

General Purpose Transistor

NPN Silicon

Features

- Moisture Sensitivity Level: 1
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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
Electrostatic Discharge	ESD	HBM Class 2 MM Class B	

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	$^\circ\text{C}$

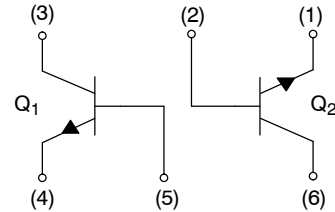
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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



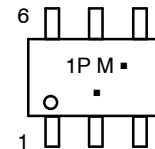
ON Semiconductor®

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

MARKING DIAGRAM



1P = Specific Device Code
M = Date Code
■ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
MBT2222ADW1T1G	SOT-363 (Pb-Free)	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.

MBT2222ADW1T1G

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

Characteristic	Symbol	Min	Max	Unit
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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

SMALL–SIGNAL CHARACTERISTICS

Current–Gain – Bandwidth Product (Note 3) ($I_C = 20\text{ mA}$, $V_{CE} = 20\text{ Vdc}$, $f = 100\text{ MHz}$)	f_T	300	–	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{obo}	–	8.0	pF
Input Capacitance ($V_{EB} = 0.5\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$)	C_{ibo}	–	25	pF
Input Impedance ($I_C = 1.0\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$) ($I_C = 10\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{ie}	2.0 0.25	8.0 1.25	k Ω
Voltage Feedback Ratio ($I_C = 1.0\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$) ($I_C = 10\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{re}	– –	8.0 4.0	$\times 10^{-4}$
Small–Signal Current Gain ($I_C = 1.0\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$) ($I_C = 10\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{fe}	50 75	300 375	–
Output Admittance ($I_C = 1.0\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$) ($I_C = 10\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{oe}	5.0 25	35 200	μmhos
Collector Base Time Constant ($I_E = 20\text{ mA}$, $V_{CB} = 20\text{ Vdc}$, $f = 31.8\text{ MHz}$)	r_b , C_c	–	150	ps
Noise Figure ($I_C = 100\text{ }\mu\text{A}$, $V_{CE} = 10\text{ Vdc}$, $R_S = 1.0\text{ k}\Omega$, $f = 1.0\text{ kHz}$)	NF	–	4.0	dB

SWITCHING CHARACTERISTICS

Delay Time	$(V_{CC} = 30\text{ Vdc}$, $V_{BE(off)} = -0.5\text{ Vdc}$, $I_C = 150\text{ mA}$, $I_{B1} = 15\text{ mA}$)	t_d	–	10	ns
Rise Time		t_r	–	25	
Storage Time	$(V_{CC} = 30\text{ Vdc}$, $I_C = 150\text{ mA}$, $I_{B1} = I_{B2} = 15\text{ mA}$)	t_s	–	225	ns
Fall Time		t_f	–	60	

- Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.
- f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

MBT2222ADW1T1G

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SWITCHING TIME EQUIVALENT TEST CIRCUITS

