

# FCX493U

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# FCX493U

## 1A, 100V NPN Plastic-Encapsulate Transistor

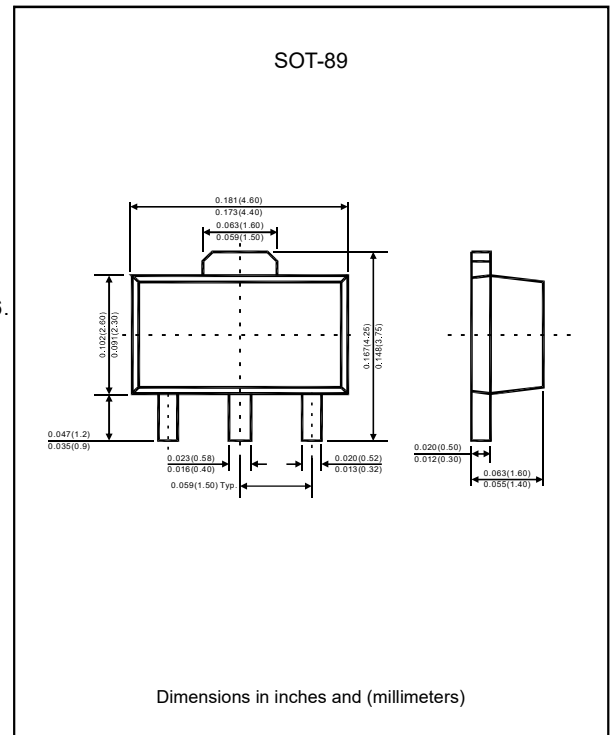
### Features

- $V_{(BR)CEO} > 100V$ .
- $I_C = 1A$  high Continuous Current.
- Low saturation voltage  $V_{CE(sat)} < 300mV$ , @ 250mA.
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates Halogen free parts, ex. FCX493U-H.

### Mechanical data

- Epoxy: UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-89.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.
- Mounting Position : Any.

### Package outline



### Maximum ratings (At $T_A = 25^\circ C$ unless otherwise noted)

| Parameter                                  | Symbol          | Value       | Unit         |
|--------------------------------------------|-----------------|-------------|--------------|
| Collector to base voltage                  | $V_{CBO}$       | 120         | V            |
| Collector to emitter voltage               | $V_{CEO}$       | 100         | V            |
| Emitter to base voltage                    | $V_{EBO}$       | 7           | V            |
| Collector current-continuous               | $I_C$           | 1           | A            |
| Peak pulse current                         | $I_{CM}$        | 2           | A            |
| Continuous base current                    | $I_B$           | 200         | mA           |
| Collector power dissipation                | $P_C$           | 1           | W            |
| Thermal resistance junction to ambient air | $R_{\theta JA}$ | 125         | $^\circ C/W$ |
| Thermal resistance junction to leads       | $R_{\theta JL}$ | 10.01       | $^\circ C/W$ |
| Operating temperature range                | $T_J$           | -65 to +150 | $^\circ C$   |
| Storage temperature range                  | $T_{STG}$       | -65 to +150 | $^\circ C$   |

