

MBT2222ADW1T1

General Purpose Transistor

NPN Silicon

- Moisture Sensitivity Level: 1
- ESD Rating: Human Body Model – 4 kV
Machine Model – 400 V

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--------------------------------|-----------|-------|------|
| Collector–Emitter Voltage | V_{CEO} | 40 | Vdc |
| Collector–Base Voltage | V_{CBO} | 75 | Vdc |
| Emitter–Base Voltage | V_{EBO} | 6.0 | Vdc |
| Collector Current – Continuous | I_C | 600 | mAdc |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|--|-----------------|-------------|--------------------|
| Total Package Dissipation (Note 1) $T_A = 25^\circ\text{C}$ | P_D | 150 | mW |
| Thermal Resistance, Junction–to–Ambient | $R_{\theta JA}$ | 833 | $^\circ\text{C/W}$ |
| Junction and Storage Temperature | T_J, T_{stg} | –55 to +150 | $^\circ\text{C}$ |

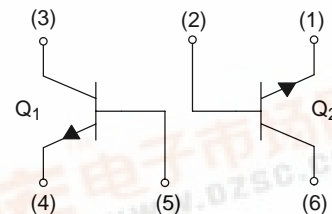
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur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

- Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint.



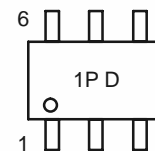
ON Semiconductor®

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SC–88/SC70–6/SOT–363
CASE 419B
STYLE 1

MARKING DIAGRAM



1P = Specific Device Code
D = Date Code

ORDERING INFORMATION

| Device | Package | Shipping† |
|---------------|---------|------------------|
| MBT2222ADW1T1 | SOT–363 | 3000/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.

MBT2222ADW1T1

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

| Characteristic | Symbol | Min | Max | Unit |
|---|---------------|---|-----------------------------------|-----------------|
| OFF CHARACTERISTICS | | | | |
| Collector–Emitter Breakdown Voltage ($I_C = 10\text{ mA}$, $I_B = 0$) | $V_{(BR)CEO}$ | 40 | – | Vdc |
| Collector–Base Breakdown Voltage ($I_C = 10\text{ }\mu\text{A}$, $I_E = 0$) | $V_{(BR)CBO}$ | 75 | – | Vdc |
| Emitter–Base Breakdown Voltage ($I_E = 10\text{ }\mu\text{A}$, $I_C = 0$) | $V_{(BR)EBO}$ | 6.0 | – | Vdc |
| Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{EB(off)} = 3.0\text{ Vdc}$) | I_{CEX} | – | 10 | nAdc |
| Collector Cutoff Current ($V_{CB} = 60\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 60\text{ Vdc}$, $I_E = 0$, $T_A = 125^\circ\text{C}$) | I_{CBO} | – – | 0.01 10 | μAdc |
| Emitter Cutoff Current ($V_{EB} = 3.0\text{ Vdc}$, $I_C = 0$) | I_{EBO} | – | 100 | nAdc |
| Base Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{EB(off)} = 3.0\text{ Vdc}$) | I_{BL} | – | 20 | nAdc |
| ON CHARACTERISTICS | | | | |
| DC Current Gain ($I_C = 0.1\text{ mA}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 1.0\text{ mA}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 10\text{ mA}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 10\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $T_A = -55^\circ\text{C}$) ($I_C = 150\text{ mA}$, $V_{CE} = 10\text{ Vdc}$) (Note 2) ($I_C = 150\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$) (Note 2) ($I_C = 500\text{ mA}$, $V_{CE} = 10\text{ Vdc}$) (Note 2) | h_{FE} | 35 50 75 35 100 50 40 | – – – – 300 – – | – |
| Collector–Emitter Saturation Voltage (Note 2) ($I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$) ($I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$) | $V_{CE(sat)}$ | – – | 0.3 1.0 | Vdc |
| Base–Emitter Saturation Voltage (Note 2) ($I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$) ($I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$) | $V_{BE(sat)}$ | 0.6 – | 1.2 2.0 | Vdc |

2. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

MBT2222ADW1T1

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

| Characteristic | Symbol | Min | Max | Unit |
|--|---------------------------------|-------------|-------------|--------------------|
| SMALL-SIGNAL CHARACTERISTICS | | | | |
| Current-Gain – Bandwidth Product (Note 3) (I _C = 20 mA, V _{CE} = 20 V, f = 100 MHz) | f _T | 300 | – | MHz |
| Output Capacitance (V _{CB} = 10 V, I _E = 0, f = 1.0 MHz) | C _{obo} | – | 8.0 | pF |
| Input Capacitance (V _{EB} = 0.5 V, I _C = 0, f = 1.0 MHz) | C _{ibo} | – | 25 | pF |
| Input Impedance (I _C = 1.0 mA, V _{CE} = 10 V, f = 1.0 kHz) (I _C = 10 mA, V _{CE} = 10 V, f = 1.0 kHz) | h _{ie} | 2.0 0.25 | 8.0 1.25 | kΩ |
| Voltage Feedback Ratio (I _C = 1.0 mA, V _{CE} = 10 V, f = 1.0 kHz) (I _C = 10 mA, V _{CE} = 10 V, f = 1.0 kHz) | h _{re} | – – | 8.0 4.0 | X 10 ^{–4} |
| Small-Signal Current Gain (I _C = 1.0 mA, V _{CE} = 10 V, f = 1.0 kHz) (I _C = 10 mA, V _{CE} = 10 V, f = 1.0 kHz) | h _{fe} | 50 75 | 300 375 | – |
| Output Admittance (I _C = 1.0 mA, V _{CE} = 10 V, f = 1.0 kHz) (I _C = 10 mA, V _{CE} = 10 V, f = 1.0 kHz) | h _{oe} | 5.0 25 | 35 200 | μmhos |
| Collector Base Time Constant (I _E = 20 mA, V _{CB} = 20 V, f = 31.8 MHz) | r _b , C _c | – | 150 | ps |
| Noise Figure (I _C = 100 μA, V _{CE} = 10 V, R _S = 1.0 kΩ, f = 1.0 kHz) | NF | – | 4.0 | dB |

SWITCHING CHARACTERISTICS

| | | | | | |
|--------------|---|----------------|---|-----|----|
| Delay Time | (V _{CC} = 30 V, V _{BE(off)} = –0.5 V, I _C = 150 mA, I _{B1} = 15 mA) | t _d | – | 10 | ns |
| Rise Time | | t _r | – | 25 | |
| Storage Time | (V _{CC} = 30 V, I _C = 150 mA, I _{B1} = I _{B2} = 15 mA) | t _s | – | 225 | ns |
| Fall Time | | t _f | – | 60 | |

3. f_T is defined as the frequency at which |h_{fe}| extrapolates to unity.

