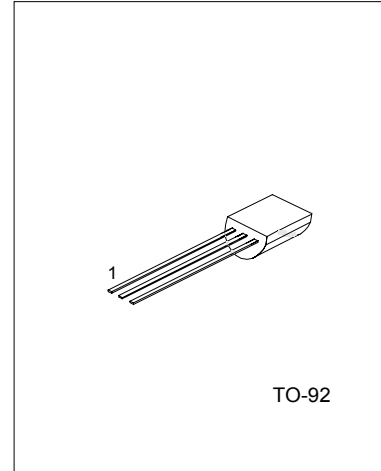


# UTC 2N5088/2N5089 NPN EPITAXIAL SILICON TRANSISTOR

## NPN GENERAL PURPOSE AMPLIFIER

### DESCRIPTION

The device is designed for low noise, high gain, general purpose amplifier applications at collector currents from 1μA to 50mA.



1:EMITTER 2:BASE 3:COLLECTOR

### MAXIMUM RATINGS (TA=25°C, unless otherwise noted)

| RATING                                           | SYMBOL                            | 2N5088     | 2N5089 | UNIT |
|--------------------------------------------------|-----------------------------------|------------|--------|------|
| Collector-Emitter voltage                        | V <sub>CEO</sub>                  | 30         | 25     | V    |
| Collector-Base voltage                           | V <sub>CBO</sub>                  | 35         | 30     | V    |
| Emitter-base voltage                             | V <sub>EB0</sub>                  | 4.5        |        | V    |
| Collector current-continuous                     | I <sub>c</sub>                    | 100        |        | mA   |
| Operating and Storage Junction Temperature Range | T <sub>j</sub> , T <sub>stg</sub> | -55 ~ +150 |        | °C   |

Note 1: These ratings are based on a maximum junction temperature of 150 degrees C.

Note 2: These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

### THERMAL CHARACTERISTICS (TA=25°C, unless otherwise noted)

| PARAMETER                                     | SYMBOL           | MAX      | UNIT        |
|-----------------------------------------------|------------------|----------|-------------|
| Total Device Dissipation<br>Derate above 25°C | P <sub>D</sub>   | 625<br>5 | mW<br>mW/°C |
| Thermal Resistance, Junction to Case          | R <sub>θJC</sub> | 83.3     | °C/W        |
| Thermal Resistance, Junction to Ambient       | R <sub>θJA</sub> | 200      | °C/W        |

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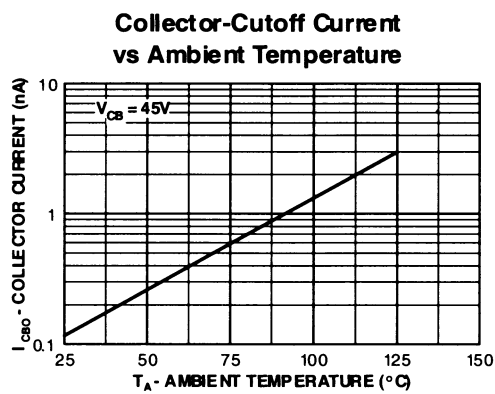
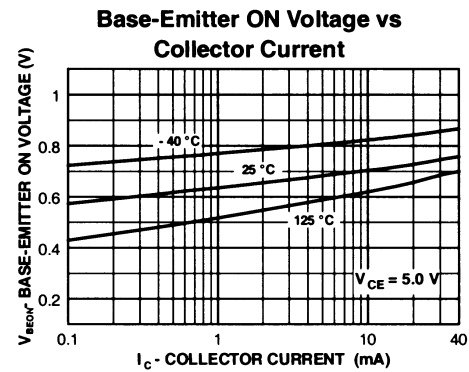
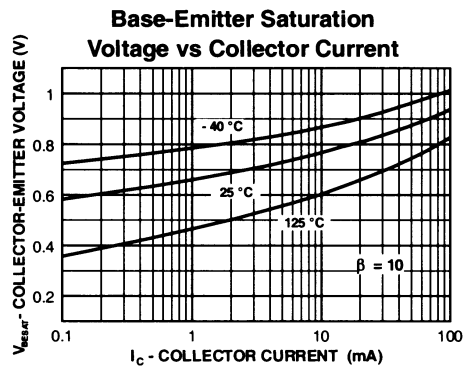
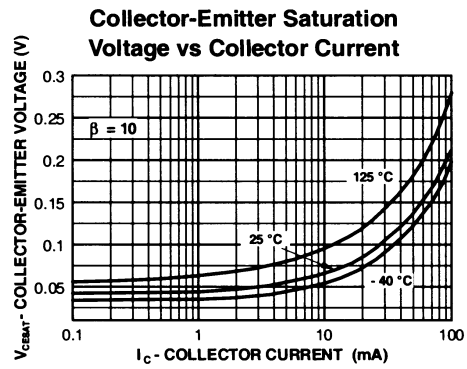
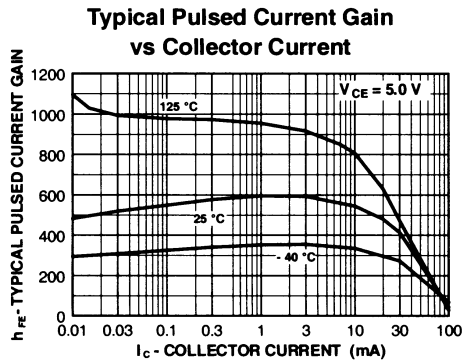
## ELECTRICAL CHARACTERISTICS (Ta=25°C, unless otherwise noted)

