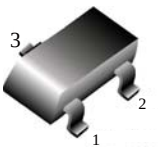
General Purpose Transistors

PNP Silicon

- We declare that the material of product compliance with RoHS requirements.



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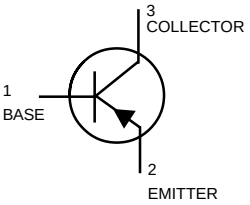
ORDERING INFORMATION

Device	Marking	Shipping
2N3906E	2A	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	– 200	mAdc



THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR– 5 Board(1) T_A=25 °C	P_D	200	mW
Derate above 25°C		1.6	mW/°C
	θ_{JA}	600	°C/W
Total Device Dissipation Alumina Substrate, (2) T_A = 25°C	P_D	300	mW
Derate above 25°C		2.4	mW/°C
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	400	°C/W
Junction and Storage Temperature	T_J, T_{stg}	–55 to +150	°C

DEVICE MARKING

2N3906ET1G = 2A

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 = –10 µAdc, I_E = 0)	$V_{(BR)CBO}$	– 40	—	Vdc
Emitter–Base Breakdown Voltage (I_E = –10 µAdc, I_C = 0)	$V_{(BR)EBO}$	– 5.0	—	Vdc
Base Cutoff Current (V_{CE} = –30 Vdc, V_{EB} = –3.0 Vdc)	I_{BL}	—	– 50	nAdc
Collector Cutoff Current (V_{CE} = –30 Vdc, V_{EB} = –3.0 Vdc)	I_{CEX}	—	– 50	nAdc

1. FR–4 Minimum Pad
2. FR-4 1.0 x 1.0 inch Pad
3. 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 (2)				
DC Current Gain	h_{FE}			—
(I_C = –0.1 mAdc, V_{CE} = –1.0 Vdc)		60	—	
(I_C = –1.0 mAdc, V_{CE} = –1.0 Vdc)		80	—	
(I_C = –10 mAdc, V_{CE} = –1.0 Vdc)		100	300	
(I_C = –50 mAdc, V_{CE} = –1.0 Vdc)		60	—	
(I_C = –100 mAdc, V_{CE} = –1.0 Vdc)		30	—	
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$			Vdc
(I_C = –10 mAdc, I_B = –1.0 mAdc)		—	– 0.25	
(I_C = –50 mAdc, I_B = –5.0 mAdc)		—	– 0.4	
Base–Emitter Saturation Voltage	$V_{BE(sat)}$			Vdc
(I_C = –10 mAdc, I_B = –1.0 mAdc)		– 0.65	– 0.85	
(I_C = –50 mAdc, I_B = –5.0 mAdc)		—	– 0.95	
SMALL–SIGNAL CHARACTERISTICS				
Current–Gain — Bandwidth Product	f_T			MHz
(I_C = –10 mAdc, V_{CE}= –20 Vdc, f = 100 MHz)		250	—	
Output Capacitance	C_{obo}			pF
(V_{CB}= –5.0 Vdc, I_E = 0, f = 1.0 MHz)		—	4.5	
Input Capacitance	C_{ibo}			pF
(V_{EB} = –0.5 Vdc, I_C = 0, f = 1.0 MHz)		—	10	
Input Impedance	h_{ie}			kΩ
(V_{CE}= –10 Vdc, I_C = –1.0 mAdc, f = 1.0 kHz)		2.0	12	
Voltage Feedback Ratio	h_{re}			X 10^{-4}
(V_{CE}= –10 Vdc, I_C = –1.0 mAdc, f = 1.0 kHz)		0.1	10	
Small–Signal Current Gain	h_{fe}			—
(V_{CE}= –10 Vdc, I_C = –1.0 mAdc, f = 1.0 kHz)		100	400	
Output Admittance	* h_{oe}			μmhos
(V_{CE}= –10 Vdc, I_C = –1.0 mAdc, f = 1.0 kHz)		3.0	60	
Noise Figure	NF			dB
(V_{CE}= –5.0Vdc, I_C = –100 μAdc, R_S =1.0 kΩ, f =1.0kHz)		—	4.0	

