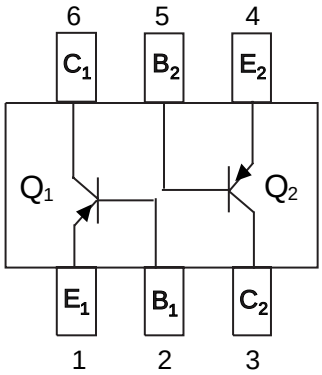
DUAL SMALL SIGNAL SURFACE MOUNT TRANSISTOR

MBT4403D

- We declare that the material of product compliance with RoHS requirements.
- S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

SOT-363



ORDERING INFORMATION

Device	Marking	Shipping
MBT4403D	2T	3000/Tape&Reel
S-MBT4403D	2T	3000/Tape&Reel

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	– 40	Vdc
Collector–Base Voltage	V_{CBO}	– 40	Vdc
Emitter–Base Voltage	V_{EBO}	– 5.0	Vdc
Collector Current — Continuous	I_C	– 600	mAdc

THERMAL CHARACTERISTICS

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

DEVICE MARKING

MBT4403D=2T

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Breakdown Voltage (3) (I_C = –1.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	– 40	—	Vdc
Collector–Base Breakdown Voltage (I_C = –0.1mAdc, I_E = 0)	$V_{(BR)CBO}$	– 40	—	Vdc
Emitter–Base Breakdown Voltage (I_E = –0.1mAdc, I_C = 0)	$V_{(BR)EBO}$	– 5.0	—	Vdc
Base Cutoff Current (V_{CE} = –35 Vdc, V_{EB} = –0.4 Vdc)	I_{BEV}	—	– 0.1	µAdc
Collector Cutoff Current (V_{CE} = –35 Vdc, V_{EB} = –0.4 Vdc)	I_{CEX}	—	– 0.1	µAdc

1. FR–5 = 1.0 x 0.75 x 0.062 in.
2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.
3. Pulse Test: Pulse Width ≤300 µs; Duty Cycle ≤2.0%.

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

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS				
DC Current Gain	h_{FE}			—
(I_C = –0.1 mAdc, V_{CE} = –1.0 Vdc)		30	—	
(I_C = –1.0 mAdc, V_{CE} = –1.0 Vdc)		60	—	
(I_C = –10 mAdc, V_{CE} = –1.0 Vdc)		100	—	
(I_C = –150 mAdc, V_{CE} = –2.0 Vdc)(3)		100	300	
(I_C = –500 mAdc, V_{CE} = –2.0 Vdc)(3)		20	—	
Collector–Emitter Saturation Voltage(3)	$V_{CE(sat)}$			Vdc
(I_C = –150mAdc, I_B = –15 mAdc)		—	– 0.4	
(I_C = –500 mAdc, I_B = –50 mAdc)		—	– 0.75	
Base–Emitter Saturation Voltage (3)	$V_{BE(sat)}$			Vdc
(I_C = –150 mAdc, I_B = –15 mAdc)		– 0.75	– 0.95	
(I_C = –500 mAdc, I_B = –50 mAdc)		—	– 1.3	
SMALL–SIGNAL CHARACTERISTICS				
Current–Gain — Bandwidth Product	f_T			MHz
(I_C = –20mAdc, V_{CE}= –10 Vdc, f = 100 MHz)		200	—	
Collector–Base Capacitance	C_{cb}			pF
(V_{CB}= –10 Vdc, I_E = 0, f = 1.0 MHz)		—	8.5	
Emitter–Base Capacitance	C_{eb}			pF
(V_{BE} = –0.5 Vdc, I_C = 0, f = 1.0 MHz)		—	30	
Input Impedance	h_{ie}			kΩ
(V_{CE}= –10 Vdc, I_C = –1.0 mAdc, f = 1.0 kHz)		1.5	15	
Voltage Feedback Ratio	h_{re}			X 10^{-4}
(V_{CE}= –10 Vdc, I_C = –1.0 mAdc, f = 1.0 kHz)		0.1	8.0	
Small–Signal Current Gain	h_{fe}			—
(V_{CE}= –10 Vdc, I_C = –1.0 mAdc, f = 1.0 kHz)		60	500	
Output Admittance	h_{oe}			μmhos
(V_{CE}= –10 Vdc, I_C = –1.0 mAdc, f = 1.0 kHz)		1.0	100	
SWITCHING CHARACTERISTICS				
Delay Time	(V_{CC} = – 30 Vdc, V_{EB} = –2.0 Vdc,	t_d	—	15	
Rise Time	I_C = –150mAdc, I_{B1} = –15 mAdc)	t_r	—	20	ns
Storage Time	(V_{CC} = –30 Vdc, I_C = –150 mAdc,	t_s	—	225	ns
Fall Time	I_{B1} = I_{B2} = –15 mAdc)	t_f	—	30	