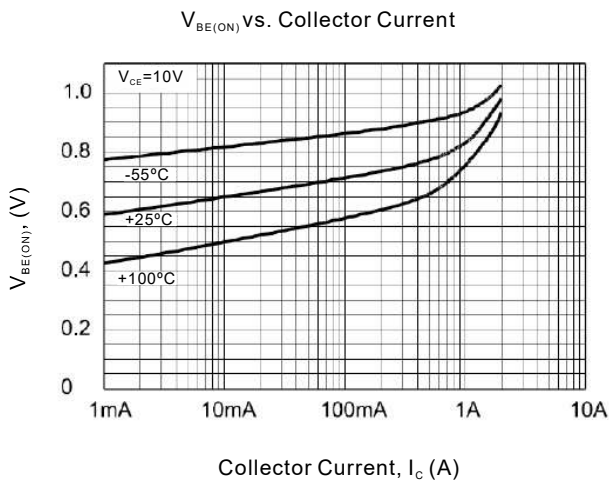
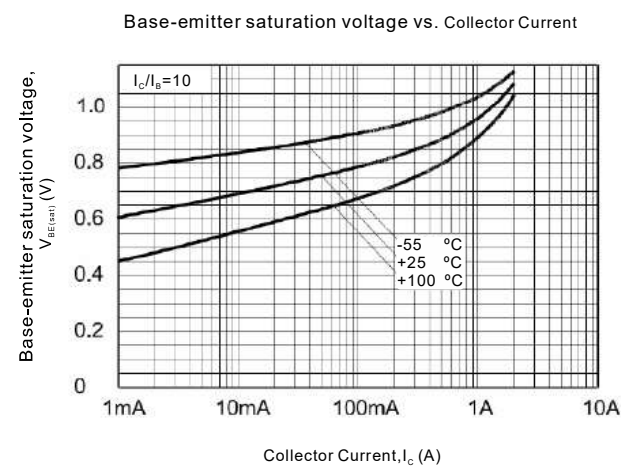
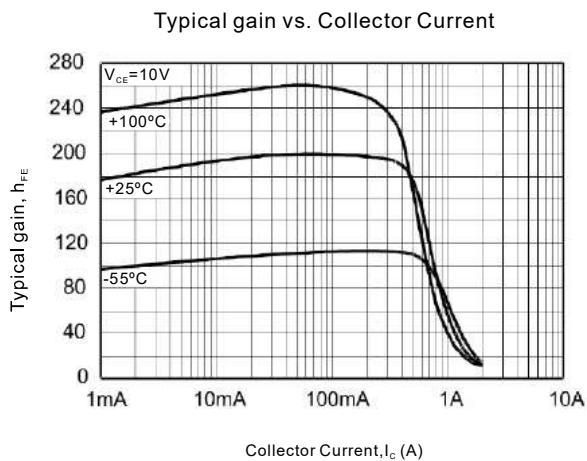
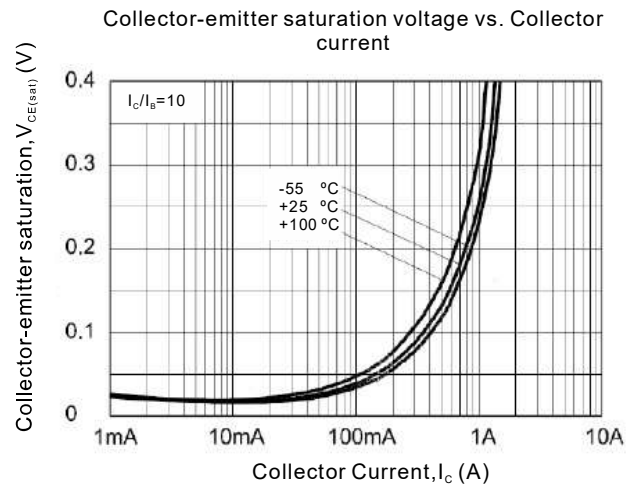
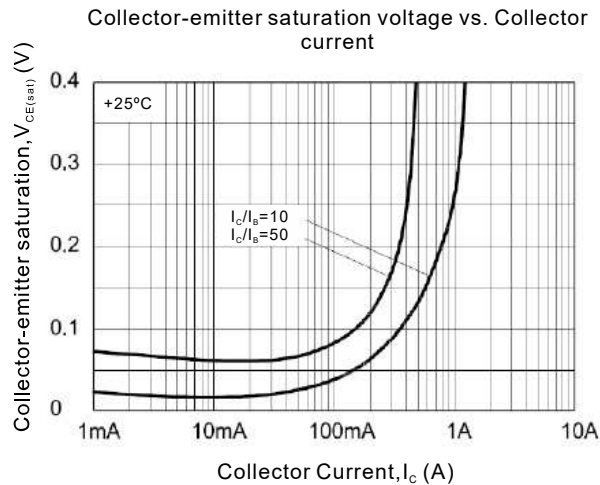
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Electrical characteristics (At  $T_A=25^{\circ}\text{C}$  unless otherwise noted)