SWITCHING CHARACTERISTICS

Delay Time	(V_{CC} = – 3.0 Vdc, V_{BE} = 0.5 Vdc,	t_d	—	35	
Rise Time	I_C = –10 mAdc, I_{B1} = –1.0 mAdc)	t_d	—	35	ns
Storage Time	(V_{CC} = –3.0 Vdc, I_C = –10 mAdc,	t_s	—	225	ns
Fall Time	I_{B1} = I_{B2} = –1.0 mAdc)	t_f	—	75	

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

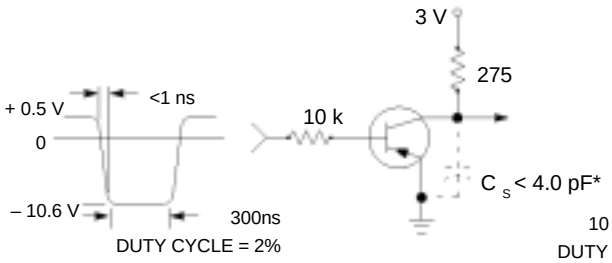


Figure 1. Delay and Rise Time Equivalent Test Circuit

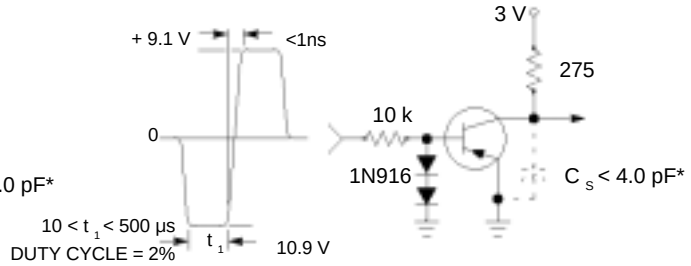


Figure 2. Storage and Fall Time Equivalent Test Circuit

*Total shunt capacitance of test jig and connectors

TYPICAL TRANSIENT CHARACTERISTICS

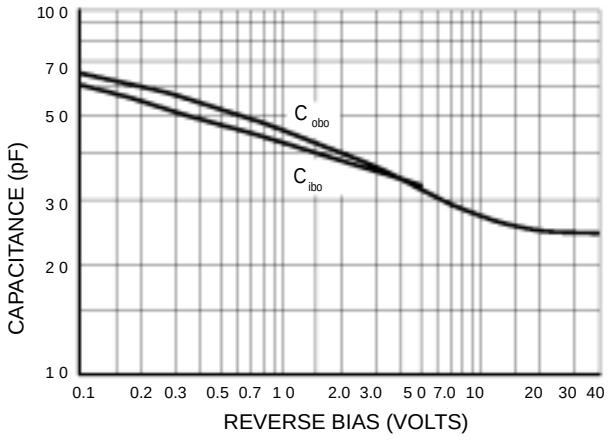


Figure 3. Capacitance

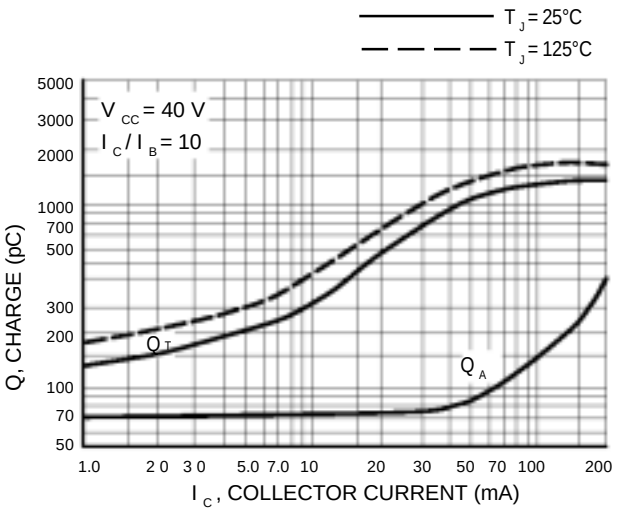


Figure 4. Charge Data

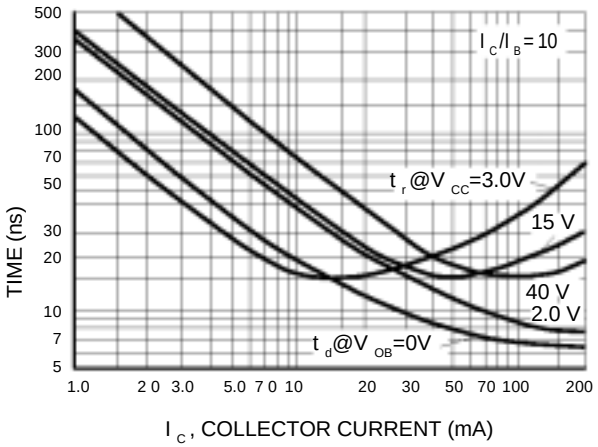


Figure 5. Turn–On Time

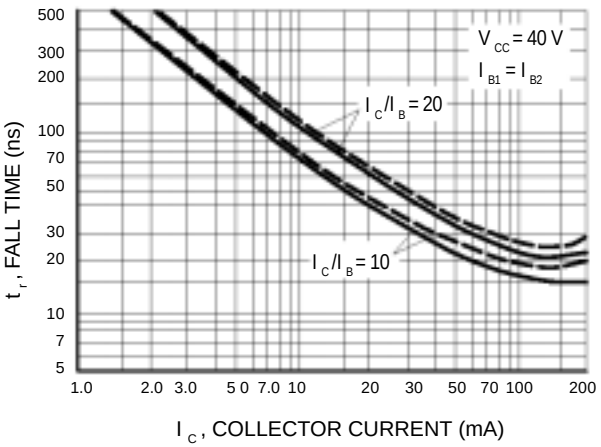


Figure 6. Fall Time

TYPICAL AUDIO SMALL–SIGNAL CHARACTERISTICS

NOISE FIGURE VARIATIONS

(V_{CE} = – 5.0 Vdc, T_A = 25°C, Bandwidth = 1.0 Hz)