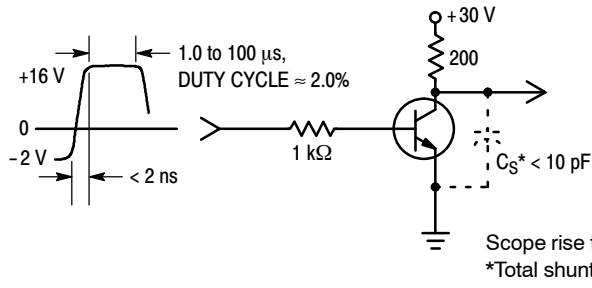


Figure 1. Turn-On Time

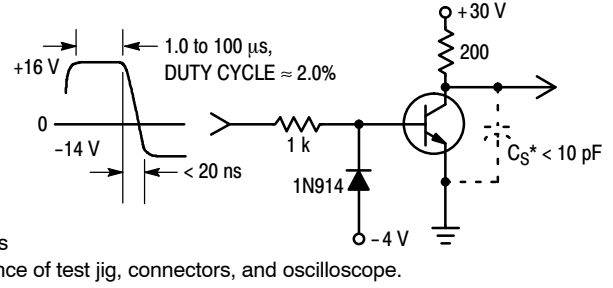


Figure 2. Turn-Off Time

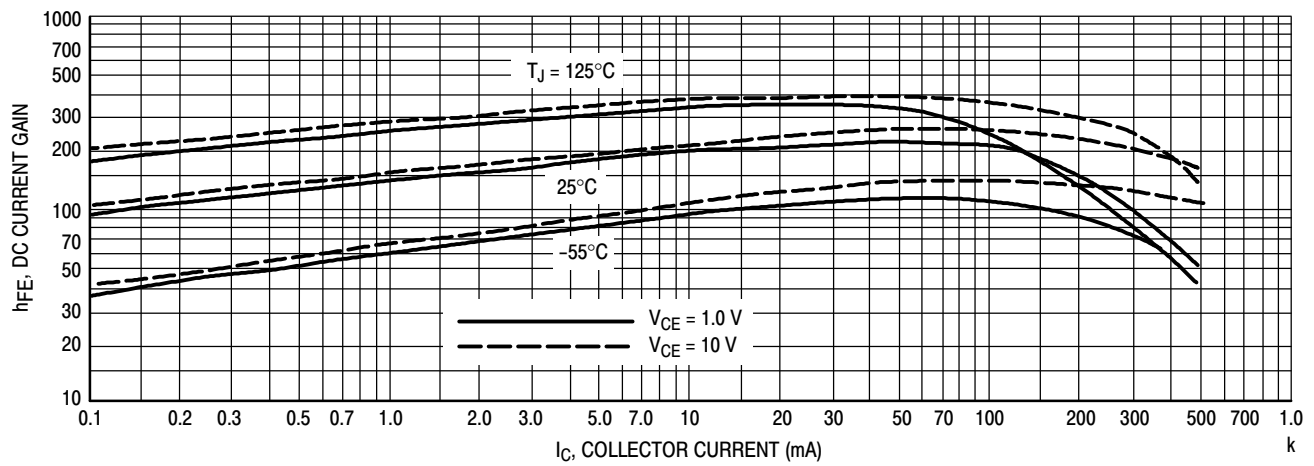


Figure 3. DC Current Gain

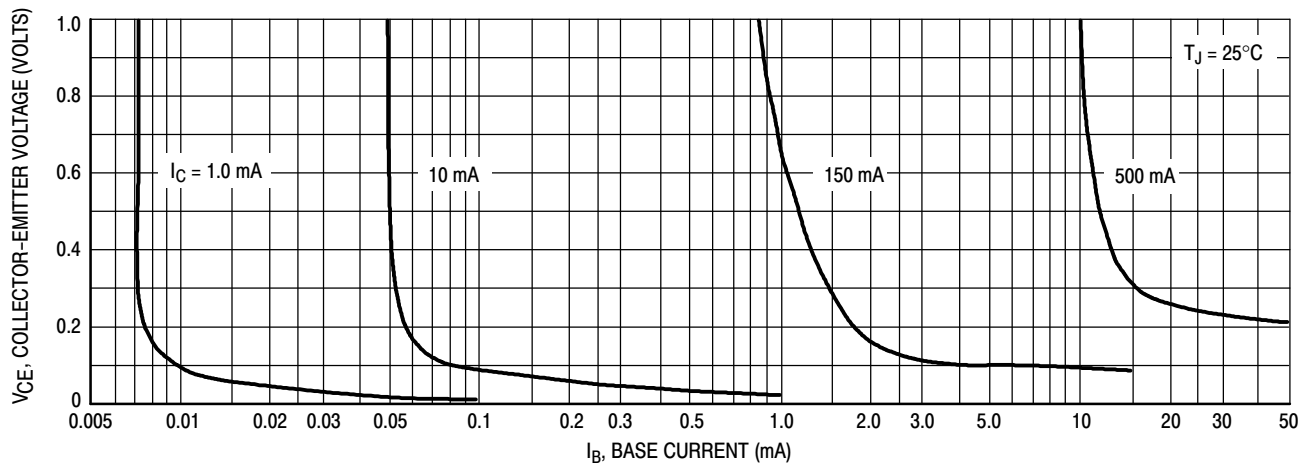
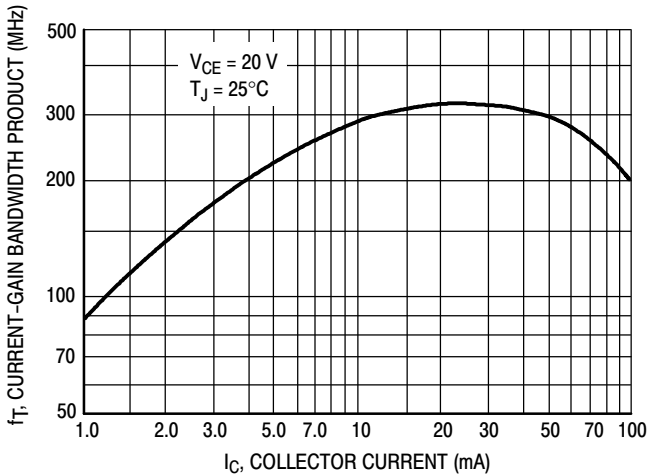