| PARAMETER                                                         | SYMBOL               | TEST CONDITIONS                                                                                                                                                                                       | MIN                                    | MAX          | UNIT     |
|-------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------|----------|
| <b>OFF CHARACTERISTICS</b>                                        |                      |                                                                                                                                                                                                       |                                        |              |          |
| Collector-Emitter Breakdown Voltage<br>(note)<br>2N5088<br>2N5089 | V <sub>(BR)CEO</sub> | I <sub>C</sub> =1.0mA, I <sub>B</sub> =0                                                                                                                                                              | 30<br>25                               |              | V<br>V   |
| Collector-Base Breakdown Voltage<br>2N5088<br>2N5089              | V <sub>(BR)CBO</sub> | I <sub>C</sub> =100μA, I <sub>E</sub> =0                                                                                                                                                              | 35<br>30                               |              | V<br>V   |
| Collector Cut-Off Current<br>2N5088<br>2N5089                     | I <sub>CBO</sub>     | V <sub>CB</sub> =20V, I <sub>E</sub> =0<br>V <sub>CB</sub> =15V, I <sub>E</sub> =0                                                                                                                    |                                        | 50<br>50     | nA<br>nA |
| Emitter Cutoff Current                                            | I <sub>EBO</sub>     | V <sub>EB</sub> =3.0V, I <sub>C</sub> =0<br>V <sub>EB</sub> =4.5V, I <sub>C</sub> =0                                                                                                                  |                                        | 50<br>100    | nA<br>nA |
| <b>ON CHARACTERISTICS</b>                                         |                      |                                                                                                                                                                                                       |                                        |              |          |
| DC Current Gain                                                   | h <sub>FE</sub>      | V <sub>CE</sub> =5.0V, I <sub>C</sub> =100μA 2N5088<br>2N5089<br>V <sub>CE</sub> =5.0V, I <sub>C</sub> =1.0mA 2N5088<br>2N5089<br>V <sub>CE</sub> =5.0V, I <sub>C</sub> =10mA 2N5088<br>(NOTE) 2N5089 | 300<br>400<br>350<br>450<br>300<br>400 | 900<br>1200  |          |
| Collector-Emitter Saturation Voltage                              | V <sub>CE(sat)</sub> | I <sub>C</sub> =10mA, I <sub>B</sub> =1.0mA                                                                                                                                                           |                                        | 0.5          | V        |
| Base-Emitter On Voltage                                           | V <sub>BE(on)</sub>  | I <sub>C</sub> =10mA, V <sub>CE</sub> =5.0V                                                                                                                                                           |                                        | 0.8          | V        |
| <b>SMALL SIGNAL CHARACTERISTICS</b>                               |                      |                                                                                                                                                                                                       |                                        |              |          |
| Current Gain-Bandwidth Product                                    | f <sub>T</sub>       | V <sub>CE</sub> =5.0mA, I <sub>C</sub> =500μA, f=20MHz                                                                                                                                                | 50                                     |              | MHz      |
| Collector-Base Capacitance                                        | C <sub>cb</sub>      | V <sub>CB</sub> =5.0V, I <sub>E</sub> =0, f=100kHz                                                                                                                                                    |                                        | 4            | pF       |
| Emitter-Base Capacitance                                          | C <sub>eb</sub>      | V <sub>EB</sub> =0.5V, I <sub>C</sub> =0, f=100kHz                                                                                                                                                    |                                        | 10           | pF       |
| Small-Signal Current Gain<br>2N5088<br>2N5089                     | h <sub>FE</sub>      | V <sub>CE</sub> =5.0V, I <sub>C</sub> =1.0mA, f=1.0kHz                                                                                                                                                | 350<br>450                             | 1400<br>1800 |          |
| Noise Figure<br>2N5088<br>2N5089                                  | NF                   | V <sub>CE</sub> =5.0V, I <sub>C</sub> =100μA, R <sub>s</sub> =10kΩ,<br>f=10KHz to 15.7kHz                                                                                                             |                                        | 3.0<br>2.0   | dB<br>dB |

