

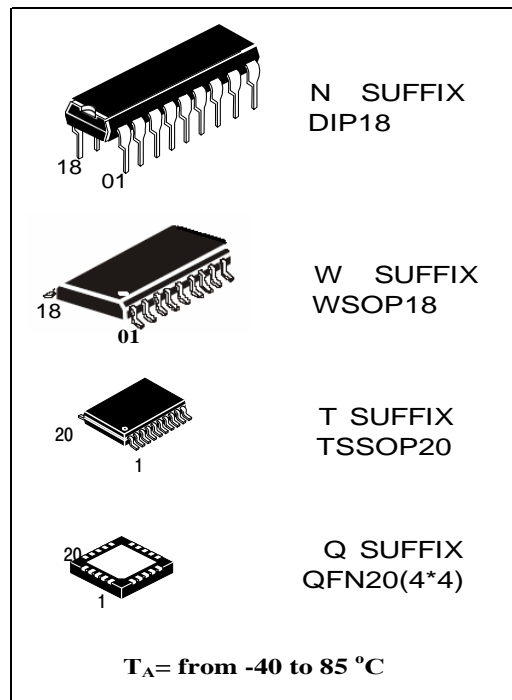
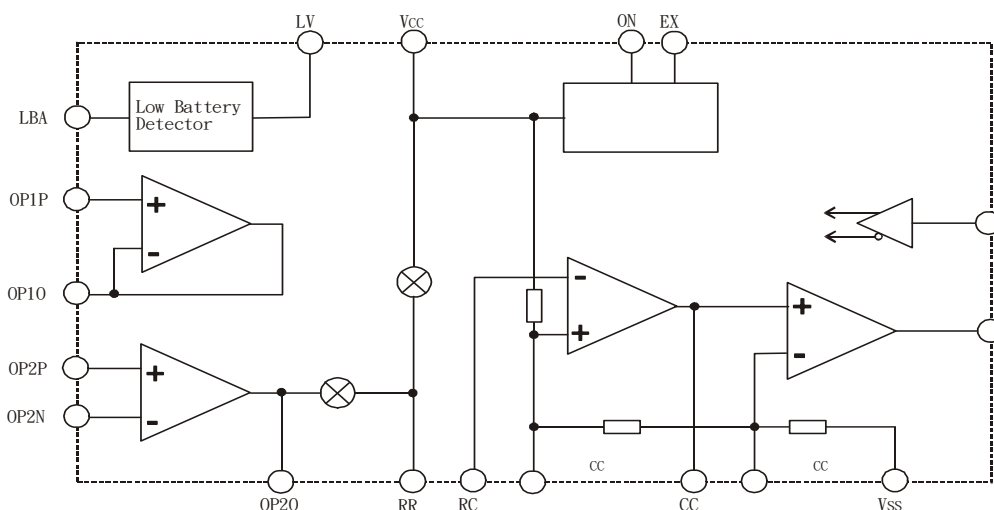
Pressure sensor drive

The HT8314 is high performance, very low power, front-end analog processor CMOS IC, includes operational amplifier, comparators, low battery detector, switched voltage source and charge/ discharge control circuitry. The HT8314 is designed specifically to drive a piezo-resistive pressure sensor and providing the analog architecture of dual-slope converting to operate from the control bus of a wide variety of microprocessor. The input stage consist of a high impedance buffer to achieve stable bias current with varying input voltage. A built-in low noise amplifier is used for achieving high level output from the buffer. In operation, the unknown amplified signal voltage is integrated during a certain time, then re-integrates to a known reference voltage and measures the amount of time required to bring the integration back to its original value. When charged by a constant current the voltage on the external capacitor is a linear function of time and can be used to connect the voltage on the external capacitor is a linear function of time and can be used to connect the input voltage being measured to the time as determined by a digital counter.

