

# FMPBSS5160-Q1

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# FMPBSS5160-Q1

**-1.0A -60V Transistor PNP Silicon**

## Features

- Low  $V_{CE(sat)}$ , high current.
- Qualified to AEC-Q101 standards for high reliability.
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates Halogen free parts, ex. FMPBSS5160-Q1-H.

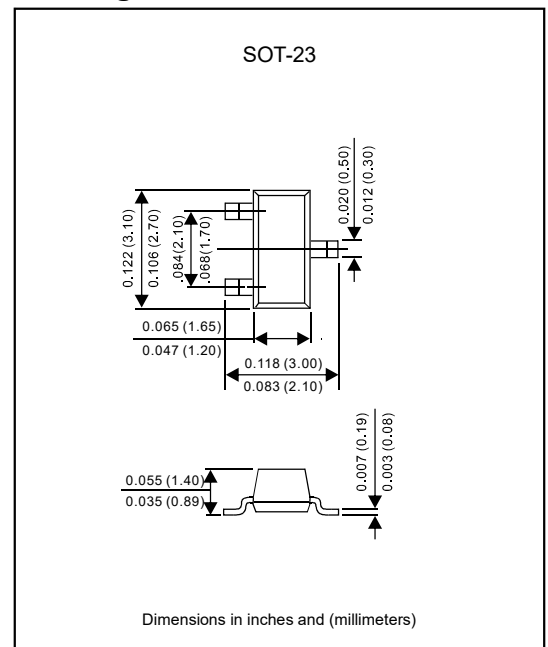
## Applications

- General purpose switching and muting.
- LCD back-lighting.
- Supply line switching circuits.

## Mechanical data

- Epoxy: UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-23.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.
- Mounting Position : Any.

## Package outline



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

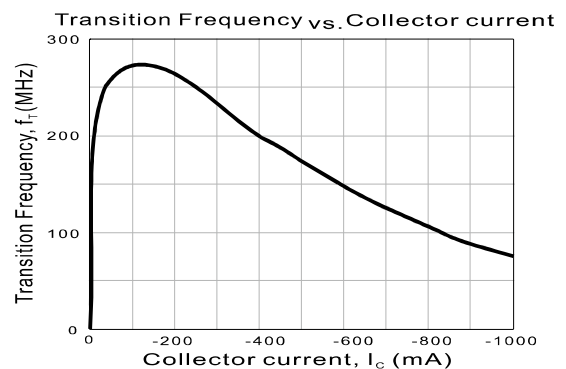
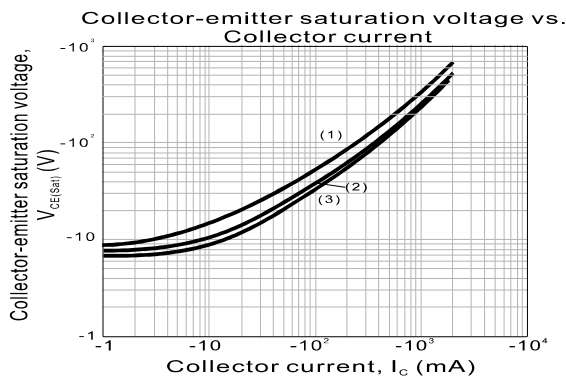
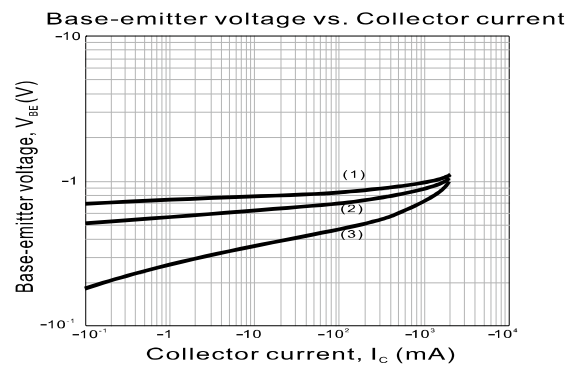
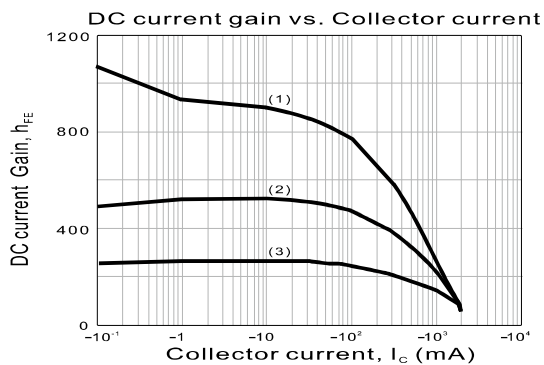
| Parameter                    | Symbol     | Ratings     | Unit             |
|------------------------------|------------|-------------|------------------|
| Collector to base voltage    | $-V_{CBO}$ | 80          | V                |
| Collector to Emitter Voltage | $-V_{CEO}$ | 60          | V                |
| Emitter to base voltage      | $-V_{EBO}$ | 5           | V                |
| Collector current            | $-I_C$     | 1           | A                |
| Peak collector current       | $-I_{CM}$  | 2           | A                |
| Base current                 | $-I_B$     | 0.3         | A                |
| Peak base current            | $-I_{BM}$  | 1           | A                |
| Collector power dissipation  | $P_C$      | 400         | mW               |
| Junction temperature         | $T_J$      | +150        | $^\circ\text{C}$ |
| Storage temperature range    | $T_{STG}$  | -55 to +150 | $^\circ\text{C}$ |