3. Pulse Test: Pulse Width ≤300 μs; Duty Cycle ≤2.0%.

SWITCHING TIME EQUIVALENT TEST CIRCUITS

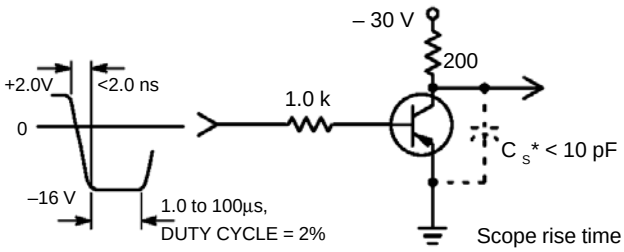


Figure 1. Turn–On Time

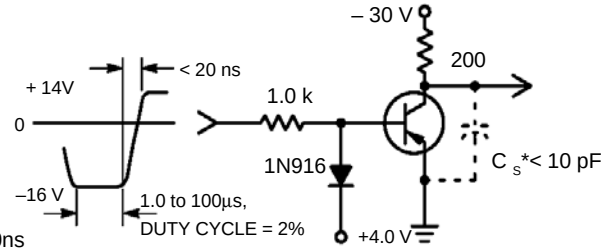


Figure 2. Turn–Off Time

Scope rise time < 4.0ns

*Total shunt capacitance of test jig connectors, and oscilloscope

TYPICAL TRANSIENT CHARACTERISTICS

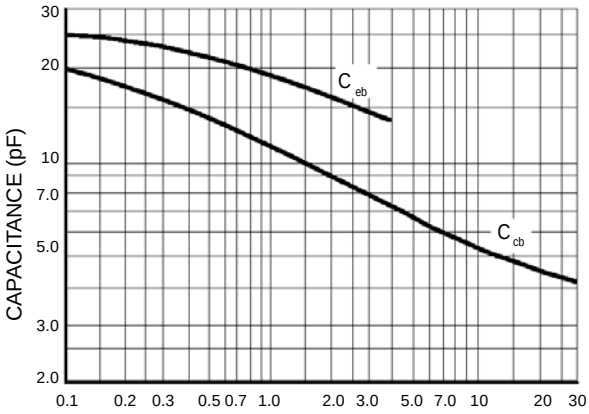


Figure 3. Capacitance

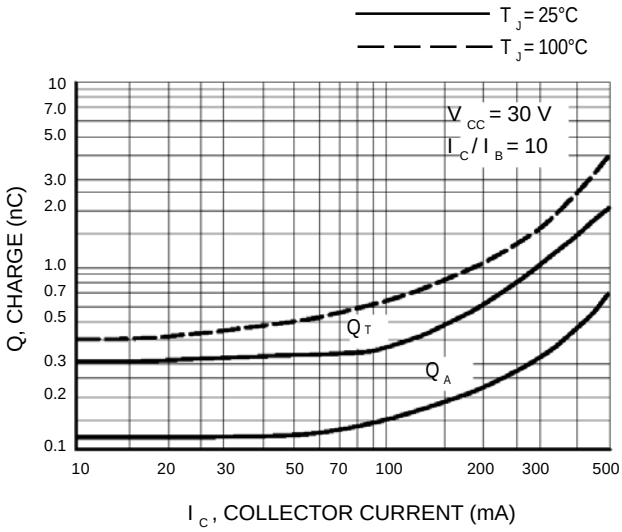


Figure 4. Charge Data

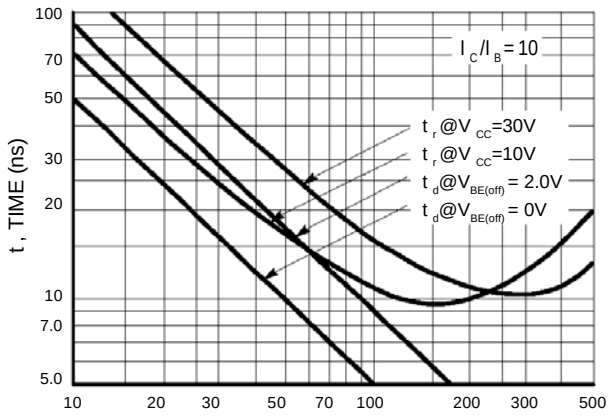


Figure 5. Turn–On Time

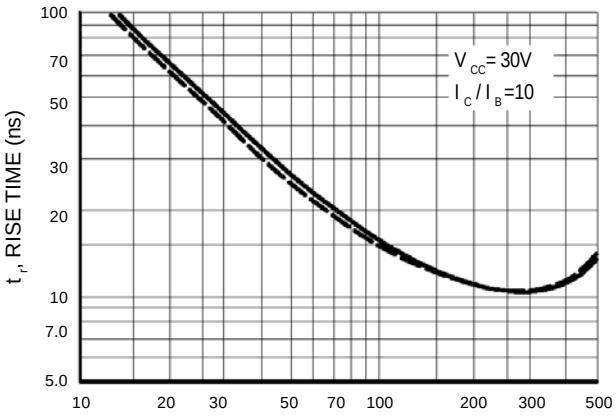


Figure 6. Rise Time

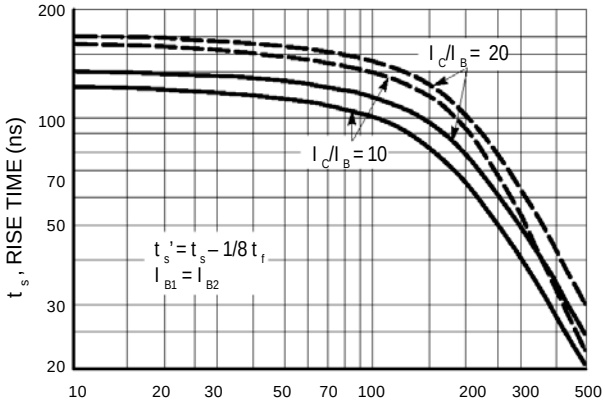


