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# EMF5XV6T5

Preferred Devices

## Power Management, Dual Transistors

### NPN Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

#### Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- These are Pb-Free Devices

#### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--------|--------|-------|------|
|--------|--------|-------|------|

**Q<sub>1</sub>** (T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>)

|                           |                  |                           |      |
|---------------------------|------------------|---------------------------|------|
| Collector-Base Voltage    | V <sub>CB0</sub> | 50                        | Vdc  |
| Collector-Emitter Voltage | V <sub>CEO</sub> | 50                        | Vdc  |
| Collector Current         | I <sub>C</sub>   | 100                       | mAdc |
| Electrostatic Discharge   | ESD              | HBM Class 1<br>MM Class B |      |

**Q<sub>2</sub>** (T<sub>A</sub> = 25°C)

|  |                  |                            |     |
|--|------------------|----------------------------|-----|
| Collector-Emitter Voltage                | V <sub>CEO</sub> | -12                        | Vdc |
| Collector-Base Voltage                   | V <sub>CB0</sub> | -15                        | Vdc |
| Emitter-Base Voltage                     | V <sub>EBO</sub> | -6.0                       | Vdc |
| Collector Current – Peak<br>– Continuous | I <sub>C</sub>   | -1.0 (Note 1)<br>-0.5      | Adc |
| Electrostatic Discharge                  | ESD              | HBM Class 3B<br>MM Class C |     |

#### THERMAL CHARACTERISTICS

| Characteristic<br>(One Junction Heated)                                | Symbol                            | Max                          | Unit        |
|--|-----------------------------------|------------------------------|-------------|
| Total Device Dissipation<br>T <sub>A</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>                    | 357 (Note 2)<br>2.9 (Note 2) | mW<br>mW/°C |
| Thermal Resistance,<br>Junction-to-Ambient                             | R <sub>θJA</sub>                  | 350 (Note 2)                 | °C/W        |
| Characteristic<br>(Both Junctions Heated)                              | Symbol                            | Max                          | Unit        |
| Total Device Dissipation<br>T <sub>A</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>                    | 500 (Note 2)<br>4.0 (Note 2) | mW<br>mW/°C |
| Thermal Resistance,<br>Junction-to-Ambient                             | R <sub>θJA</sub>                  | 250 (Note 2)                 | °C/W        |
| Junction and Storage<br>Temperature Range                              | T <sub>J</sub> , T <sub>stg</sub> | -55 to +150                  | °C          |

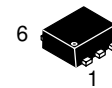
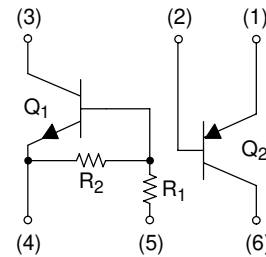
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Single pulse 1.0 ms.
2. FR-4 @ Minimum Pad.



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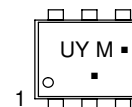


6

1

SOT-563  
CASE 463A  
PLASTIC

#### MARKING DIAGRAM



1

UY = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

| Device     | Package              | Shipping†        |
|------------|----------------------|------------------|
| EMF5XV6T5  | SOT-563<br>(Pb-Free) | 8000/Tape & Reel |
| EMF5XV6T5G | SOT-563<br>(Pb-Free) | 8000/Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

Preferred devices are recommended choices for future use and best overall value.

# EMF5XV6T5

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted, common for $Q_1$ and $Q_2$ )