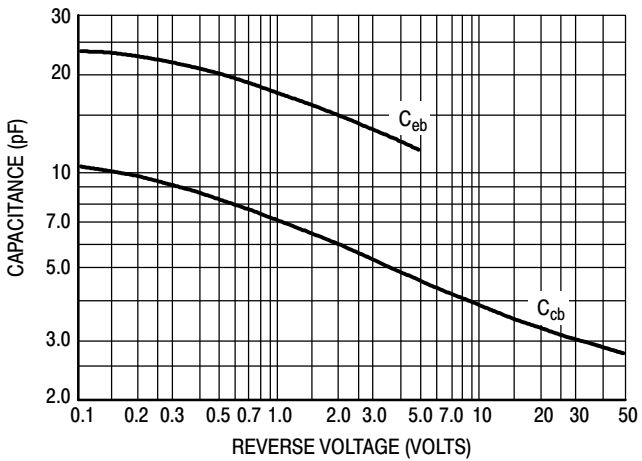
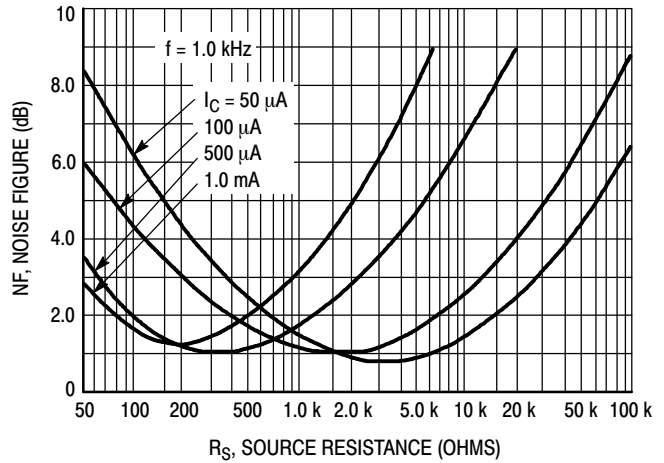
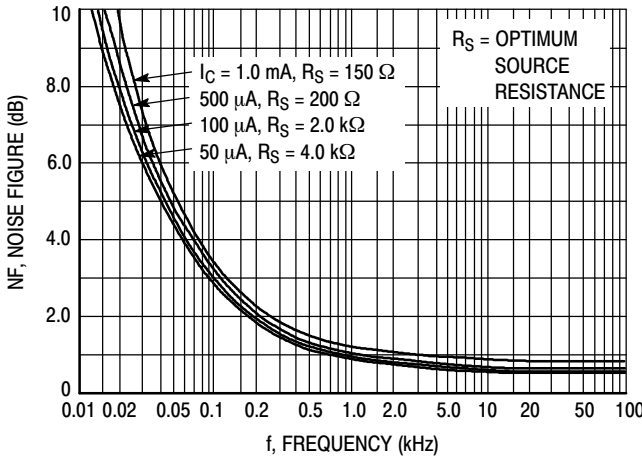
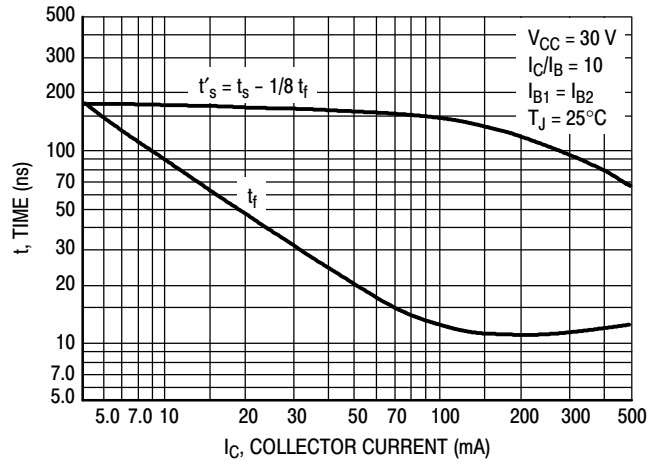
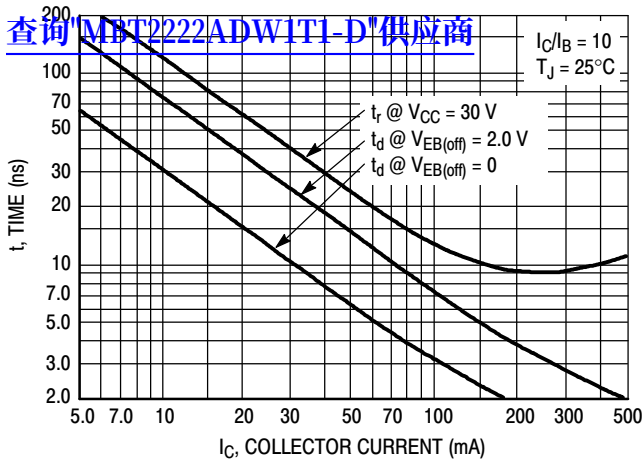
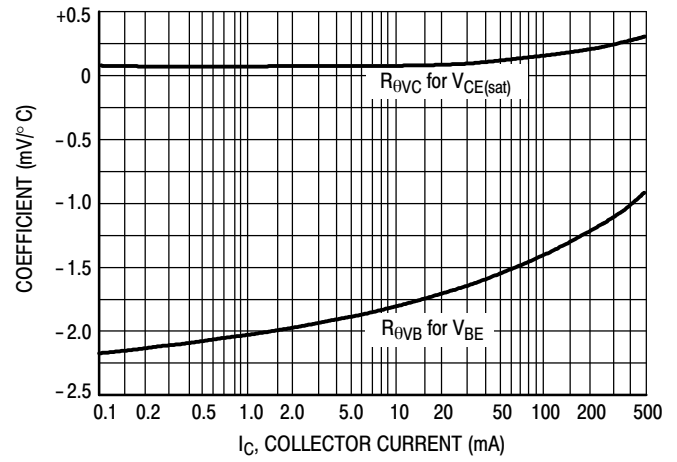
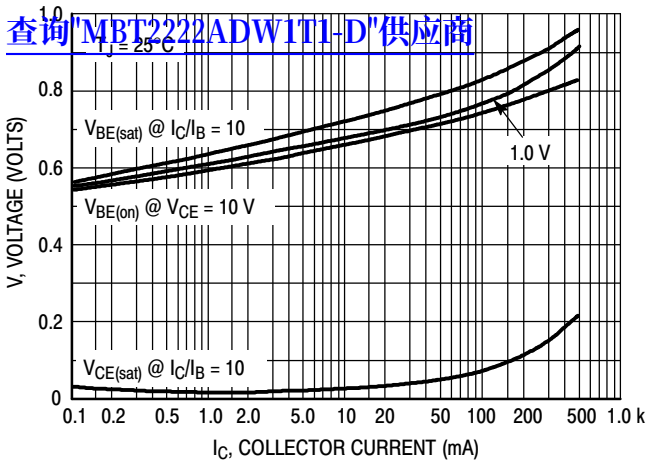