Note: Pulse Test: Pulse Width≤300μs, Duty Cycle≤2.0%.

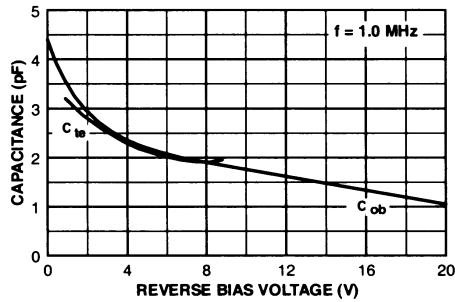
# UTC 2N5088/2N5089 NPN EPITAXIAL SILICON TRANSISTOR

## TYPICAL CHARACTERISTICS

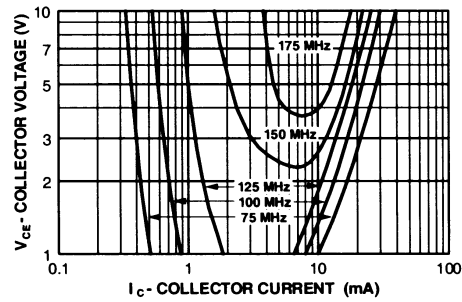


# UTC 2N5088/2N5089 NPN EPITAXIAL SILICON TRANSISTOR

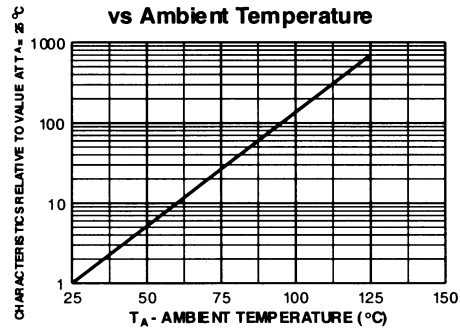
**Input and Output Capacitance  
vs Reverse Bias Voltage**



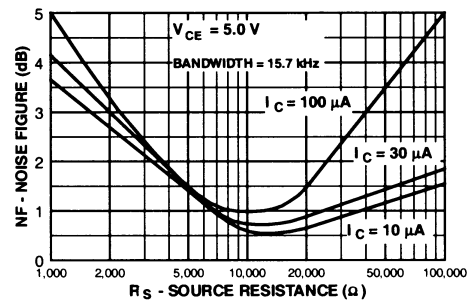
**Contours of Constant Gain  
Bandwidth Product ( $f_T$ )**



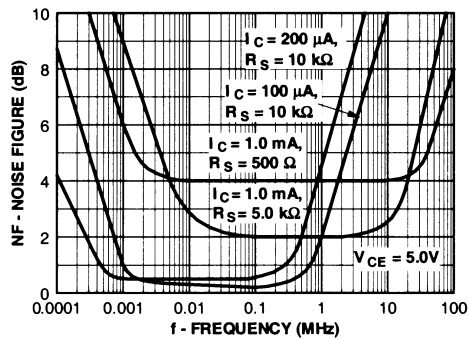
**Normalized Collector-Cutoff Current  
vs Ambient Temperature**