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### $Q_1$

#### OFF CHARACTERISTICS

|   |               |    |   |     |      |
|---|---------------|----|---|-----|------|
| Collector-Base Cutoff Current ( $V_{CB} = 50\text{ V}, I_E = 0$ )               | $I_{CBO}$     | -  | - | 100 | nAdc |
| Collector-Emitter Cutoff Current ( $V_{CE} = 50\text{ V}, I_B = 0$ )            | $I_{CEO}$     | -  | - | 500 | nAdc |
| Emitter-Base Cutoff Current ( $V_{EB} = 6.0\text{ V}, I_C = 0$ )                | $I_{EBO}$     | -  | - | 0.1 | mAdc |
| Collector-Base Breakdown Voltage ( $I_C = 10\ \mu\text{A}, I_E = 0$ )           | $V_{(BR)CBO}$ | 50 | - | -   | Vdc  |
| Collector-Emitter Breakdown Voltage (Note 3) ( $I_C = 2.0\text{ mA}, I_B = 0$ ) | $V_{(BR)CEO}$ | 50 | - | -   | Vdc  |

#### ON CHARACTERISTICS (Note 3)

|  |               |      |     |      |            |
|--|---------------|------|-----|------|------------|
| DC Current Gain ( $V_{CE} = 10\text{ V}, I_C = 5.0\text{ mA}$ )                                | $h_{FE}$      | 80   | 140 | -    |            |
| Collector-Emitter Saturation Voltage ( $I_C = 10\text{ mA}, I_B = 0.3\text{ mA}$ )             | $V_{CE(sat)}$ | -    | -   | 0.25 | Vdc        |
| Output Voltage (on) ( $V_{CC} = 5.0\text{ V}, V_B = 3.5\text{ V}, R_L = 1.0\text{ k}\Omega$ )  | $V_{OL}$      | -    | -   | 0.2  | Vdc        |
| Output Voltage (off) ( $V_{CC} = 5.0\text{ V}, V_B = 0.5\text{ V}, R_L = 1.0\text{ k}\Omega$ ) | $V_{OH}$      | 4.9  | -   | -    | Vdc        |
| Input Resistor   | R1            | 32.9 | 47  | 61.1 | k $\Omega$ |
| Resistor Ratio   | R1/R2         | 0.8  | 1.0 | 1.2  |            |

### $Q_2$

#### OFF CHARACTERISTICS

|  |               |      |   |      |                 |
|--|---------------|------|---|------|-----------------|
| Collector-Emitter Breakdown Voltage ( $I_C = -10\text{ mAdc}, I_B = 0$ ) | $V_{(BR)CEO}$ | -12  | - | -    | Vdc             |
| Collector-Base Breakdown Voltage ( $I_C = -0.1\text{ mAdc}, I_E = 0$ )   | $V_{(BR)CBO}$ | -15  | - | -    | Vdc             |
| Emitter-Base Breakdown Voltage ( $I_E = -0.1\text{ mAdc}, I_C = 0$ )     | $V_{(BR)EBO}$ | -6.0 | - | -    | Vdc             |
| Collector Cutoff Current ( $V_{CB} = -15\text{ Vdc}, I_E = 0$ )          | $I_{CBO}$     | -    | - | -0.1 | $\mu\text{Adc}$ |
| Emitter Cutoff Current ( $V_{EB} = -6.0\text{ Vdc}$ )                    | $I_{EBO}$     | -    | - | -0.1 | $\mu\text{Adc}$ |

#### ON CHARACTERISTICS

|   |               |     |       |        |    |
|---|---------------|-----|-------|--------|----|
| DC Current Gain (Note 4) ( $I_C = -10\text{ mA}, V_{CE} = -2.0\text{ V}$ )                    | $h_{FE}$      | 270 | -     | 680    |    |
| Collector-Emitter Saturation Voltage (Note 4) ( $I_C = -200\text{ mA}, I_B = -10\text{ mA}$ ) | $V_{CE(sat)}$ | -   | -     | -250   | mV |
| Base-Emitter Saturation Voltage (Note 4) ( $I_C = -150\text{ mA}, I_B = -20\text{ mA}$ )      | $V_{BE(sat)}$ | -   | -0.81 | -0.90  | V  |
| Base-Emitter Turn-on Voltage (Note 4) ( $I_C = -150\text{ mA}, V_{CE} = -3.0\text{ V}$ )      | $V_{BE(on)}$  | -   | -0.81 | -0.875 | V  |
| Input Capacitance ( $V_{EB} = 0\text{ V}, f = 1.0\text{ MHz}$ )                               | $C_{ibo}$     | -   | 52    | -      | pF |
| Output Capacitance ( $V_{CB} = 0\text{ V}, f = 1.0\text{ MHz}$ )                              | $C_{obo}$     | -   | 30    | -      | pF |
| Turn-On Time ( $I_{B1} = -50\text{ mA}, I_C = -500\text{ mA}, R_L = 3.0\ \Omega$ )            | $t_{on}$      | -   | 50    | -      | ns |
| Turn-Off Time ( $I_{B1} = I_{B2} = -50\text{ mA}, I_C = -500\text{ mA}, R_L = 3.0\ \Omega$ )  | $t_{off}$     | -   | 80    | -      | ns |

- Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty Cycle < 2.0%.
- Pulsed Condition: Pulse Width = 300  $\mu\text{sec}$ , Duty Cycle  $\leq$  2%.

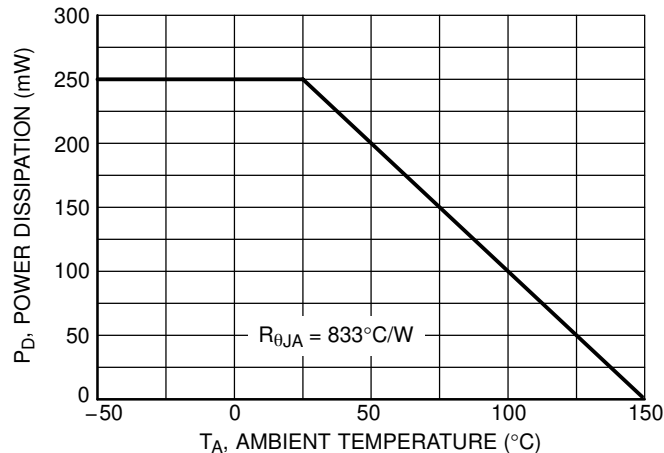


Figure 1. Derating Curve

# EMF5XV6T5

## TYPICAL ELECTRICAL CHARACTERISTICS FOR Q1

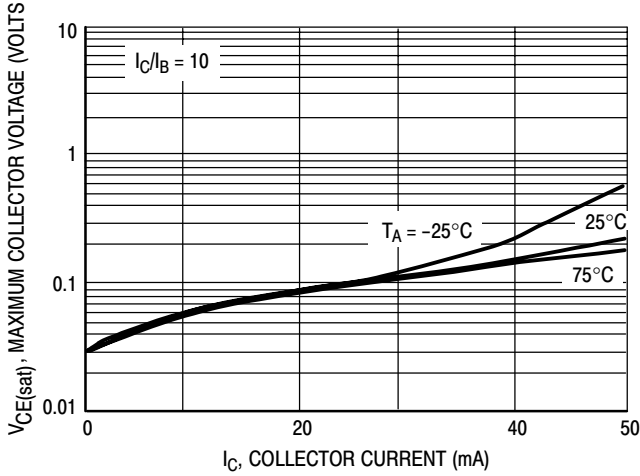