| Parameter                            | Conditions                       | Symbol        | Min. | Typ. | Max. | Unit |
|--------------------------------------|----------------------------------|---------------|------|------|------|------|
| Off characteristics                  |                                  |               |      |      |      |      |
| Collector-base breakdown voltage     | $I_C=100\mu A, I_E=0$            | $V_{(BR)CBO}$ | 120  |      |      | V    |
| Collector-emitter breakdown voltage  | $I_C=1mA, I_B=0$                 | $V_{(BR)CEO}$ | 100  |      |      | V    |
| Emitter-base breakdown voltage       | $I_E=100\mu A, I_C=0$            | $V_{(BR)EBO}$ | 7    |      |      | V    |
| Collector-base cut off current       | $V_{CB}=100V, I_E=0$             | $I_{CBO}$     |      |      | 100  | nA   |
| Emitter-base cut off current         | $V_{EB}=5V, I_C=0$               | $I_{EBO}$     |      |      | 100  | nA   |
| Collector-Emitter cut off current    | $V_{CES}=100V$                   | $I_{CES}$     |      |      | 100  | nA   |
| On characteristics                   |                                  |               |      |      |      |      |
| DC current gain current gain         | $V_{CE}=10V, I_C=1mA$            | $h_{FE}$      | 100  |      |      |      |
|                                      | $V_{CE}=10V, I_C=250mA$          |               | 100  |      | 300  |      |
|                                      | $V_{CE}=10V, I_C=500mA$          |               | 60   |      |      |      |
|                                      | $V_{CE}=10V, I_C=1000mA$         |               | 20   |      |      |      |
| Base-emitter saturation voltage      | $I_C=1A, I_B=100mA$              | $V_{BE(sat)}$ |      |      | 1.15 | V    |
| Collector-emitter saturation voltage | $I_C=500mA, I_B=50mA$            | $V_{CE(sat)}$ |      |      | 0.3  | V    |
|                                      | $I_C=1A, I_B=100mA$              |               |      |      | 0.6  | V    |
| Small signal characteristics         |                                  |               |      |      |      |      |
| Output capacitance                   | $V_{CB}=10V, I_E=0, f=1MHz$      | $C_{ob}$      |      |      | 10   | pF   |
| Gain-bandwidth product               | $V_{CE}=10V, I_C=50mA, f=100MHz$ | $f_T$         | 150  |      |      | MHz  |

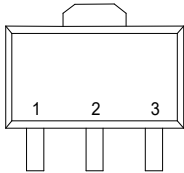
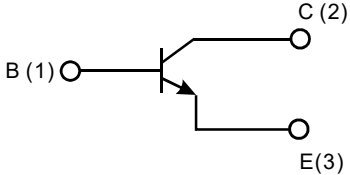
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## Rating and characteristic curves



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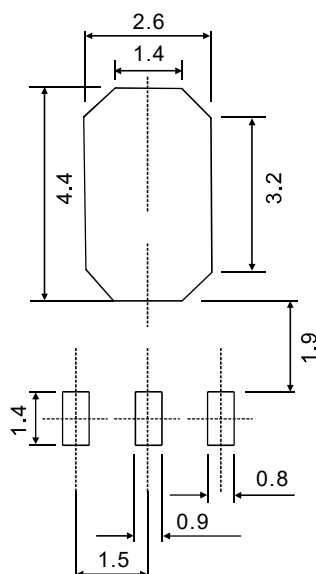
## Pinning information

| Pin                                         | Simplified outline                                                                | Symbol                                                                              |
|---------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Pin1 Base<br>Pin2 Collector<br>Pin3 Emitter |  |  |

## Marking

| Type number | Marking code |
|-------------|--------------|
| FCX493U     | N93          |