Figure 7. Storage Time

SMALL–SIGNAL CHARACTERISTICS

NOISE FIGURE

V_{CE} = –10 Vdc, T_A = 25°C
Bandwidth = 1.0 Hz

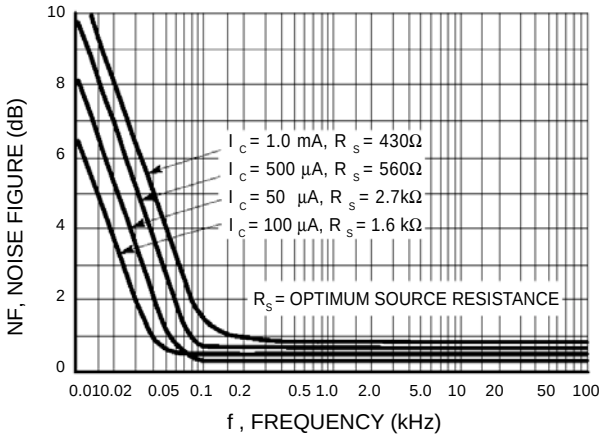


Figure 8. Frequency Effects

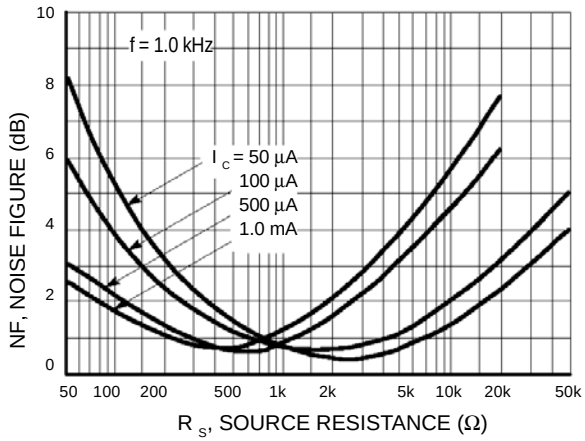


Figure 9. Source Resistance Effects

h PARAMETERS

(V_{CE} = –10 Vdc, f = 1.0 kHz, T_A = 25°C)

This group of graphs illustrates the relationship between h fe and other “h” parameters for this series of ransistors. To obtain these curves, a high–gain and a low–gain unit were selected from the MMBT4401LT1 lines, and the same units were used to develop the correspondingly numbered curves on each graph.