Figure 2.  $V_{CE(sat)}$  versus  $I_C$

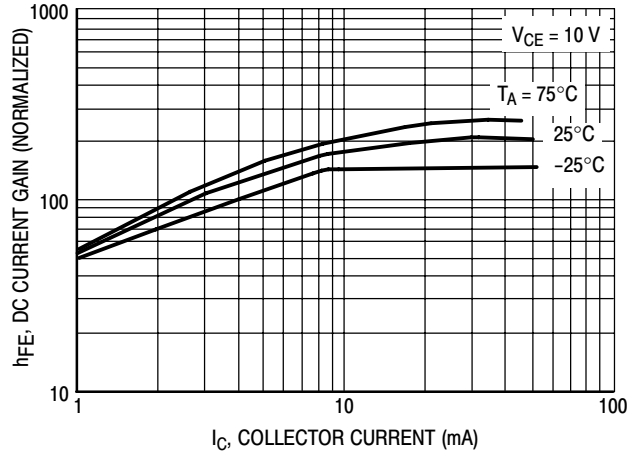


Figure 3. DC Current Gain

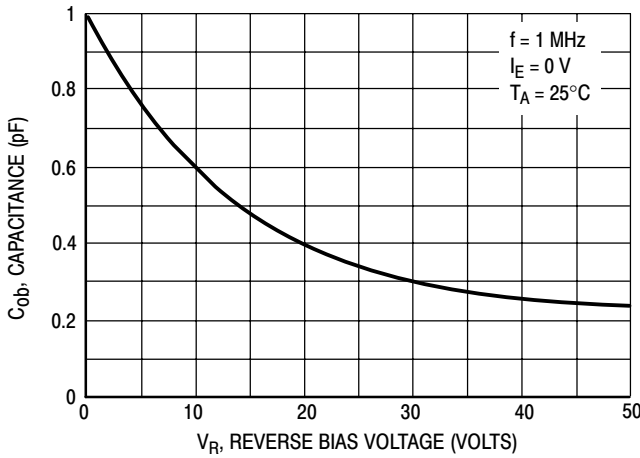


Figure 4. Output Capacitance

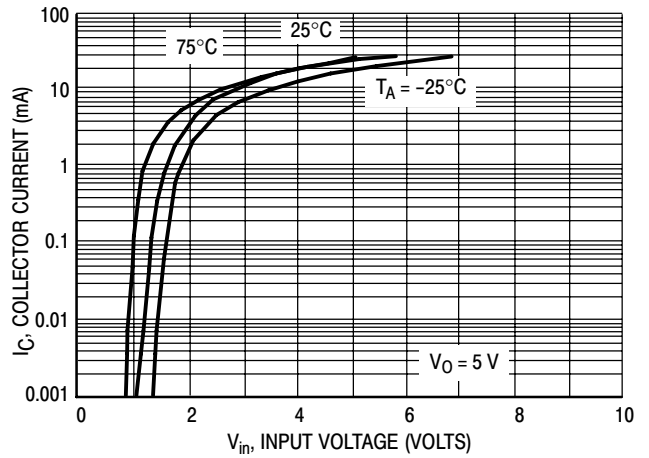


Figure 5. Output Current versus Input Voltage

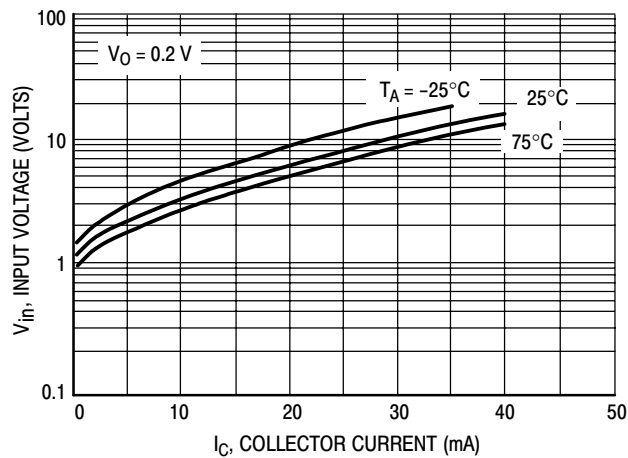


Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS FOR Q2

