

MMBT5401LT1G, SMMBT5401LT1G, MMBT5401LT3G



ON Semiconductor®

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High Voltage Transistor

PNP Silicon

Features

- AEC-Q101 Qualified and PPAP Capable
- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS

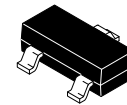
| Rating | Symbol | Value | Unit |
|--------------------------------|-----------|-------|------|
| Collector - Emitter Voltage | V_{CEO} | -150 | Vdc |
| Collector - Base Voltage | V_{CBO} | -160 | Vdc |
| Emitter - Base Voltage | V_{EBO} | -5.0 | Vdc |
| Collector Current - Continuous | I_C | -500 | mAdc |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

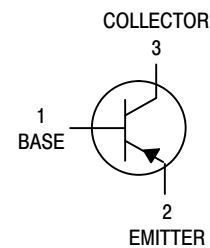
THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|-------------|---------------------------|
| Total Device Dissipation FR-5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate Above 25°C | P_D | 225 | mW |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 556 | $^\circ\text{C}/\text{W}$ |
| Total Device Dissipation Alumina Substrate (Note 2) $T_A = 25^\circ\text{C}$ Derate Above 25°C | P_D | 300 | mW |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 417 | $^\circ\text{C}/\text{W}$ |
| Junction and Storage Temperature | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

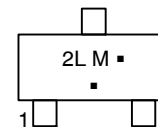
1. FR-5 = $1.0 \times 0.75 \times 0.062$ in.
2. Alumina = $0.4 \times 0.3 \times 0.024$ in 99.5% alumina.



SOT-23 (TO-236)
CASE 318
STYLE 6



MARKING DIAGRAM



2L = Specific Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or overbar may vary depending upon manufacturing location.

ORDERING INFORMATION

| Device | Package | Shipping† |
|---------------|------------------|--------------------|
| MMBT5401LT1G | SOT-23 (Pb-Free) | 3,000 Tape & Reel |
| SMMBT5401LT1G | SOT-23 (Pb-Free) | 3,000 Tape & Reel |
| MMBT5401LT3G | SOT-23 (Pb-Free) | 10,000 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.

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ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

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

OFF CHARACTERISTICS

| | | | | |
|---|----------------------|------|------------|--------------------------------------|
| Collector–Emitter Breakdown Voltage (I _C = -1.0 mA _{dc} , I _B = 0) | V _{(BR)CEO} | -150 | - | V _{dc} |
| Collector–Base Breakdown Voltage (I _C = -100 μA _{dc} , I _E = 0) | V _{(BR)CBO} | -160 | - | V _{dc} |
| Emitter–Base Breakdown Voltage (I _E = -10 μA _{dc} , I _C = 0) | V _{(BR)EBO} | -5.0 | - | V _{dc} |
| Collector–Base Cutoff Current (V _{CB} = -120 V _{dc} , I _E = 0) (V _{CB} = -120 V _{dc} , I _E = 0, T _A = 100°C) | I _{CBO} | - | -50 -50 | nA _{dc} μA _{dc} |

ON CHARACTERISTICS

| | | | | |
|---|----------------------|----------------|---------------|-----------------|
| DC Current Gain (I _C = -1.0 mA _{dc} , V _{CE} = -5.0 V _{dc}) (I _C = -10 mA _{dc} , V _{CE} = -5.0 V _{dc}) (I _C = -50 mA _{dc} , V _{CE} = -5.0 V _{dc}) | h _{FE} | 50 60 50 | - 240 - | - |
| Collector–Emitter Saturation Voltage (I _C = -10 mA _{dc} , I _B = -1.0 mA _{dc}) (I _C = -50 mA _{dc} , I _B = -5.0 mA _{dc}) | V _{CE(sat)} | - - | -0.2 -0.5 | V _{dc} |
| Base–Emitter Saturation Voltage (I _C = -10 mA _{dc} , I _B = -1.0 mA _{dc}) (I _C = -50 mA _{dc} , I _B = -5.0 mA _{dc}) | V _{BE(sat)} | - - | -1.0 -1.0 | V _{dc} |