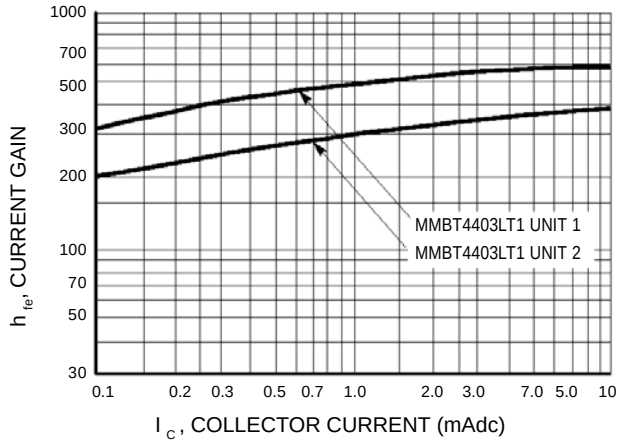


Figure 10. Current Gain

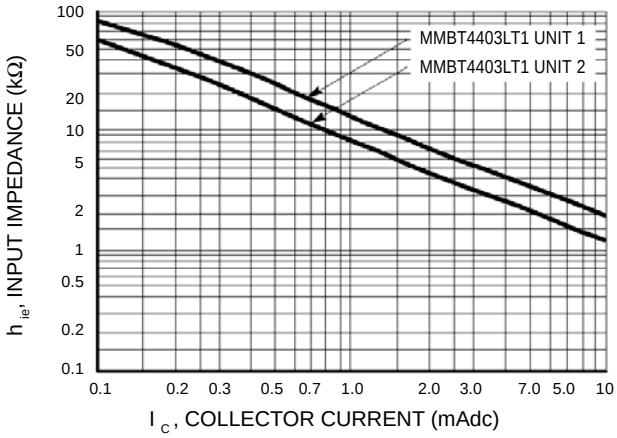


Figure 11. Input Impedance

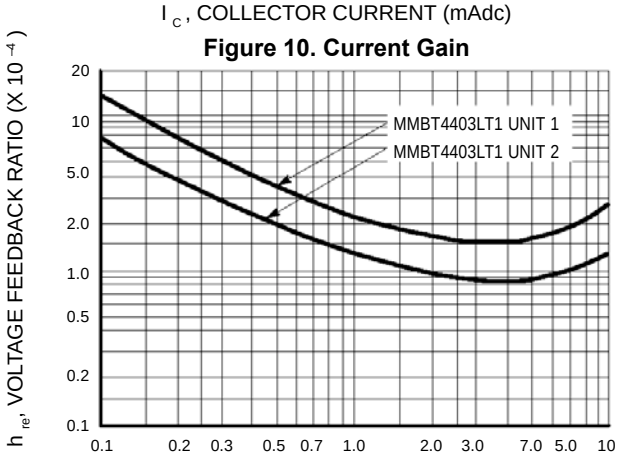


Figure 12. Voltage Feedback Ratio

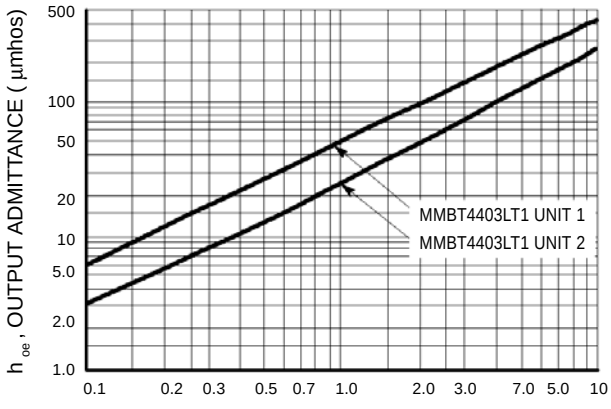


Figure 13. Output Admittance

STATIC CHARACTERISTICS