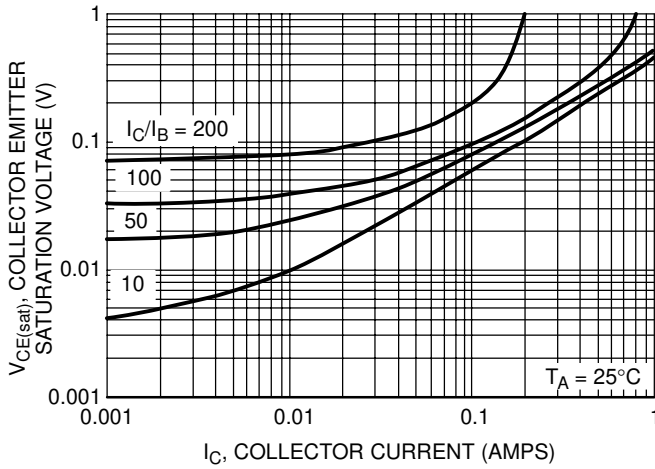


Figure 7. Collector Emitter Saturation Voltage vs. Collector Current

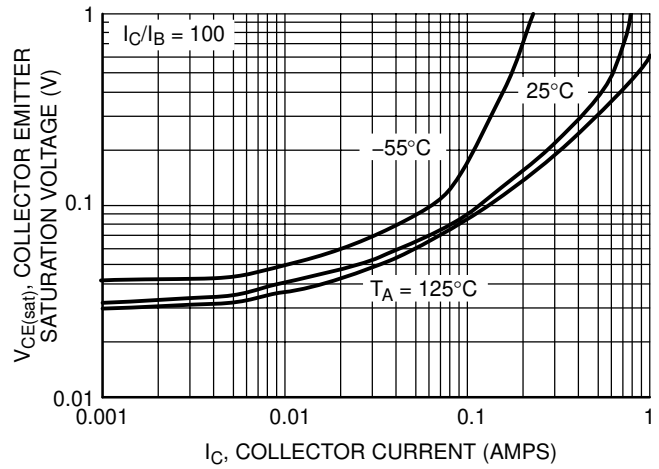


Figure 8. Collector Emitter Saturation Voltage vs. Collector Current

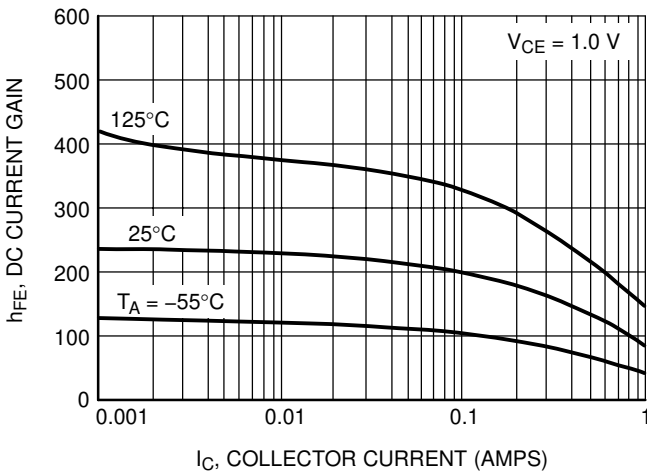


Figure 9. DC Current Gain