MBT2222ADW1T1

SWITCHING TIME EQUIVALENT TEST CIRCUITS

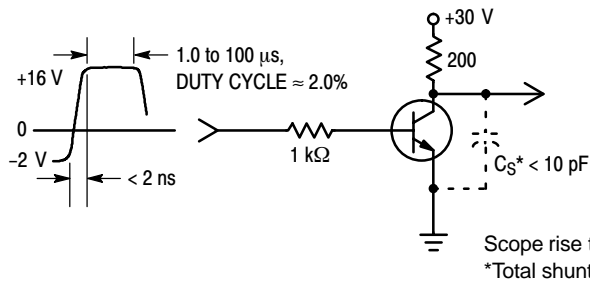


Figure 1. Turn-On Time

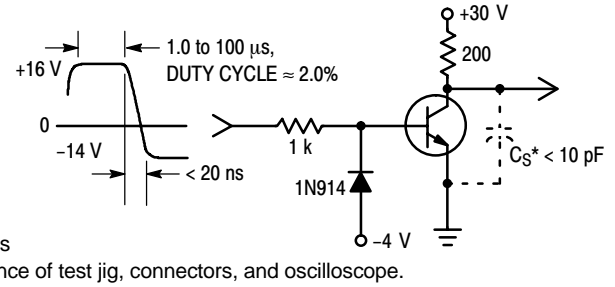


Figure 2. Turn-Off Time

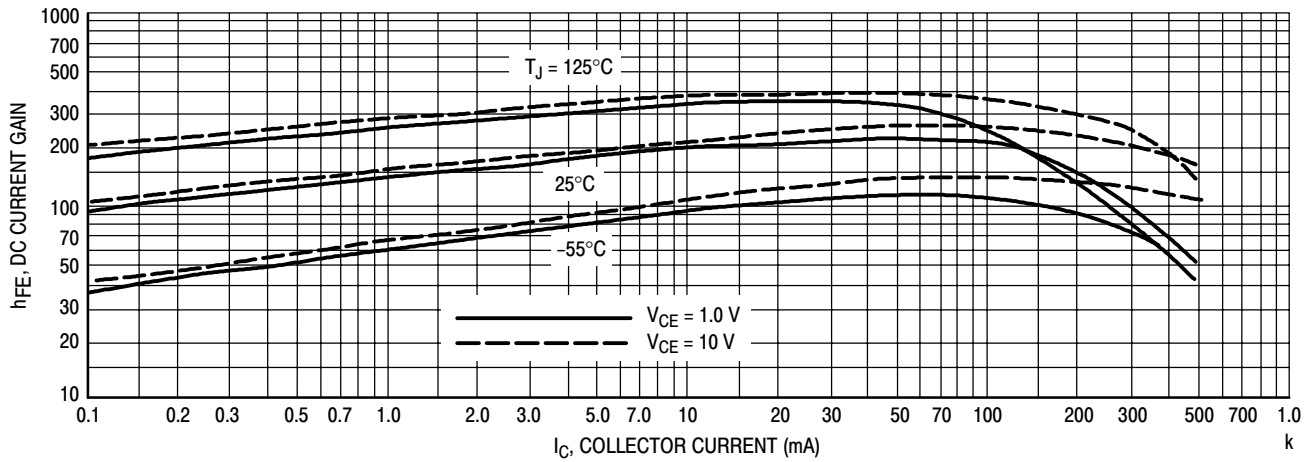


Figure 3. DC Current Gain

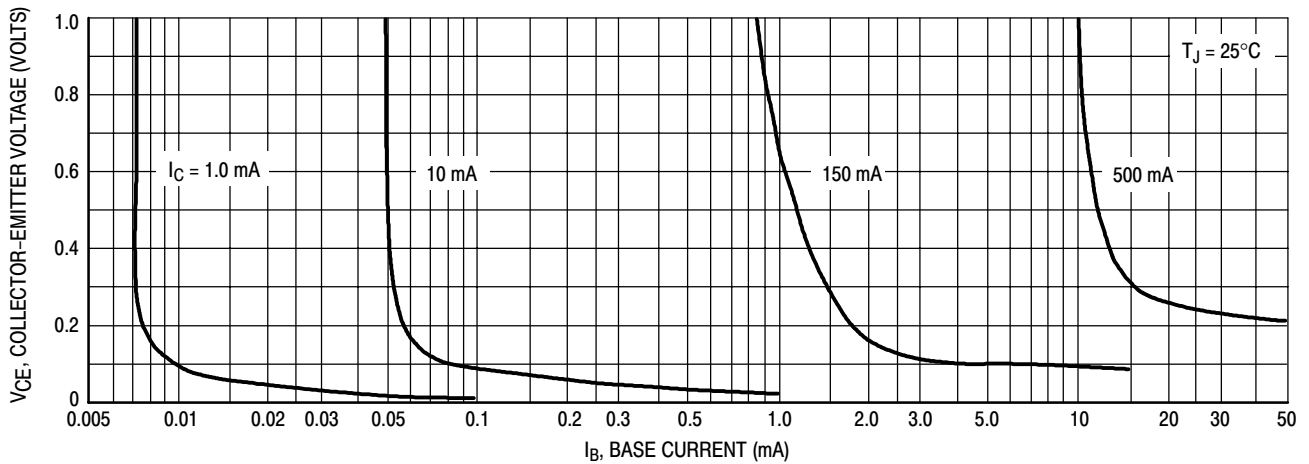


Figure 4. Collector Saturation Region

MBT2222ADW1T1

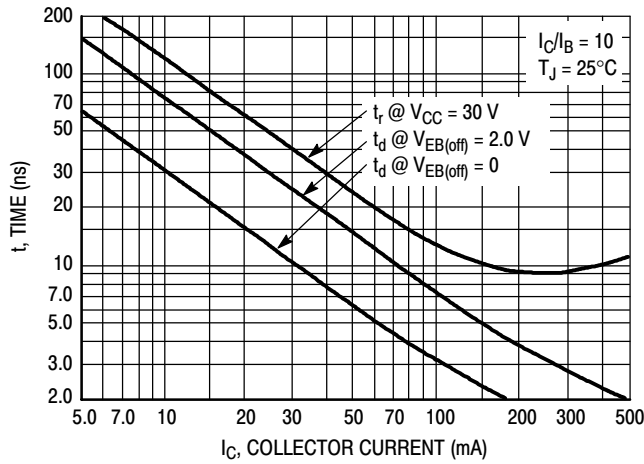


Figure 5. Turn-On Time

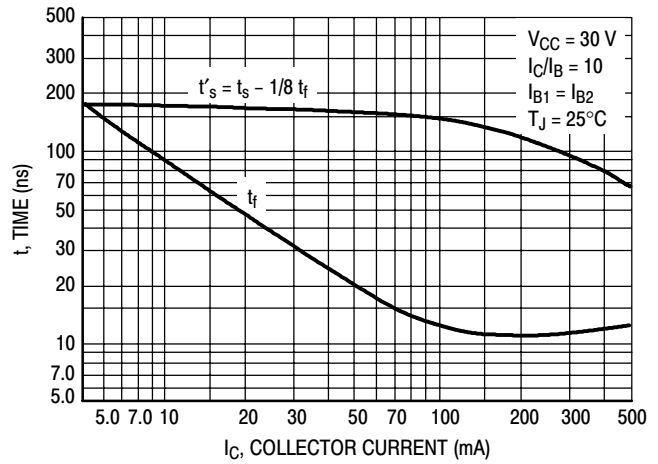


Figure 6. Turn-Off Time