## FMPBSS5160-Q1

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

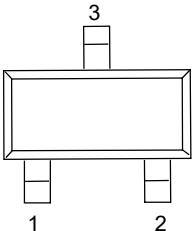
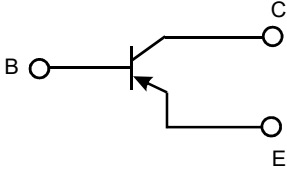
| Parameter                            | Conditions                                                     | Symbol            | Min | Typ  | Max | Unit          |
|--------------------------------------|----------------------------------------------------------------|-------------------|-----|------|-----|---------------|
| Collector-base cut off current       | $-V_{CB} = 60\text{V}, I_E = 0\text{A}$                        | $-I_{CBO}$        |     |      | 0.1 | $\mu\text{A}$ |
|                                      | $-V_{CB} = 60\text{V}, I_E = 0\text{A}, T_J=150^\circ\text{C}$ |                   |     |      | 50  |               |
| Collector-emitter cut off current    | $-V_{CE} = 60\text{V}, V_{BE} = 0\text{V}$                     | $-I_{CEO}$        |     |      | 0.1 | $\mu\text{A}$ |
| Emitter-base cut off current         | $-V_{EB} = 5\text{V}, I_C = 0\text{A}$                         | $-I_{EBO}$        |     |      | 0.1 | $\mu\text{A}$ |
| Collector-emitter saturation voltage | $-I_C = 100\text{mA}, -I_B = 1.0\text{mA}$                     | $-V_{CE(sat)(1)}$ |     | 110  | 160 | mV            |
|                                      | $-I_C = 500\text{mA}, -I_B = 50\text{mA}$                      | $-V_{CE(sat)(2)}$ |     | 120  | 175 |               |
|                                      | $-I_C = 1\text{A}, -I_B = 100\text{mA}$                        | $-V_{CE(sat)(3)}$ |     | 220  | 330 |               |
| Base-emitter voltage                 | $-V_{CE} = 5\text{V}, -I_C = 1\text{A}$                        | $-V_{BE}$         |     | 0.82 | 0.9 | V             |
| Base-emitter saturation voltage      | $-I_C = 1\text{A}, -I_B = 50\text{mA}$                         | $-V_{BE(sat)}$    |     | 0.95 | 1.1 | V             |
| DC current gain                      | $-V_{CE}=5\text{V}, -I_C=500\text{mA}$                         | $h_{FE(1)}$       | 150 | 250  |     |               |
|                                      | $-V_{CE}=5\text{V}, -I_C=1\text{mA}$                           | $h_{FE(2)}$       | 200 | 350  |     |               |
|                                      | $-V_{CE}=5\text{V}, -I_C=1\text{A}$                            | $h_{FE(3)}$       | 100 | 160  |     |               |
| Transition Frequency                 | $-V_{CE}=10\text{V}, -I_C=50\text{mA}, f=100\text{MHz}$        | $f_T$             | 150 | 220  |     | MHz           |
| Output capacitance                   | $-V_{CB}=10\text{V}, I_E=0\text{A}, f=1.0\text{MHz}$           | $C_C$             |     | 9    | 15  | pF            |