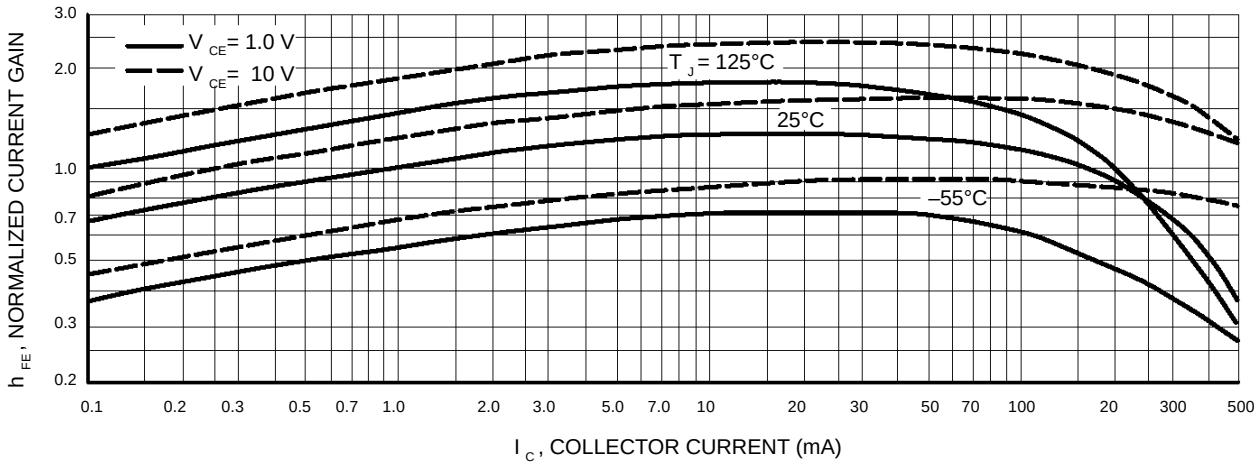


Figure 14. DC Current Gain

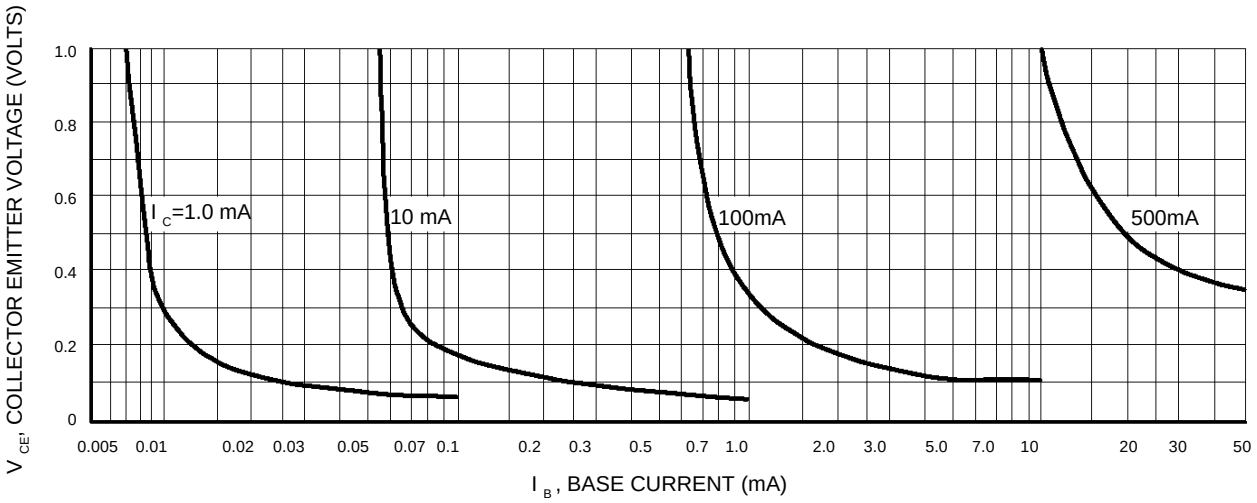


Figure 15. Collector Saturation Region

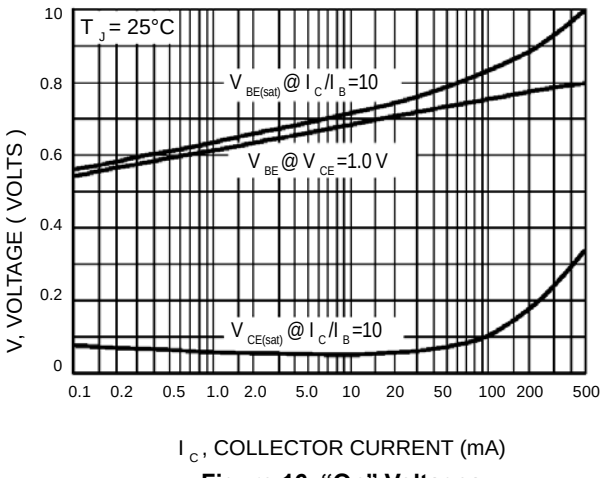


Figure 16. "On" Voltages

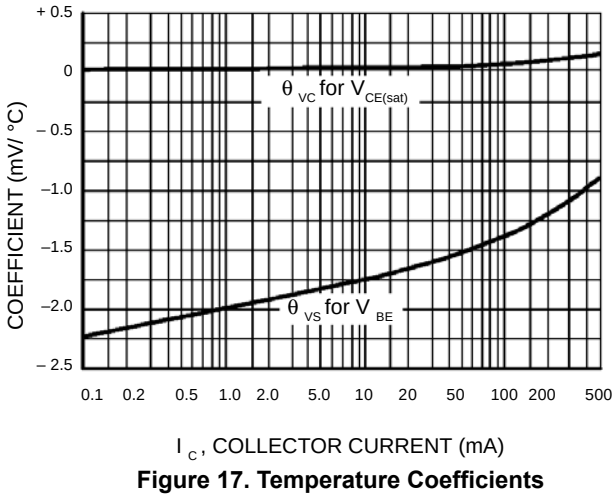


Figure 17. Temperature Coefficients

