



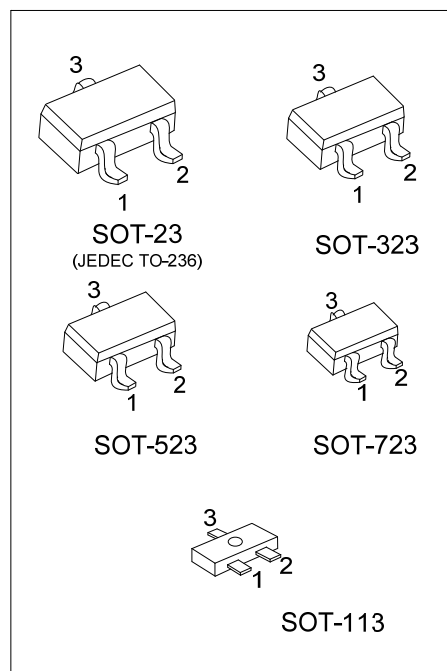
## MMBT1015

## PNP SILICON TRANSISTOR

### LOW FREQUENCY PNP AMPLIFIER TRANSISTOR

#### FEATURES

- \* Collector-Emitter Voltage:  $BV_{CEO} = -50V$
- \* Collector current up to 150mA
- \* High  $h_{FE}$  linearity
- \* Complement to MMBT1815



#### ORDERING INFORMATION

| Ordering Number   |                   | Package | Pin Assignment |   |   | Packing   |
|-------------------|-------------------|---------|----------------|---|---|-----------|
| Lead Free         | Halogen Free      |         | 1              | 2 | 3 |           |
| MMBT1015L-x-AC3-R | MMBT1015G-x-AC3-R | SOT-113 | B              | E | C | Tape Reel |
| MMBT1015L-x-AE3-R | MMBT1015G-x-AE3-R | SOT-23  | B              | E | C | Tape Reel |
| MMBT1015L-x-AL3-R | MMBT1015G-x-AL3-R | SOT-323 | B              | E | C | Tape Reel |
| MMBT1015L-x-AN3-R | MMBT1015G-x-AN3-R | SOT-523 | B              | E | C | Tape Reel |
| MMBT1015L-x-AQ3-R | MMBT1015G-x-AQ3-R | SOT-723 | B              | E | C | Tape Reel |

Note: Pin assignment: B: Base E: Emitter C: Collector

|                                                                                                          |                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>MMBT1015G-x-AC3-R</p> <p>(1) Packing Type<br/>(2) Package Type<br/>(3) Rank<br/>(4) Green Package</p> | <p>(1) R: Tape Reel<br/>(2) AC3: SOT-113, AE3: SOT-23, AL3: SOT-323, AN3: SOT-523, AQ3: SOT-723, T92: TO-92<br/>(3) x: refer to Classification of <math>h_{FE1}</math><br/>(4) G: Halogen Free and Lead Free, L: Lead Free</p> |
|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### MARKING

| PACKAGE                     | MARKING                                 |                                         |                                         |
|-----------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
|                             | Y                                       | GR                                      | BL                                      |
| SOT-23                      | <p>L: Lead Free<br/>G: Halogen Free</p> | <p>L: Lead Free<br/>G: Halogen Free</p> | <p>L: Lead Free<br/>G: Halogen Free</p> |
| SOT-113 / SOT-323 / SOT-523 | <p>L: Lead Free<br/>G: Halogen Free</p> |                                         |                                         |
| SOT-723                     | <p>L: Lead Free<br/>G: Halogen Free</p> |                                         |                                         |