## Rating and characteristic curves



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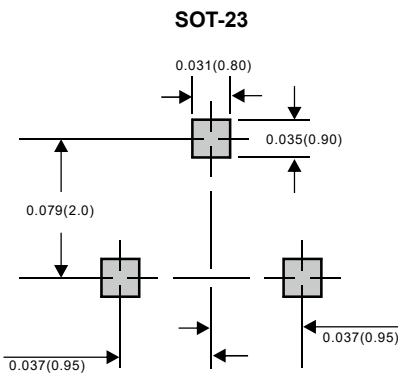
Pinning information

| Pin                                            | Simplified outline                                                                | Symbol                                                                              |
|------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Pin 1 Base<br>Pin 2 Emitter<br>Pin 3 Collector |  |  |

Marking and  $h_{FE}$  range

| Type number   | Marking code | DC current gain range ( $h_{FE}$ ) |
|---------------|--------------|------------------------------------|
| FMPBSS5160-Q1 | HU6          | >150                               |

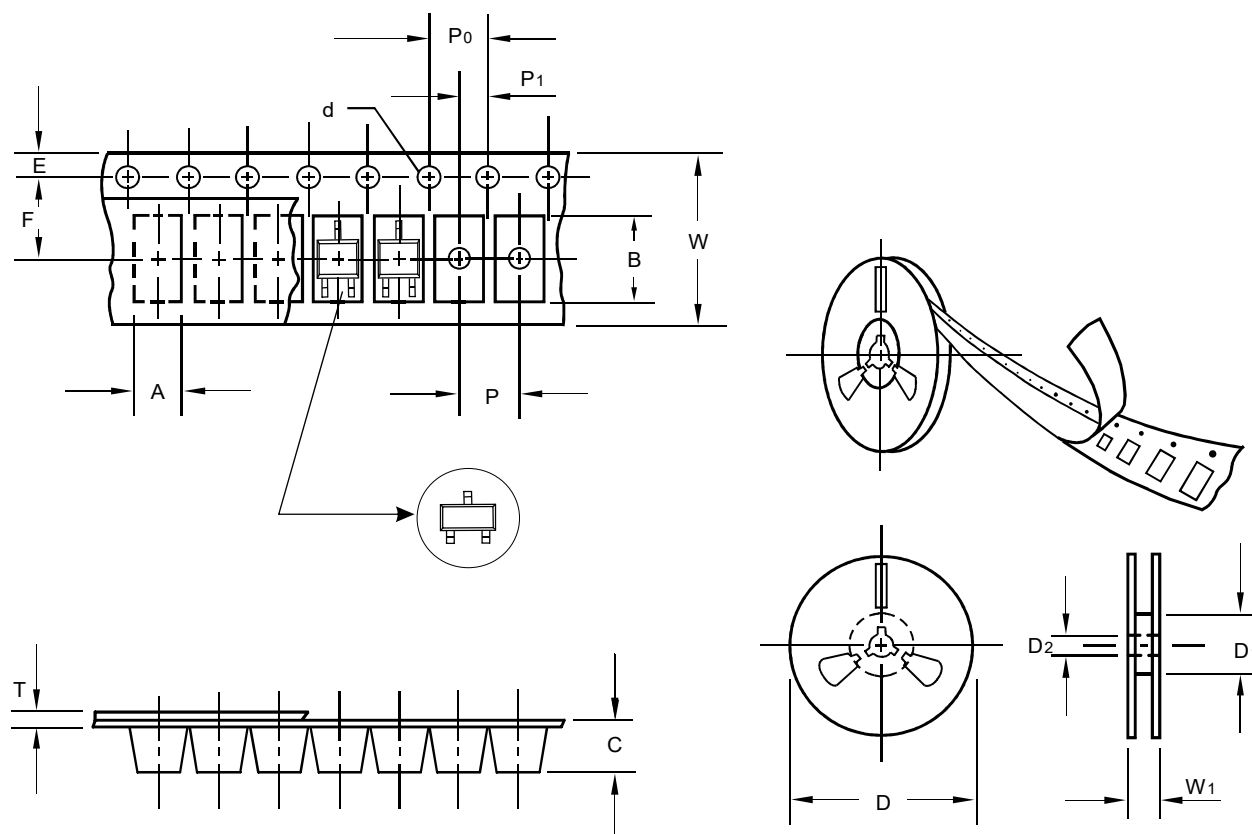
Suggested solder pad layout



Dimensions in inches and (millimeters)

## FMPBSS5160-Q1

## Packing information



unit:mm

| Item                      | Symbol | Tolerance | SOT-23 |
|---------------------------|--------|-----------|--------|
| Carrier width             | A      | 0.3       | 3.30   |