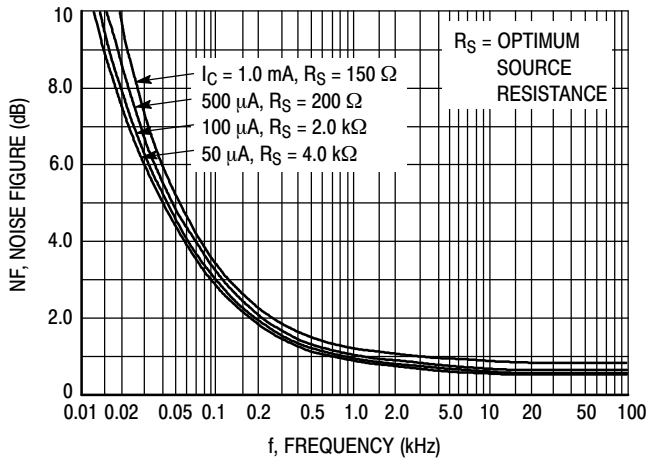


Figure 7. Frequency Effects

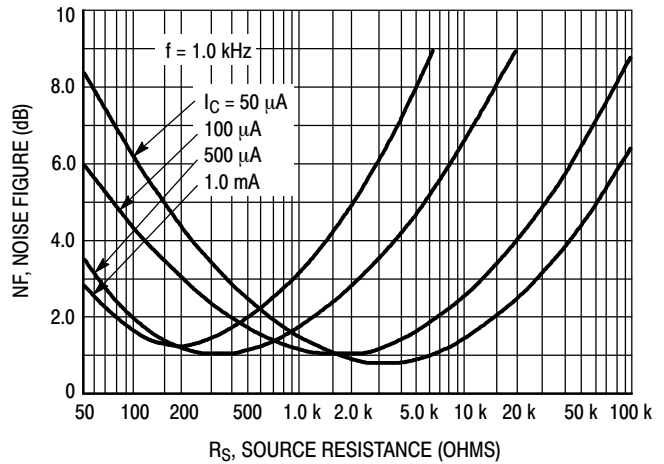


Figure 8. Source Resistance Effects

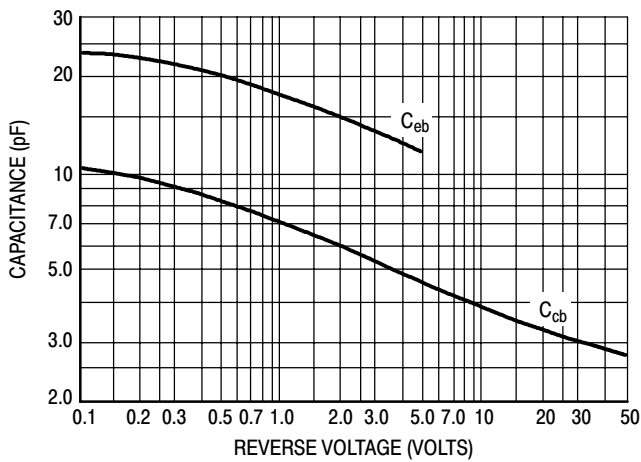


Figure 9. Capacitances

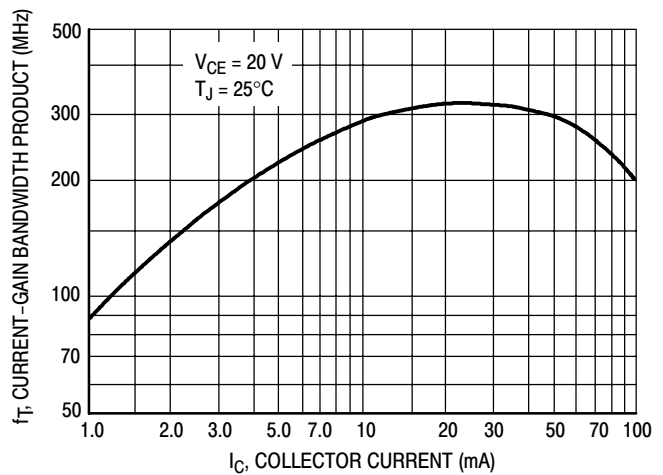


Figure 10. Current-Gain Bandwidth Product

MBT2222ADW1T1

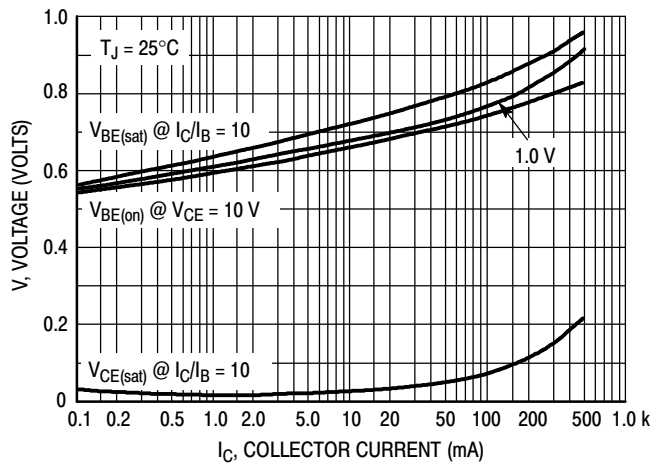


Figure 11. "On" Voltages

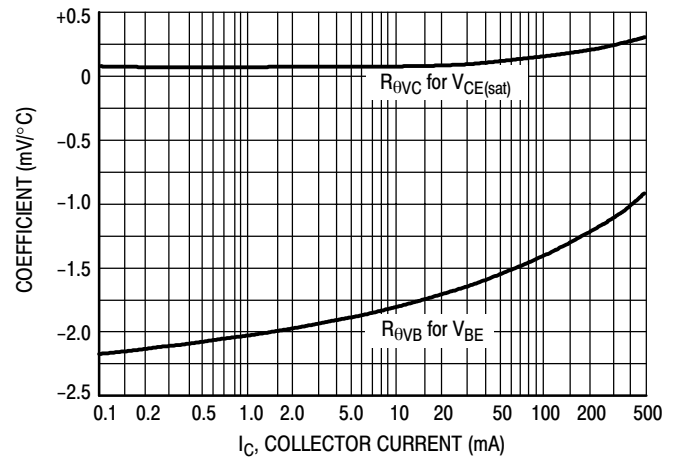


Figure 12. Temperature Coefficients