■ ABSOLUTE MAXIMUM RATING ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER                 |         | SYMBOL    | RATINGS    | UNIT               |
|---------------------------|---------|-----------|------------|--------------------|
| Collector-Base Voltage    |         | $V_{CBO}$ | -50        | V                  |
| Collector-Emitter Voltage |         | $V_{CEO}$ | -50        | V                  |
| Emitter-Base Voltage      |         | $V_{EBO}$ | -5         | V                  |
| Collector Dissipation     | SOT-23  | $P_C$     | 250        | mW                 |
|                           | SOT-523 |           | 200        | mW                 |
|                           | SOT-113 |           |            |                    |
|                           | SOT-323 |           |            |                    |
|                           | SOT-723 |           | 190        | mW                 |
| Collector Current         |         | $I_C$     | -150       | mA                 |
| Base Current              |         | $I_B$     | -50        | mA                 |
| Junction Temperature      |         | $T_J$     | +150       | $^{\circ}\text{C}$ |
| Storage Temperature       |         | $T_{STG}$ | -55 ~ +150 | $^{\circ}\text{C}$ |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

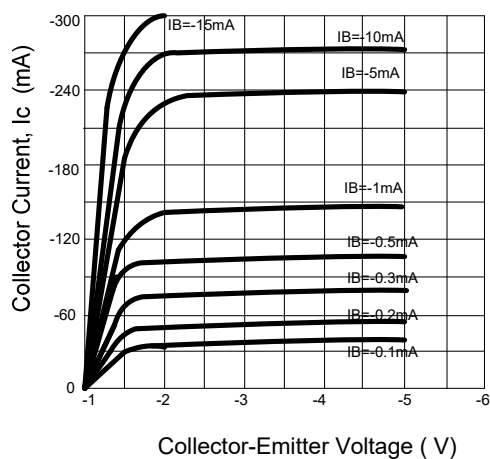
| PARAMETER                            | SYMBOL        | TEST CONDITIONS                                                                               | MIN | TYP  | MAX  | UNIT |
|--------------------------------------|---------------|-----------------------------------------------------------------------------------------------|-----|------|------|------|
| Collector-Base Breakdown Voltage     | $BV_{CBO}$    | $I_C = -100\mu\text{A}$ , $I_E = 0$                                                           | -50 |      |      | V    |
| Collector-Emitter Breakdown Voltage  | $BV_{CEO}$    | $I_C = -10\text{mA}$ , $I_B = 0$                                                              | -50 |      |      | V    |
| Emitter-Base Breakdown Voltage       | $BV_{EBO}$    | $I_E = -10\mu\text{A}$ , $I_C = 0$                                                            | -5  |      |      | V    |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | $I_C = -100\text{mA}$ , $I_B = -10\text{mA}$                                                  |     | -0.1 | -0.3 | V    |
| Base-Emitter Saturation Voltage      | $V_{BE(SAT)}$ | $I_C = -100\text{mA}$ , $I_B = -10\text{mA}$                                                  |     |      | -1.1 | V    |
| Collector Cut-off Current            | $I_{CBO}$     | $V_{CB} = -50\text{V}$ , $I_E = 0$                                                            |     |      | -100 | nA   |
| Emitter Cut-off Current              | $I_{EBO}$     | $V_{EB} = -5\text{V}$ , $I_C = 0$                                                             |     |      | -100 | nA   |
| DC Current Gain                      | $h_{FE1}$     | $V_{CE} = -6\text{V}$ , $I_C = -2\text{mA}$                                                   | 120 |      | 700  |      |
|                                      | $h_{FE2}$     | $V_{CE} = -6\text{V}$ , $I_C = -150\text{mA}$                                                 | 25  |      |      |      |
| Transition Frequency                 | $f_T$         | $V_{CE} = -10\text{V}$ , $I_C = -1\text{mA}$                                                  | 80  |      |      | MHz  |
| Output Capacitance                   | $C_{OB}$      | $V_{CB} = -10\text{V}$ , $I_E = 0$ , $f = 1\text{MHz}$                                        |     | 4.0  | 7.0  | pF   |
| Noise Figure                         | NF            | $I_C = -0.1\text{mA}$ , $V_{CE} = -6\text{V}$<br>$R_G = 1\text{k}\Omega$ , $f = 100\text{Hz}$ |     | 0.5  | 6    | dB   |