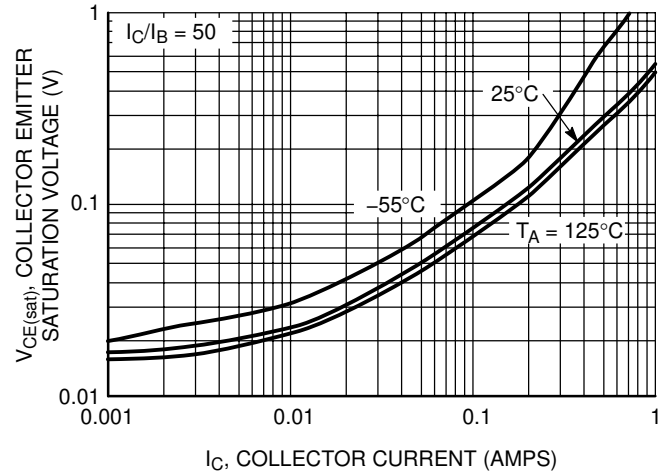


Figure 10. Collector Emitter Saturation Voltage vs. Collector Current

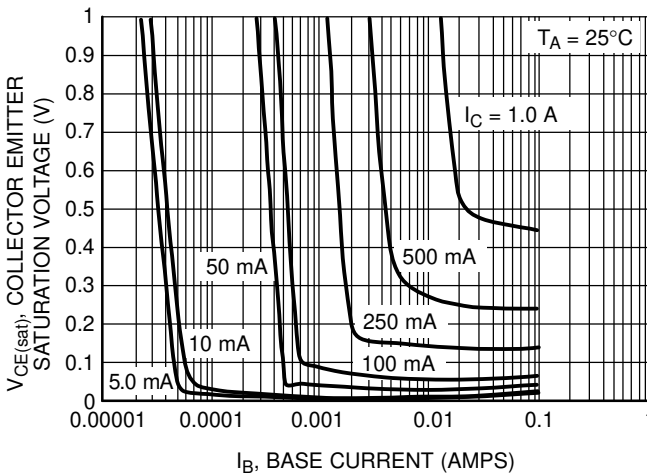


Figure 11. Collector Emitter Saturation Voltage vs Base Current

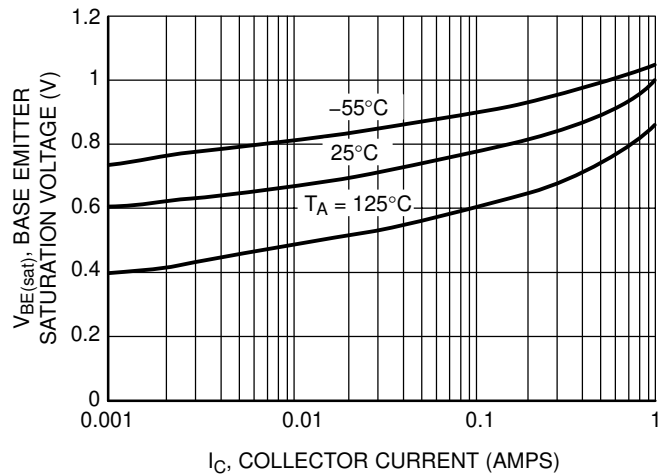
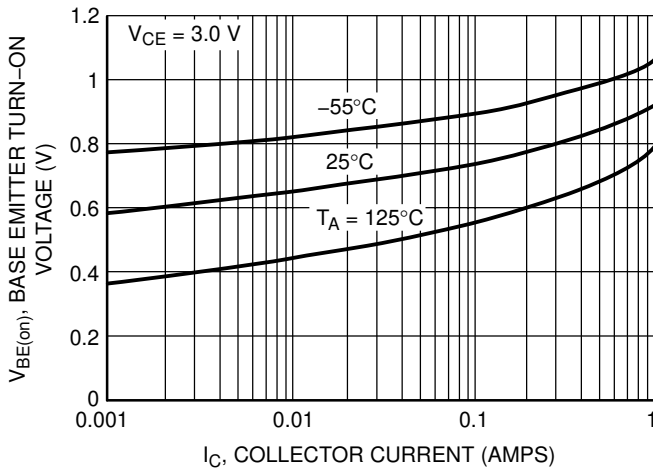
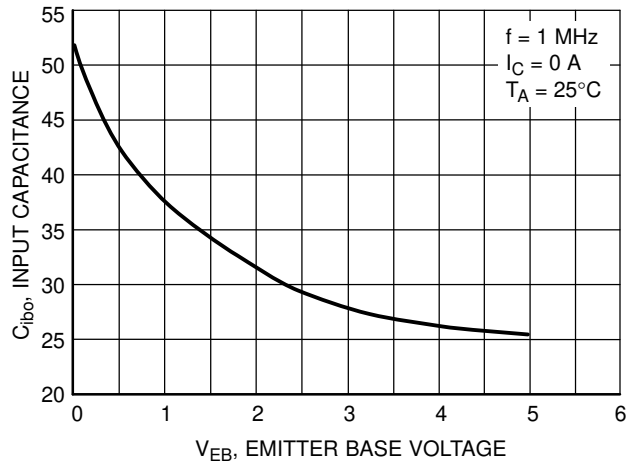