| Carrier length            | B      | 0.3       | 3.20   |
| Carrier depth             | C      | 0.3       | 1.50   |
| Sprocket hole             | d      | 0.1       | 1.50   |
| 13" Reel outside diameter | D      | 2.0       | -      |
| 13" Reel inner diameter   | D1     | min       | -      |
| 7" Reel outside diameter  | D      | 2.0       | 178.00 |
| 7" Reel inner diameter    | D1     | min       | 54.40  |
| Feed hole diameter        | D2     | 0.5       | 13.00  |
| Sprocket hole position    | E      | 0.1       | 1.75   |
| Punch hole position       | F      | 0.1       | 3.50   |
| Punch hole pitch          | P      | 0.1       | 4.00   |
| Sprocket hole pitch       | P0     | 0.1       | 4.00   |
| Embossment center         | P1     | 0.1       | 2.00   |
| Overall tape thickness    | T      | 0.1       | 0.23   |
| Tape width                | W      | 0.3       | 8.00   |
| Reel width                | W1     | 1.0       | 12.0   |

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

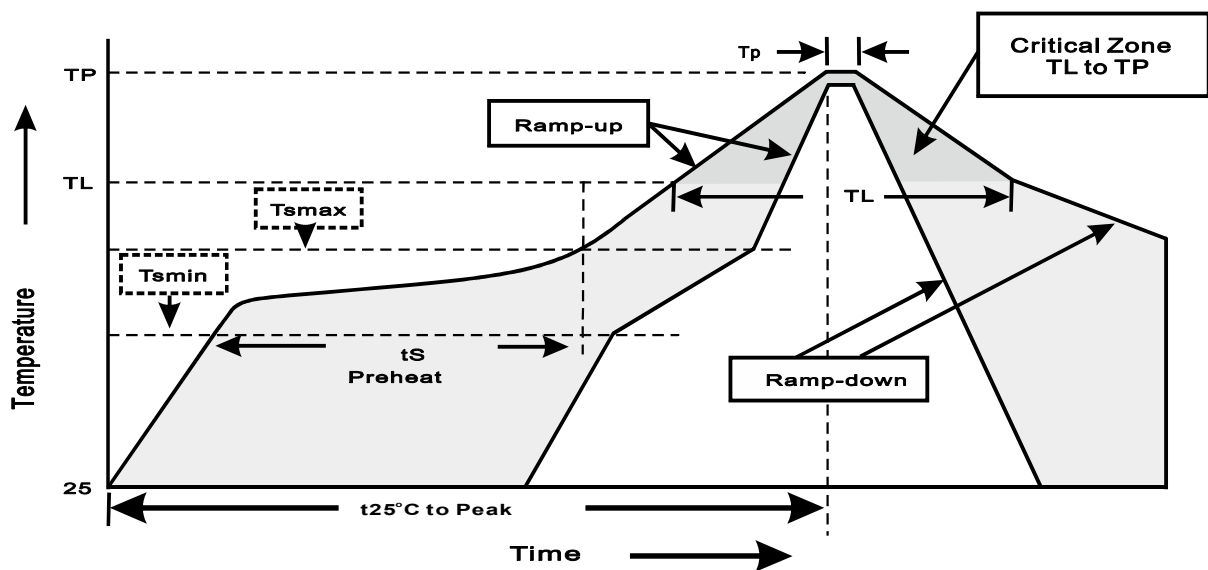
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## Reel packing