SMALL-SIGNAL CHARACTERISTICS

| | | | | |
|--|------------------|-----|-----|-----|
| Current–Gain — Bandwidth Product (I _C = -10 mA _{dc} , V _{CE} = -10 V _{dc} , f = 100 MHz) | f _T | 100 | 300 | MHz |
| Output Capacitance (V _{CB} = -10 V _{dc} , I _E = 0, f = 1.0 MHz) | C _{obo} | - | 6.0 | pF |
| Small Signal Current Gain (I _C = -1.0 mA _{dc} , V _{CE} = -10 V _{dc} , f = 1.0 kHz) | h _{fe} | 40 | 200 | - |
| Noise Figure (I _C = -200 μA _{dc} , V _{CE} = -5.0 V _{dc} , R _S = 10 Ω, f = 1.0 kHz) | NF | - | 8.0 | dB |

MMBT5401LT1G, SMMBT5401LT1G, MMBT5401LT3G

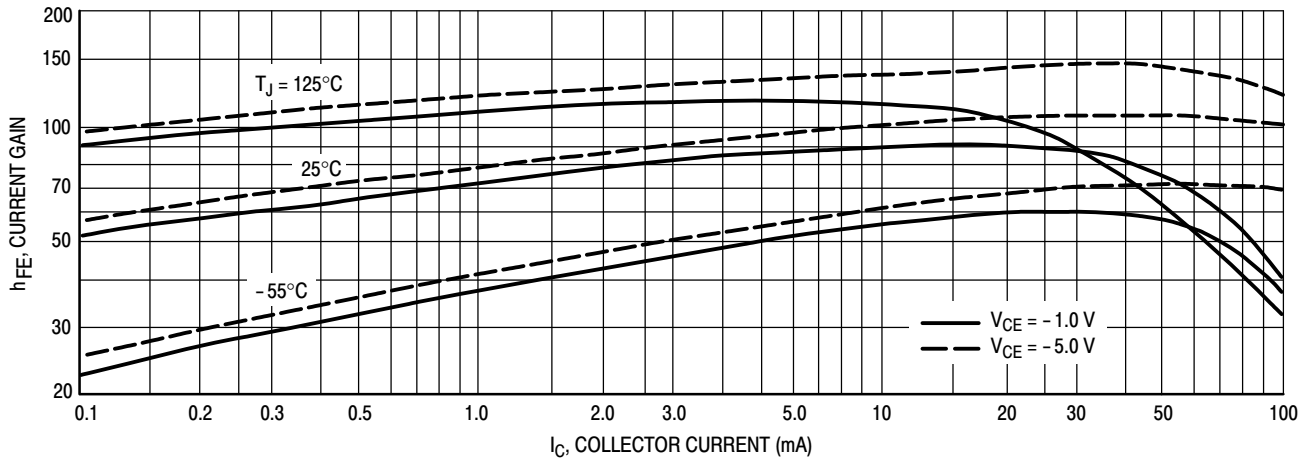


Figure 1. DC Current Gain

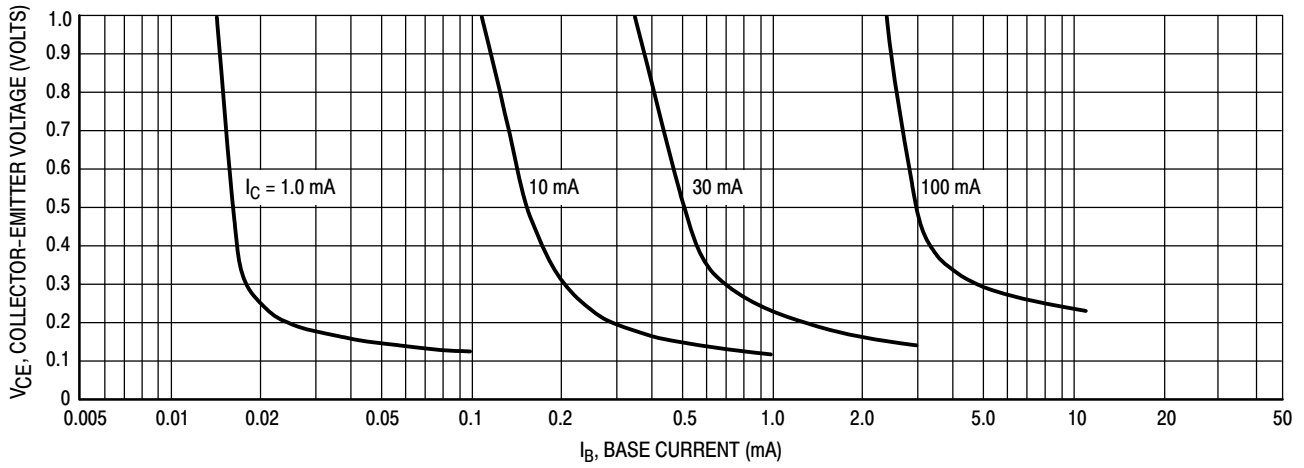


Figure 2. Collector Saturation Region

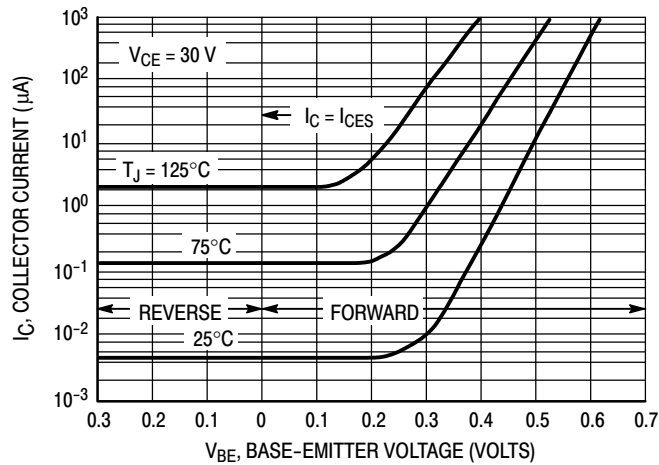


Figure 3. Collector Cut-Off Region

MMBT5401LT1G, SMMBT5401LT1G, MMBT5401LT3G