## Suggested solder pad layout

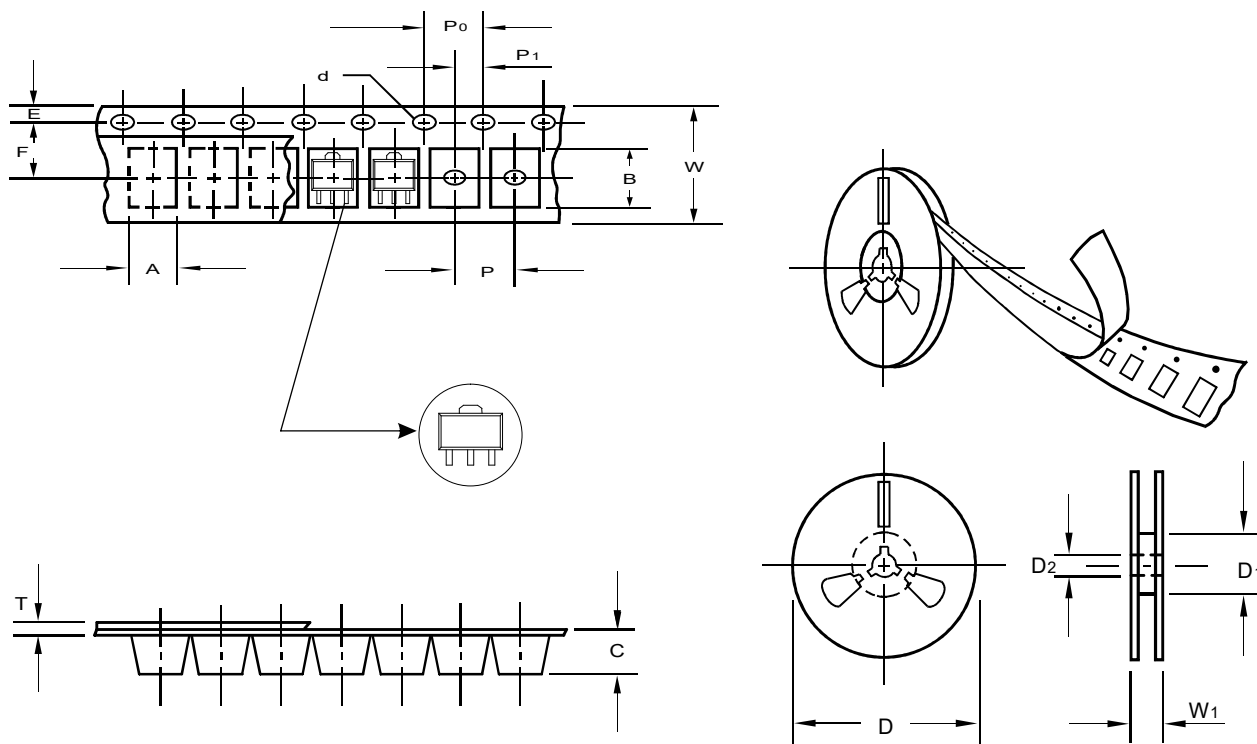


Note :

1. Controlling dimension : in millimeters.
2. General tolerance :  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.

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## Packing information



unit:mm

| Item                      | Symbol         | Tolerance | SOT-89 |
|---------------------------|----------------|-----------|--------|
| Carrier width             | A              | 0.1       | 4.85   |
| Carrier length            | B              | 0.1       | 4.45   |
| Carrier depth             | C              | 0.1       | 1.85   |
| Sprocket hole             | d              | 0.1       | 1.50   |
| 13" Reel outside diameter | D              | 2.0       | -      |
| 13" Reel inner diameter   | D <sub>1</sub> | min       | -      |
| 7" Reel outside diameter  | D              | 1.0       | 180.00 |
| 7" Reel inner diameter    | D <sub>1</sub> | 1.5       | 60.00  |
| Feed hole diameter        | D <sub>2</sub> | 0.2       | 13.00  |
| Sprocket hole position    | E              | 0.1       | 1.75   |
| Punch hole position       | F              | 0.1       | 5.50   |
| Punch hole pitch          | P              | 0.1       | 8.00   |
| Sprocket hole pitch       | P <sub>0</sub> | 0.1       | 4.00   |
| Embossment center         | P <sub>1</sub> | 0.1       | 2.00   |
| Overall tape thickness    | T              | 0.01      | 0.292  |
| Tape width                | W              | 0.1       | 12.00  |
| Reel width                | W <sub>1</sub> | 0.2       | 16.50  |

Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

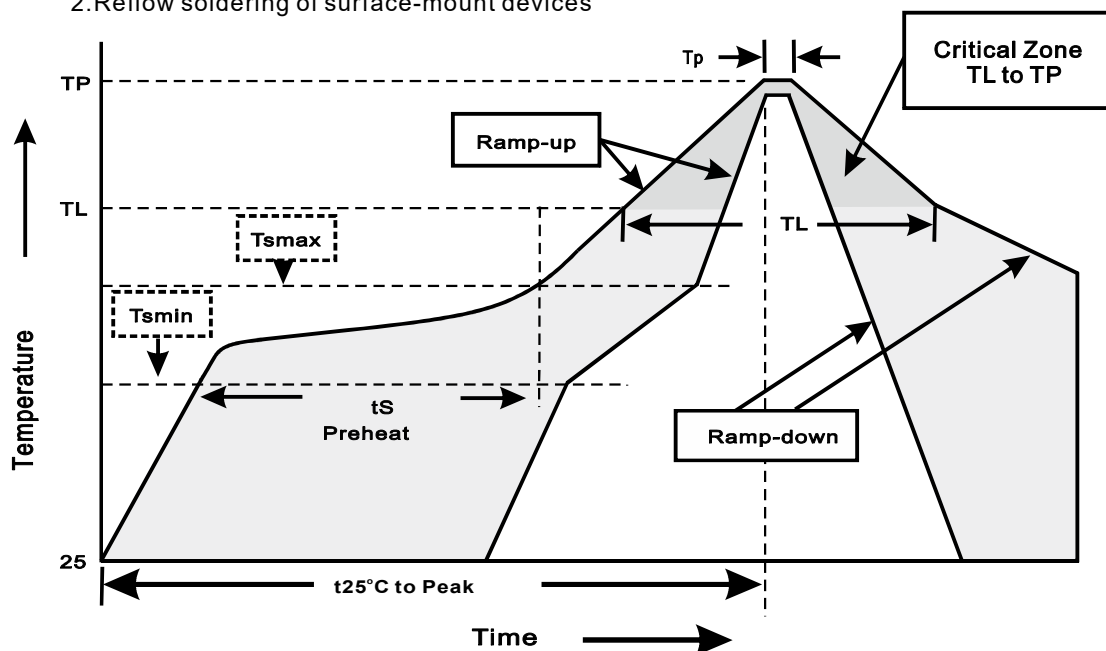
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## Reel packing

| PACKAGE | REEL SIZE | REEL (pcs) | COMPONENT SPACING (m/m) | BOX (pcs) | INNER BOX (m/m) | REEL DIA, (m/m) | CARTON SIZE (m/m) | CARTON (pcs) | APPROX. GROSS WEIGHT (kg) |
|---------|-----------|------------|-------------------------|-----------|-----------------|-----------------|-------------------|--------------|---------------------------|
| SOT-89  | 7"        | 1,000      | 8.0                     | 10,000    | 183*123*183     | 178             | 382*257*387       | 80,000       | 18.5                      |

## Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%
- 2.Reflow soldering of surface-mount devices



- 3.Reflow soldering

| Profile Feature                                                                                                               | Soldering Condition         |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Average ramp-up rate(T <sub>L</sub> to T <sub>P</sub> )                                                                       | <3°C/sec                    |
| Preheat<br>-Temperature Min(T <sub>smin</sub> )<br>-Temperature Max(T <sub>smax</sub> )<br>-Time(min to max)(t <sub>s</sub> ) | 150°C<br>200°C<br>60~120sec |
| T <sub>smax</sub> to T <sub>L</sub><br>-Ramp-upRate                                                                           | <3°C/sec                    |
| Time maintained above:<br>-Temperature(T <sub>L</sub> )<br>-Time(t <sub>L</sub> )                                             | 217°C<br>60~260sec          |
| Peak Temperature(T <sub>P</sub> )                                                                                             | 255°C-0/+5°C                |
| Time within 5°C of actual Peak Temperature(t <sub>P</sub> )                                                                   | 10~30sec                    |
| Ramp-down Rate                                                                                                                | <6°C/sec                    |
| Time 25°C to Peak Temperature                                                                                                 | <6minutes                   |