FUNCTIONS

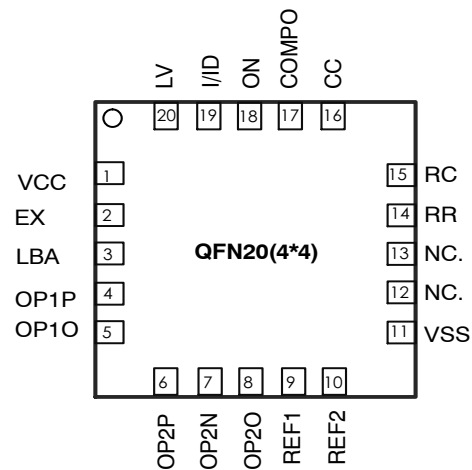
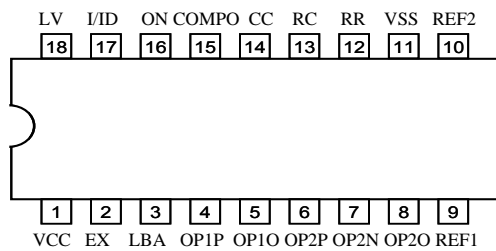
- Dual-Slope analog converting
- Low standby current: 0.5 μ A
- Low power operation – 0.9 mW
- Low operating voltage: 2.4V ~ 5.2V
- Adjustable low-battery detector

BLOCK DIAGRAM

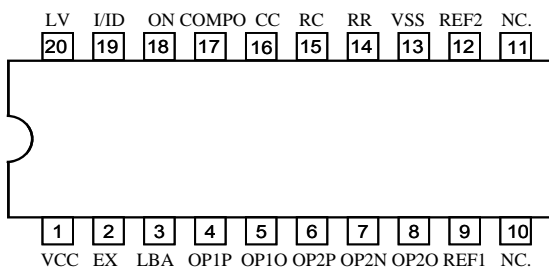


Pin Assignment (top view)

PIN Name	Description
V _{CC}	Positive power supply
EX	Sensor excitation
LBA	Low-battery adjustment
OP1P	Positive input of the OA1
OP1O	Output of the OA1
OP2P	Positive input of the OA2
OP2N	Negative input of the OA2
OP2O	Output of the OA2
REF1	Input of reference voltage
REF2	Input of reference voltage
V _{SS}	Negative power supply
RR	The terminal of integrating resistor
RC	The terminal of integrating capacitor and resistor
CC	The terminal of integrating capacitor
COMPO	The output of comparator
ON	System power supply control: Hi = ON, Low = shutdown
I/DI	The ADC charge and discharge control: Hi = Charge, Low = Discharge
LV	Low-battery detector output. For battery low, the output goes high

(WSOP18,DIP18)


Exposed center pad of the QFN package: GND

(TSSOP20,SSOP20)


ELECTRICAL CHARACTERISTICS

$V_{CC} = 3.0V$, $T_A = 25^{\circ}C$, $V_{SS} = 0V$, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Operating Voltage	V_{CC}		2.4	3.0	5.2	V
Supply Current	I_{CC}			300	500	μA
Standby Current	I_{STB}	ON = V_{CC}		0.5	2	μA
Output Source Current	I_{EX}	ON = V_{CC}		10	12	mA
Output Sink Current	I_{COMPO}	ON = V_{CC}		1.0	1.1	mA

FUNCTIONAL DESCRIPTION
1. LBA/LV

The HT8314 has a built-in low-battery detector, of which the LBA is low battery adjustment pin, where an external resistor-divider is used to set the desired trip voltage. When the supply voltage is below the reference voltage, the LV pin (a CMOS output) goes high.

2. OPERATIONAL AMPLIFIER OA1

OA1 is configured as a voltage follower internally to provide low impedance at the input of OA2 to preserve good common mode rejection.

3. OPERATIONAL AMPLIFIER OA2

OA2 is configured as non-inverting amplifier. This provides a correcting way to the low level uncalibrated sensor and achieves a high-level output signal.

4. TRANSMISSION GATES & INTEGRATOR

The transmission gate consist of digitally controlled analog switches to configure the analog path for charging and discharging on the integrating capacitor. Based on proper integrating interval, the integrating resistor and capacitor should be selected to remain in linear region and give maximum voltage swing. An additional requirement of the integrating capacitor is that it must have a low dielectric absorption to prevent roll-over errors, while 0.22 μF polypropylene capacitor gives good result.

5. INTEGRATE CONTROL I/DI

When the I/DI goes high, the HT8314 will enter to signal integrate phase. The current $I_{CH} (V_{REF1} - V_{IN})/R5$ that is proportional to the amplified signal will charge the integrating capacitor C2. The signal continues to be integrated for a predicted time interval T1 that is determined by the user's program. When I/DI does low, it will enter to reference integrate (de-integrate) phase. At the beginning of this phase, the integrator input is switched from V_{IN} to V_{CC} . The polarity of the reference voltage will be opposite of the input signal, and the integration capacitor will discharge at a rate proportional to $(V_{CC} - V_{REF1})/R5$.