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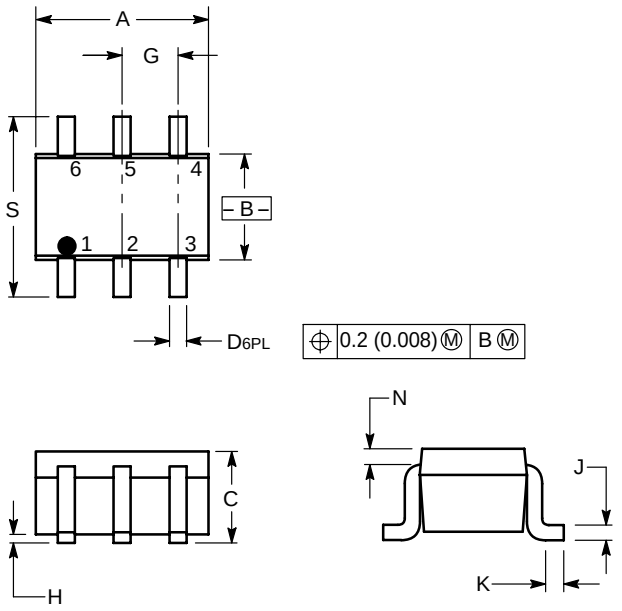

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

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

PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4.EMITTER 1
5. BASE 1
6.COLLECTOR 2