ mAdc}, I_B = 15 \text{ mAdc}$<br>$I_C = 500 \text{ mAdc}, I_B = 50 \text{ mAdc}$                                                                                                                                                             | $V_{CE(sat)}$ |                              | 0.3<br>1.0 | Vdc  |
| Base-Emitter Saturation Voltage<br>$I_C = 150 \text{ mAdc}, I_B = 15 \text{ mAdc}$<br>$I_C = 500 \text{ mAdc}, I_B = 50 \text{ mAdc}$                                                                                                                                                                  | $V_{BE(sat)}$ | 0.6                          | 1.2<br>2.0 | Vdc  |

**DYNAMIC CHARACTERISTICS**

|                                                                                                                                                    |            |     |     |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----|-----|----|
| Magnitude of Small-Signal Short-Circuit<br>Forward Current Transfer Ratio<br>$I_C = 20 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 100 \text{ MHz}$ | $ h_{fe} $ | 2.5 | 8.0 |    |
| Forward Current Transfer Ratio<br>$I_C = 1.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 1.0 \text{ kHz}$                                           | $h_{fe}$   | 50  |     |    |
| Output Capacitance<br>$V_{CB} = 10 \text{ Vdc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$                                              | $C_{obo}$  |     | 8.0 | pF |
| Input Capacitance<br>$V_{EB} = 0.5 \text{ Vdc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$                                              | $C_{ibo}$  |     | 25  | pF |

(4) Pulse Test: Pulse Width = 300 $\mu$ s, Duty Cycle  $\leq$  2.0%.

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