Figure 12. Base Emitter Saturation Voltage vs. Collector Current

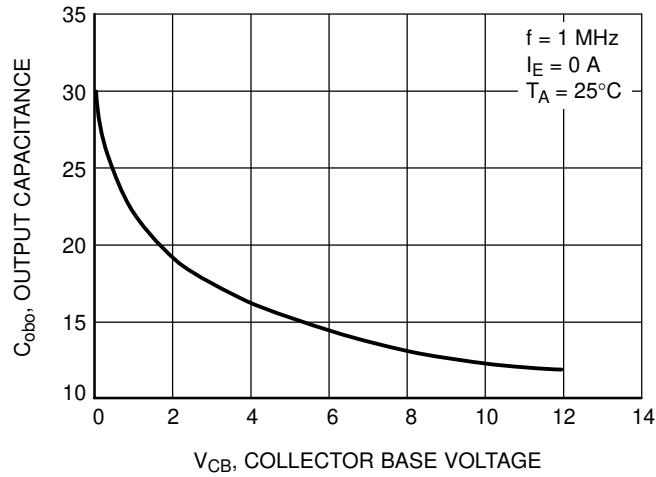
# EMF5XV6T5



**Figure 13. Base Emitter Turn-On Voltage vs. Collector Current**



**Figure 14. Input Capacitance**

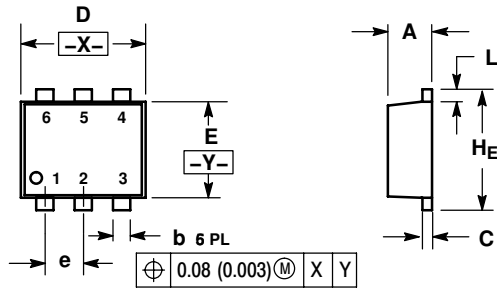


**Figure 15. Output Capacitance**

# EMF5XV6T5

## PACKAGE DIMENSIONS

SOT-563, 6 LEAD  
CASE 463A-01  
ISSUE F

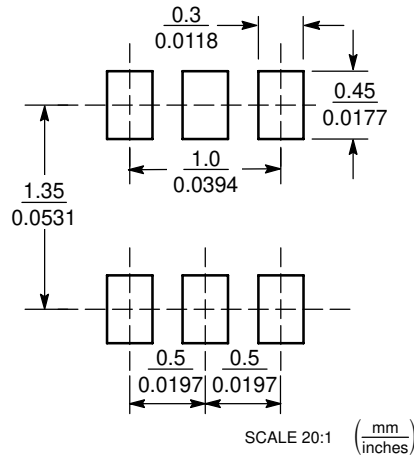


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

| DIM            | MILLIMETERS |      |      | INCHES   |       |       |
|----------------|-------------|------|------|----------|-------|-------|
|                | MIN         | NOM  | MAX  | MIN      | NOM   | MAX   |
| A              | 0.50        | 0.55 | 0.60 | 0.020    | 0.021 | 0.023 |
| b              | 0.17        | 0.22 | 0.27 | 0.007    | 0.009 | 0.011 |
| C              | 0.08        | 0.12 | 0.18 | 0.003    | 0.005 | 0.007 |
| D              | 1.50        | 1.60 | 1.70 | 0.059    | 0.062 | 0.066 |
| E              | 1.10        | 1.20 | 1.30 | 0.043    | 0.047 | 0.051 |
| e              | 0.5 BSC     |      |      | 0.02 BSC |       |       |
| L              | 0.10        | 0.20 | 0.30 | 0.004    | 0.008 | 0.012 |
| H <sub>E</sub> | 1.50        | 1.60 | 1.70 | 0.059    | 0.062 | 0.066 |

### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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