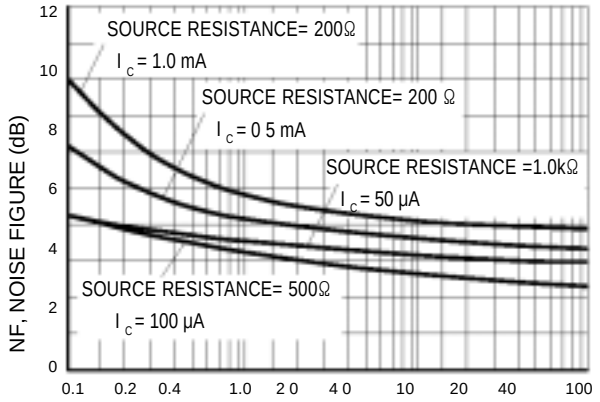


Figure 7. Noise Figure

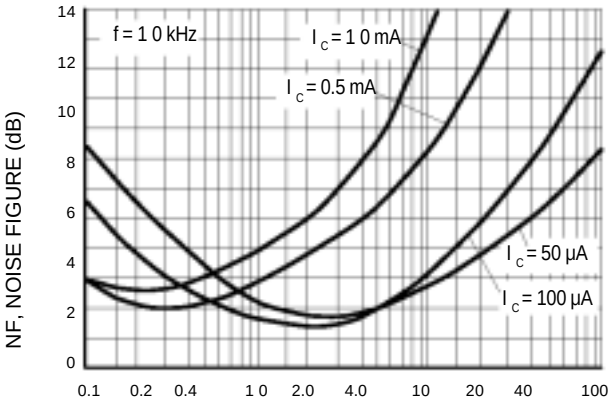


Figure 8. Noise Figure

h PARAMETERS

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

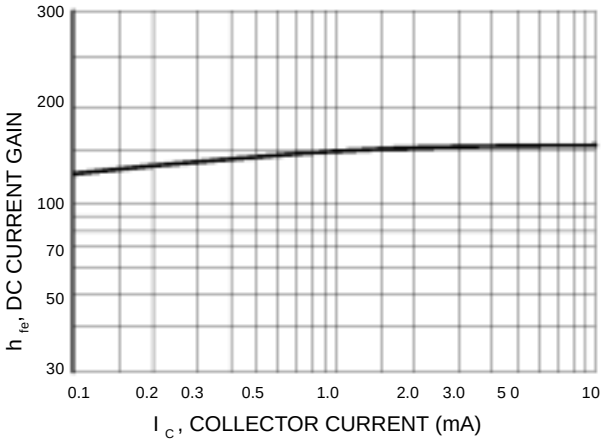


Figure 9. Current Gain

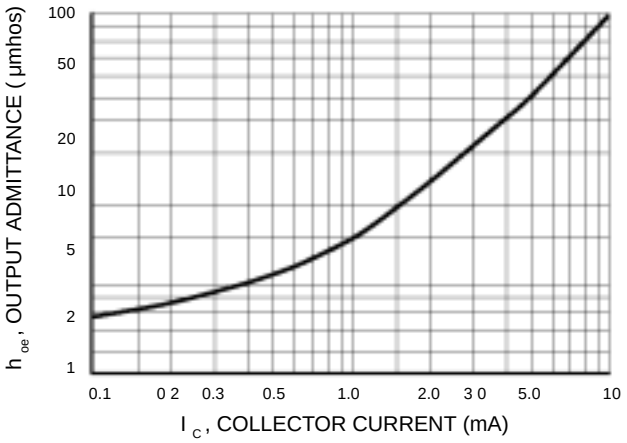


Figure 10. Output Admittance

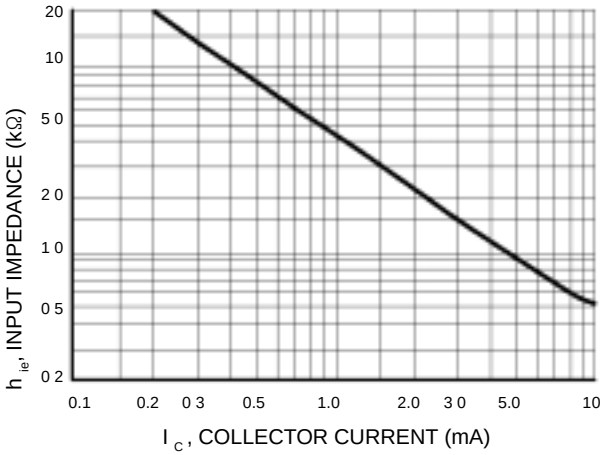


Figure 11. Input Impedance