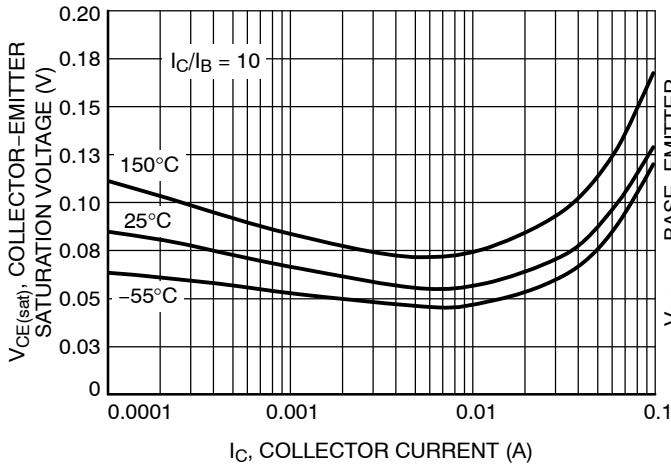


Figure 4. Collector Emitter Saturation Voltage vs. Collector Current

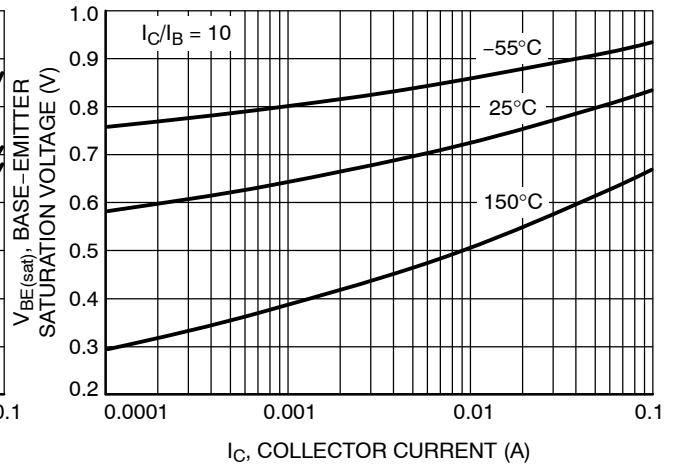


Figure 5. Base Emitter Saturation Voltage vs. Collector Current

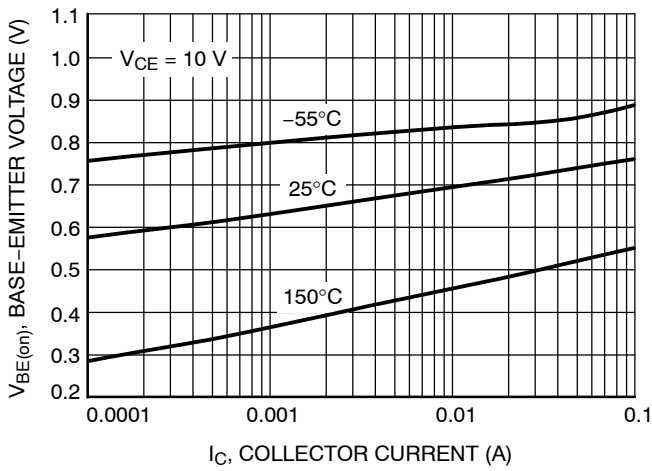


Figure 6. Base Emitter Voltage vs. Collector Current

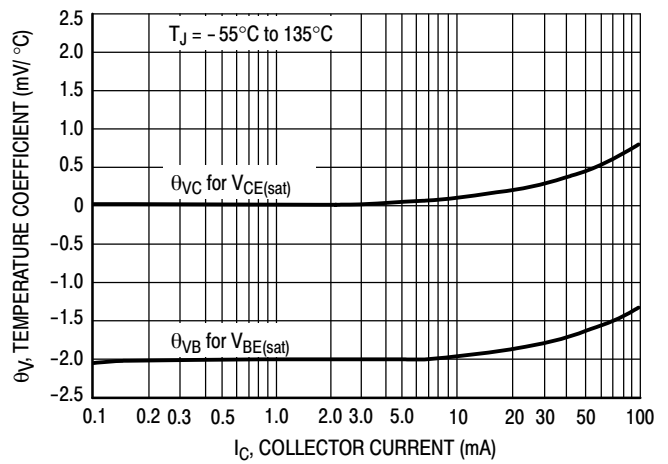
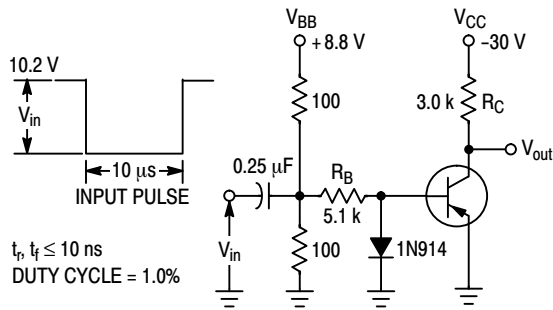