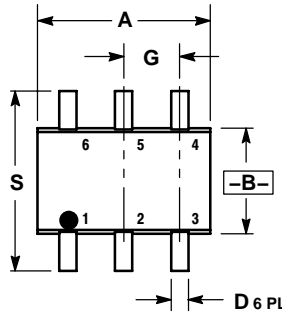
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PACKAGE DIMENSIONS

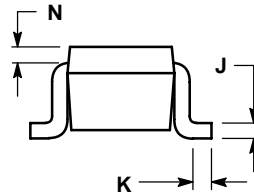
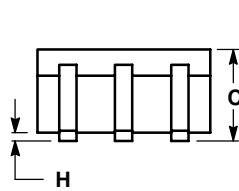
SC-88/SC70-6/SOT-363

CASE 419B-02

ISSUE 02U



| | | | | |
|----------|-------------|-----|---|-----|
| \oplus | 0.2 (0.008) | (M) | B | (M) |
|----------|-------------|-----|---|-----|



NOTES:

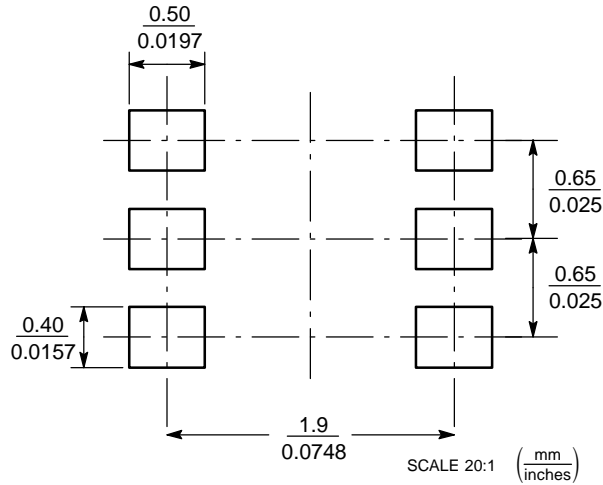
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.071 | 0.087 | 1.80 | 2.20 |
| B | 0.045 | 0.053 | 1.15 | 1.35 |
| C | 0.031 | 0.043 | 0.80 | 1.10 |
| D | 0.004 | 0.012 | 0.10 | 0.30 |
| G | 0.026 BSC | | 0.65 BSC | |
| H | --- | 0.004 | --- | 0.10 |
| J | 0.004 | 0.010 | 0.10 | 0.25 |
| K | 0.004 | 0.012 | 0.10 | 0.30 |
| N | 0.008 REF | | 0.20 REF | |
| S | 0.079 | 0.087 | 2.00 | 2.20 |


STYLE 1:

- PIN 1. EMITTER 2
- BASE 2
- COLLECTOR 1
- EMITTER 1
- BASE 1
- COLLECTOR 2

SOLDERING FOOTPRINT



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