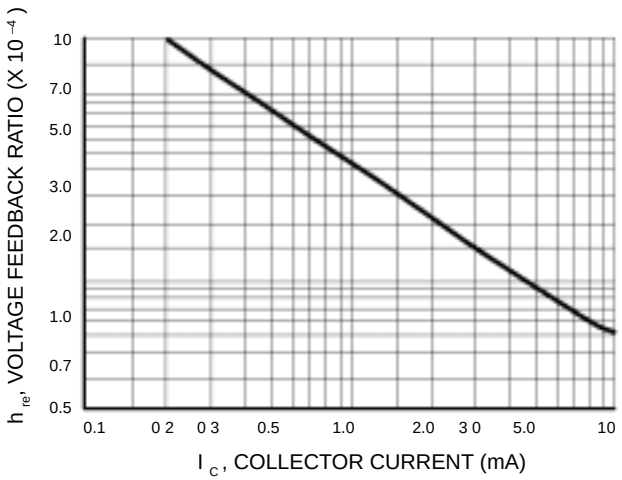


Figure 12. Voltage Feedback Ratio

TYPICAL STATIC CHARACTERISTICS

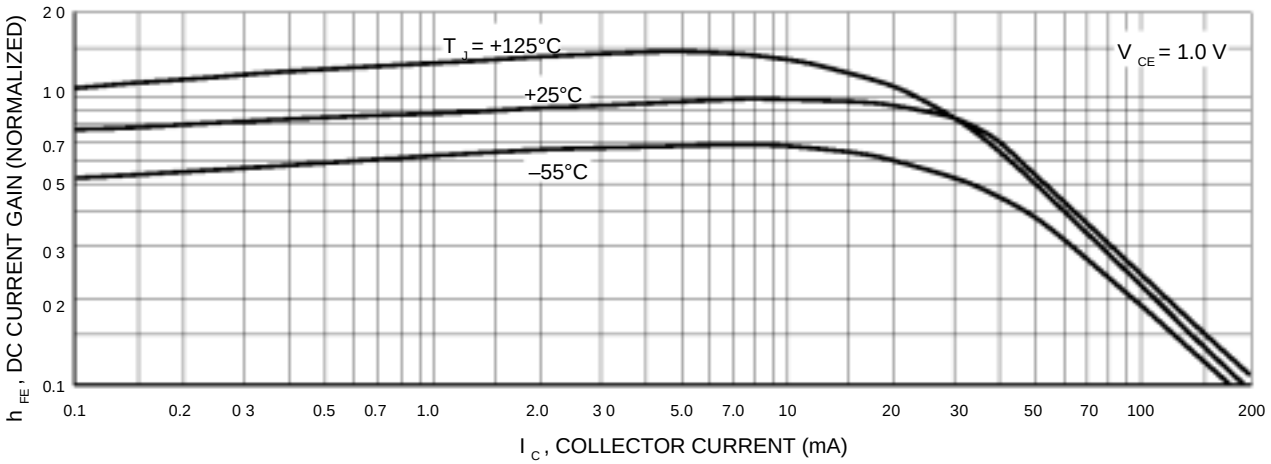


Figure 13. DC Current Gain

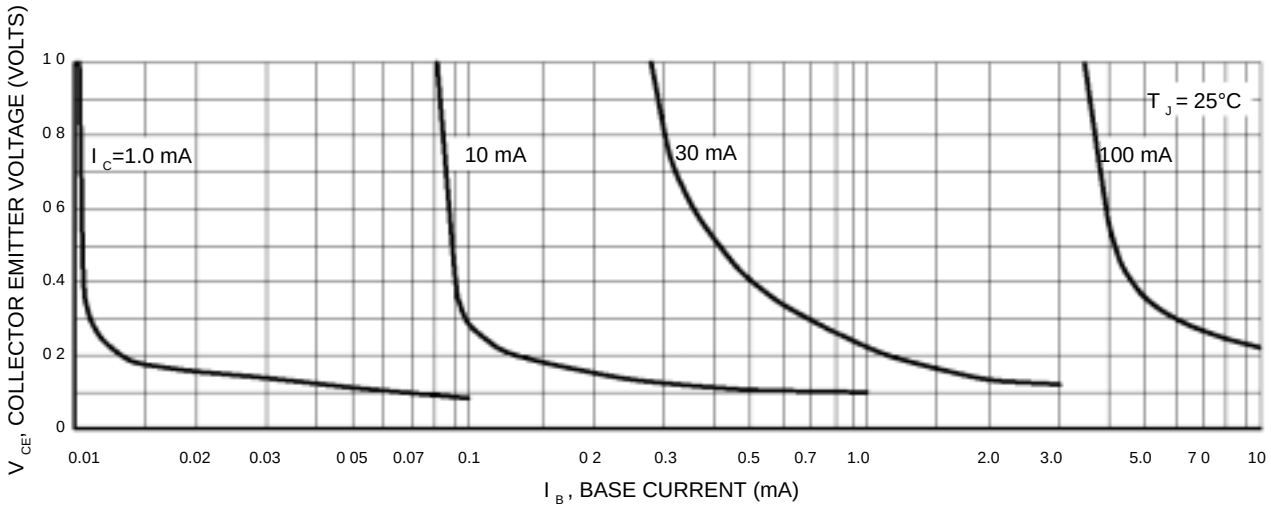


Figure 14. Collector Saturation Region

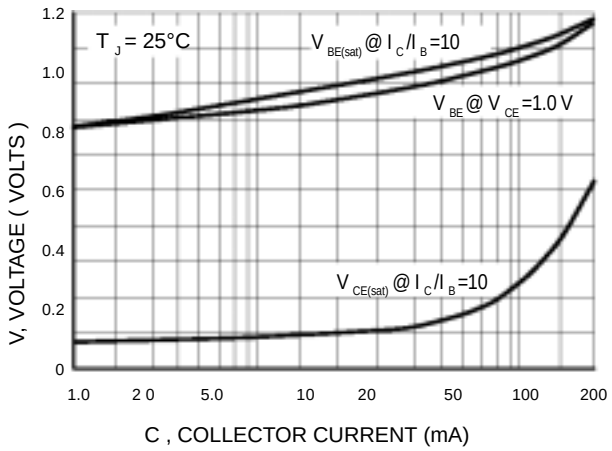


Figure 15. “ON” Voltages

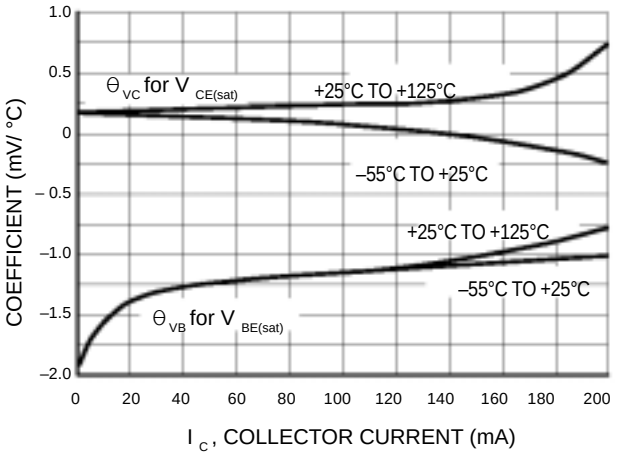


Figure 16. Temperature Coefficients