■ CLASSIFICATION OF  $h_{FE1}$

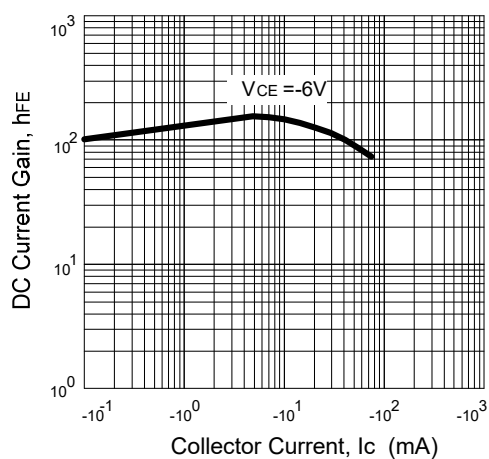
| RANK  | Y       | GR      | BL      |
|-------|---------|---------|---------|
| RANGE | 120-240 | 200-400 | 350-700 |

■ TYPICAL CHARACTERISTICS

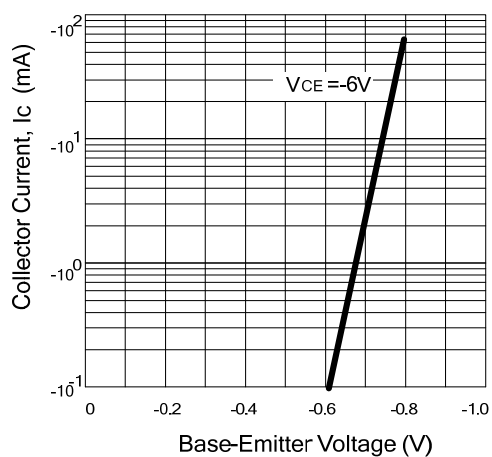
Static Characteristics



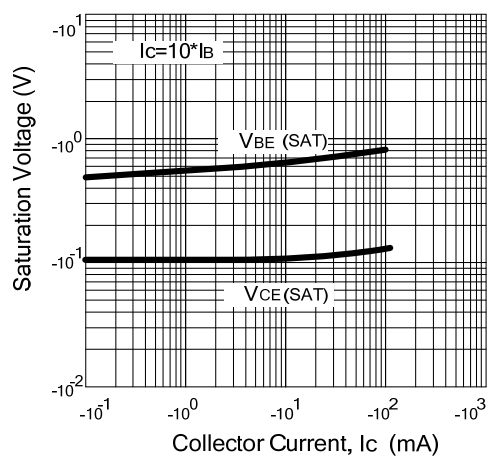
DC Current Gain



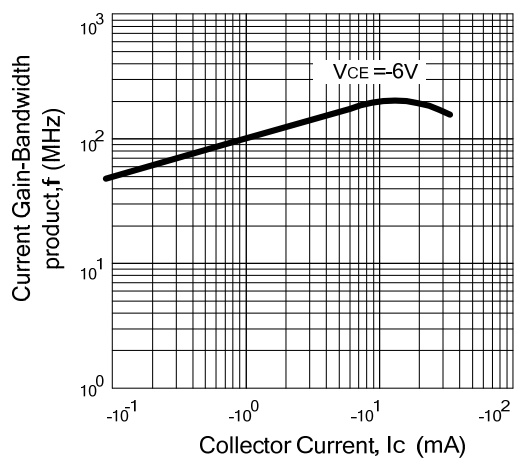
Base-Emitter on Voltage



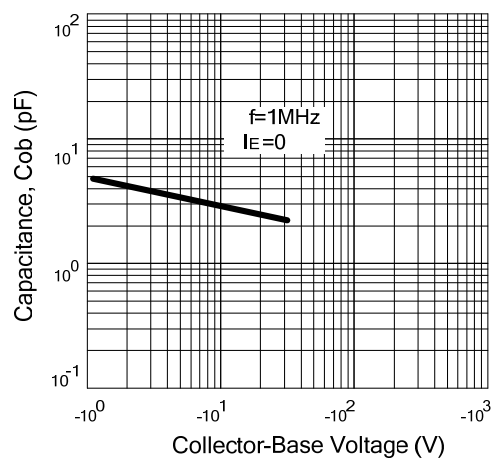
Saturation Voltage



Current Gain-Bandwidth Product



Collector Output Capacitance



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