Figure 4. Collector Saturation Region

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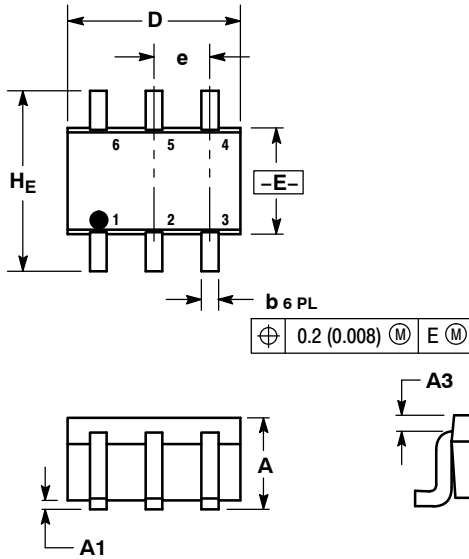


MBT2222ADW1T1G

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PACKAGE DIMENSIONS

SC-88/SC70-6/SOT-363
CASE 419B-02
ISSUE W

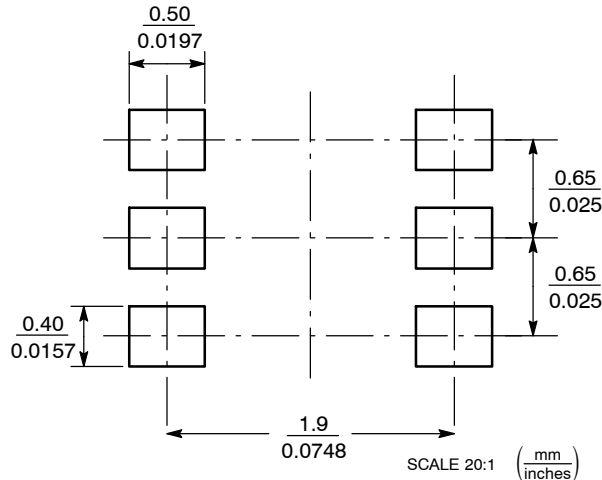


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.95	1.10	0.031	0.037	0.043
A1	0.00	0.05	0.10	0.000	0.002	0.004
A3	0.20 REF			0.008 REF		
b	0.10	0.21	0.30	0.004	0.008	0.012
C	0.10	0.14	0.25	0.004	0.005	0.010
D	1.80	2.00	2.20	0.070	0.078	0.086
E	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
HE	2.00	2.10	2.20	0.078	0.082	0.086

- STYLE 1:
1. EMITTER 2
 2. BASE 2
 3. COLLECTOR 1
 4. EMITTER 1
 5. BASE 1
 6. COLLECTOR 2

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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