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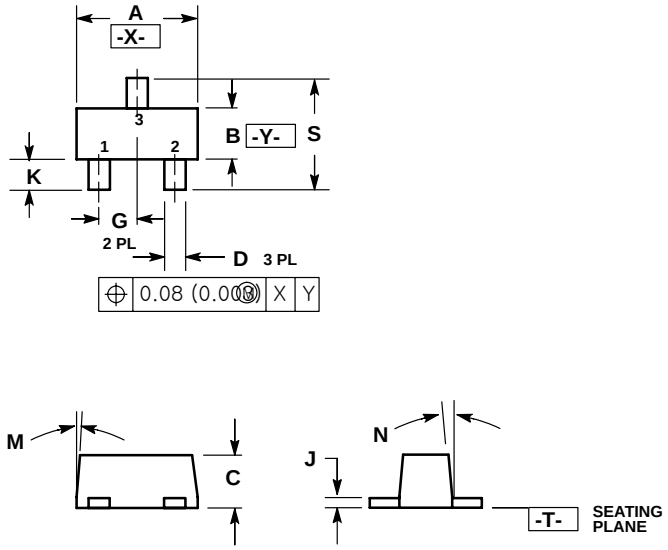
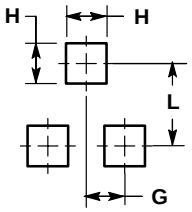


NOTES:
1. D MENSIONING AND TOLERANC NG PER ANSI Y14.5M, 1982.
2. CONTROLLING D MENSION: M LLIMETERS
3. MAXIMUM LEAD THICKNESS NCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 463C-01 OBSOLETE, NEW STANDARD 463C-02.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	1.50	1.60	1.70	0.059	0.063	0.067
B	0.75	0.85	0.95	0.030	0.034	0.040
C	0.60	0.70	0.80	0.024	0.028	0.031
D	0.23	0.28	0.33	0.009	0.011	0.013
G		0.50 BSC			0.020 BSC	
H		0.53 REF			0.021 REF	
J	0.10	0.15	0.20	0.004	0.006	0.008
K	0.30	0.40	0.50	0.012	0.016	0.020
L		1.10 REF			0.043 REF	
M	−−−	−−−	°	10	−−−	°0
N	−−−	−−−	°	10	−−−	°0
S	1.50	1.60	1.70	0.059	0.063	0.067



RECOMMENDED PATTERN OF SOLDER PADS