| 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) |
|---------|-----------|------------|-------------------------|-----------|-----------------|-----------------|-------------------|--------------|
| SOT-23  | 7"        | 3,000      | 4.0                     | 30,000    | 183*123*183     | 178             | 382*257*387       | 240,000      |

## 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( $T_L$ to $T_P$ )                                                                       | $<3^{\circ}\text{C}/\text{sec}$ |
| Preheat<br>- Temperature Min( $T_{smin}$ )<br>- Temperature Max( $T_{smax}$ )<br>- Time(min to max)( $t_s$ ) | 150°C<br>200°C<br>60~120sec     |
| $T_{smax}$ to $T_L$<br>- Ramp-upRate                                                                         | $<3^{\circ}\text{C}/\text{sec}$ |
| Time maintained above:<br>- Temperature( $T_L$ )<br>- Time( $t_L$ )                                          | 217°C<br>60~260sec              |
| Peak Temperature( $T_P$ )                                                                                    | 255°C-0/+5°C                    |
| Time within 5°C of actual Peak Temperature( $t_p$ )                                                          | 10~30sec                        |
| Ramp-down Rate                                                                                               | $<6^{\circ}\text{C}/\text{sec}$ |
| Time 25°C to Peak Temperature                                                                                | $<6\text{minutes}$              |

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## High reliability test capabilities

| Item Test                                       | Conditions                                                                               | Reference                     |
|-------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------|
| 1. MSL Preconditioning                          | 24hr bake@125°C+168hrs@85°C<br>/85%RH+3xIR@260°C+1flux<br>immersion+alcohol+DI H2O rinse | JESD22-A113                   |
| 2. Intermittent Operating Life                  | Ta=25°C, $\Delta T_j \geq 100^\circ\text{C}$ On/Off=2min Test Duration:1000hrs           | MIL-STD-750E<br>METHOD 1037   |
| 3. High Temperature Reverse Bias                | VCE=80%BVCEO (Tj=Tj max.) Test Duration:1000hrs                                          | JESD22-A108                   |
| 4. High Temperature Storage Life                | Ta=150°C Test Duration:1000hrs                                                           | JESD22 A-103                  |
| 5. Temperature Cycle                            | -55°C(15min) to 150°C(15min) Test Cycles:1000cycles                                      | JESD22 A-104                  |
| 6. Autoclave                                    | P=2atm Ta=121°C RH=100% Test Duration:96hrs                                              | JESD22 A-102                  |
| 7. Solderability                                | 245±5°C for 5sec                                                                         | J-STD-002                     |
| 8. Moisture Resistance                          |                                                                                          | MIL-STD-750E<br>METHOD 1021.2 |
| 9. Resistance To Solder Heat                    | Ta=85°C/85%Relative humidity Test Duration:1000hrs                                       | JESD22 B-106                  |
| 10. High Temperature High Humidity Reverse Bias | 260±5°C for 10sec                                                                        | JESD22-A101                   |
|                                                 | Ta=85°C, 85%RH, VCE=80%BVCEO Test<br>Duration: 1000hrs                                   |                               |