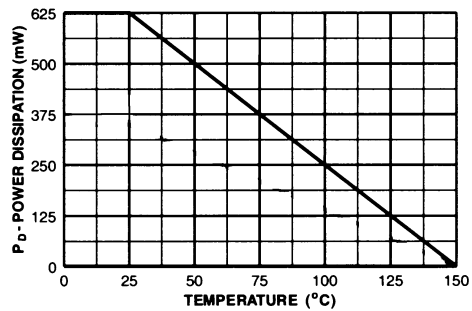
**Wideband Noise Frequency  
vs Source Resistance**



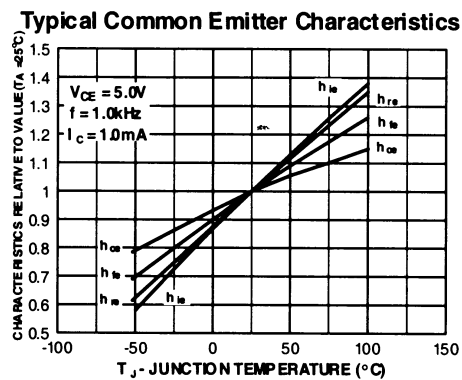
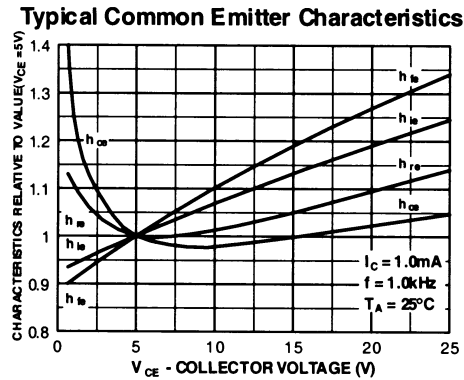
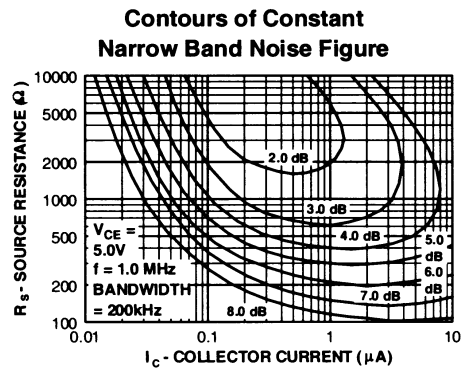
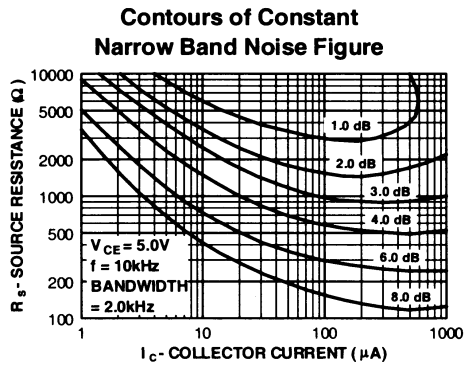
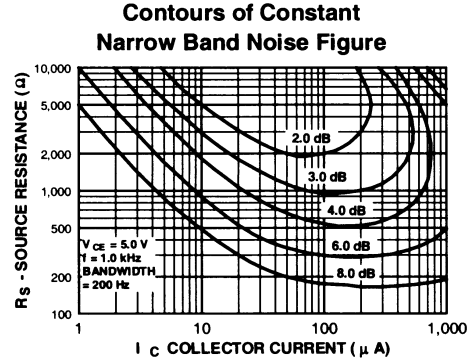
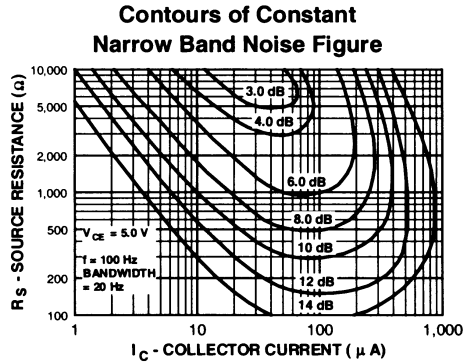
**Noise Figure vs Frequency**



**Power Dissipation vs  
Ambient Temperature**



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