Figure 7. Temperature Coefficients



Values Shown are for I_C @ 10 mA

Figure 8. Switching Time Test Circuit

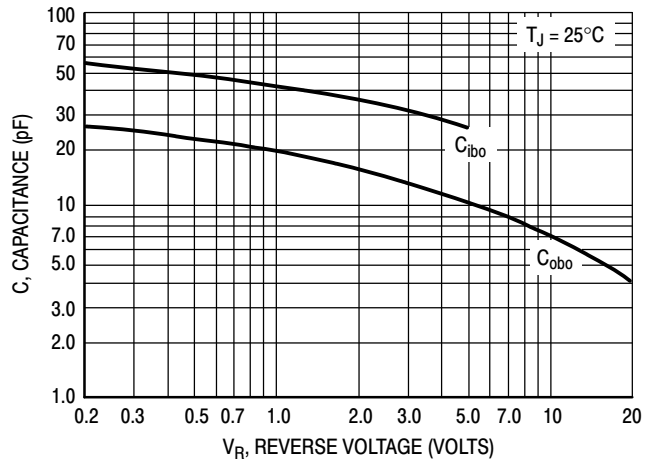


Figure 9. Capacitances

MMBT5401LT1G, SMMBT5401LT1G, MMBT5401LT3G

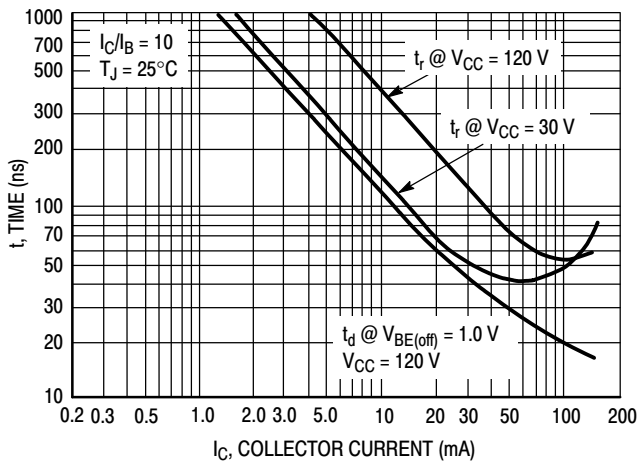


Figure 10. Turn-On Time

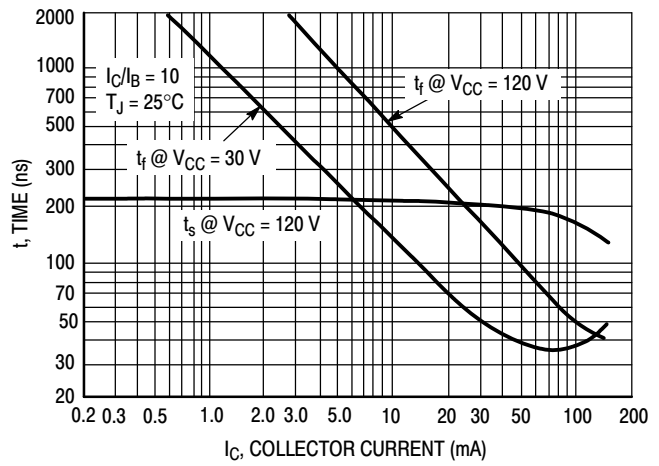


Figure 11. Turn-Off Time

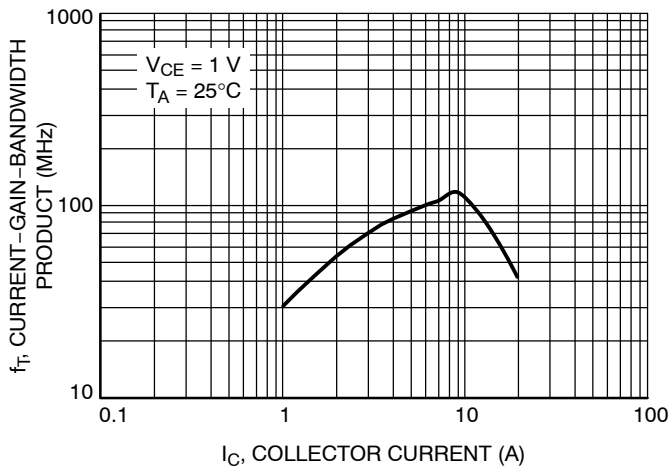


Figure 12. Current Gain Bandwidth Product

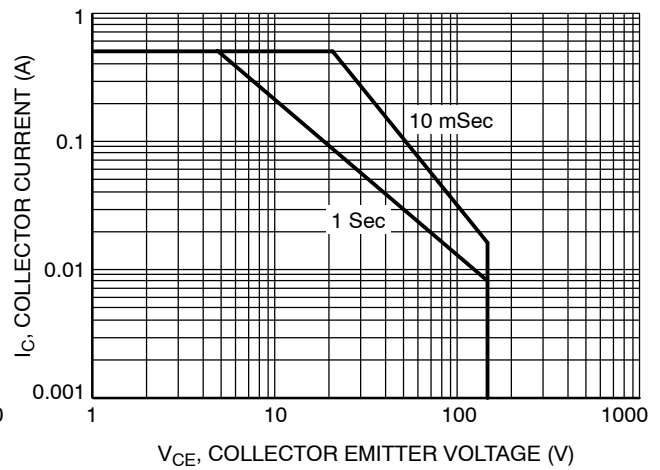
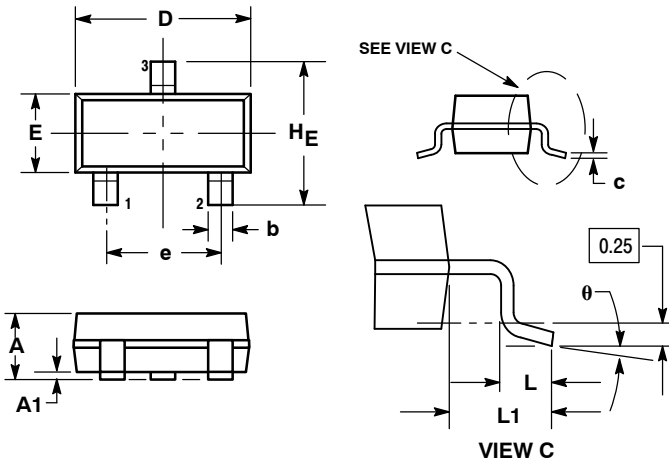


Figure 13. Safe Operating Area

MMBT5401LT1G, SMMBT5401LT1G, MMBT5401LT3G

PACKAGE DIMENSIONS

SOT-23 (TO-236)
CASE 318-08
ISSUE AP



NOTES:

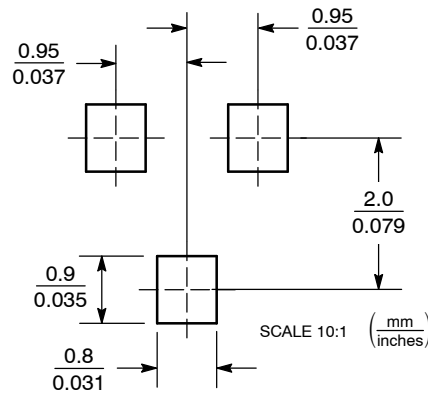
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.040 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.001 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.018 | 0.020 |
| c | 0.09 | 0.13 | 0.18 | 0.003 | 0.005 | 0.007 |
| D | 2.80 | 2.90 | 3.04 | 0.110 | 0.114 | 0.120 |
| E | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e | 1.78 | 1.90 | 2.04 | 0.070 | 0.075 | 0.081 |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.029 |
| HE | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| θ | 0° | --- | 10° | 0° | --- | 10° |

STYLE 6:

1. BASE
2. EMITTER
3. COLLECTOR

SOLDERING FOOTPRINT



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