6. COMPO

In de-integrating phase, the path of integrator is switched to reference voltage and the counter of controlling processor is initially reset to zero. The control logic will enable the counter in the end of integrate phase. Thus, the output of counter will keep incrementing and stop counting as long as the comparator output COMPO goes low. The counter output is proportional to the measured signal and can be converted to digital data through external processor.

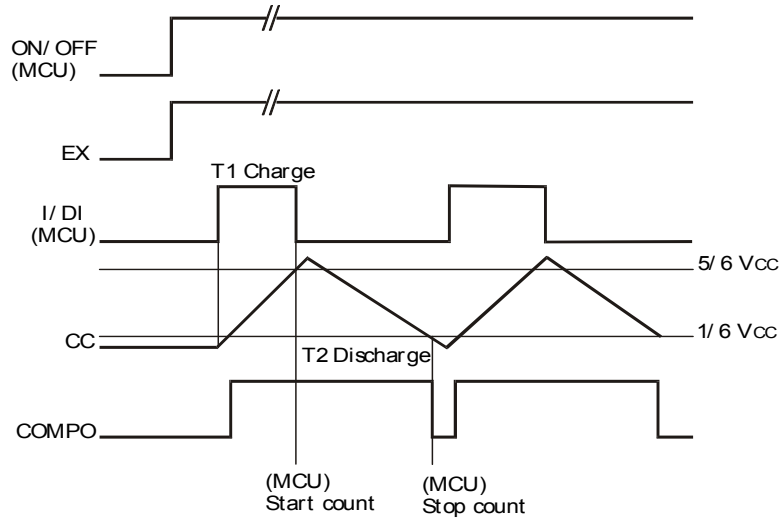
7. ON

When ON pin is low, the HT8314 enter shutdown mode. In this mode, the internal biasing circuitry is turned off (including the reference). The supply current drops to less than 2 μA . connect this pin to high for normal operation.

8. SWITCHED VOTAGE SOURCE EX

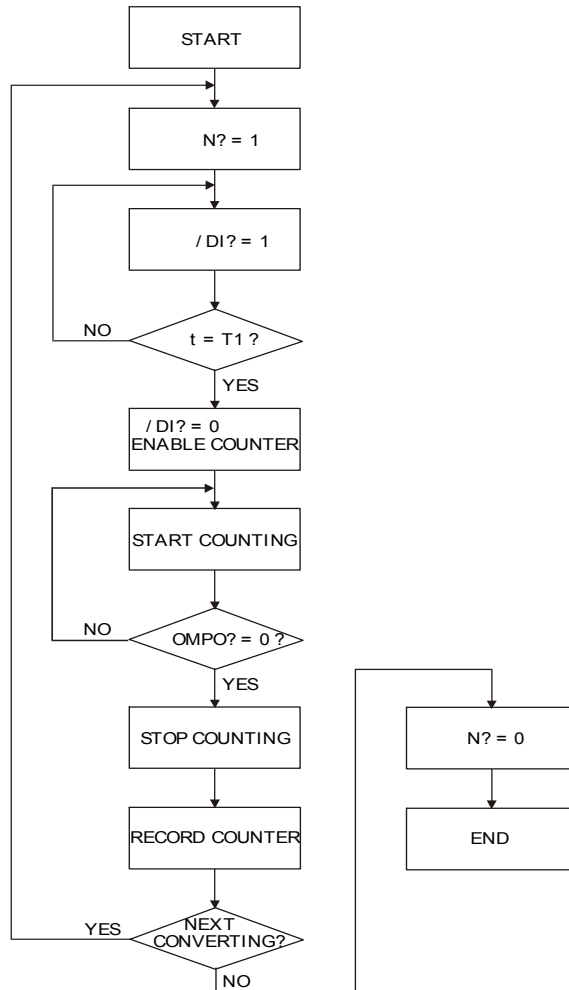
The EX is used for sensor excitation and controlled by ON synchronously. The out voltage of EX is ratiometric to the supply voltage, and the current output is 10mA typically.

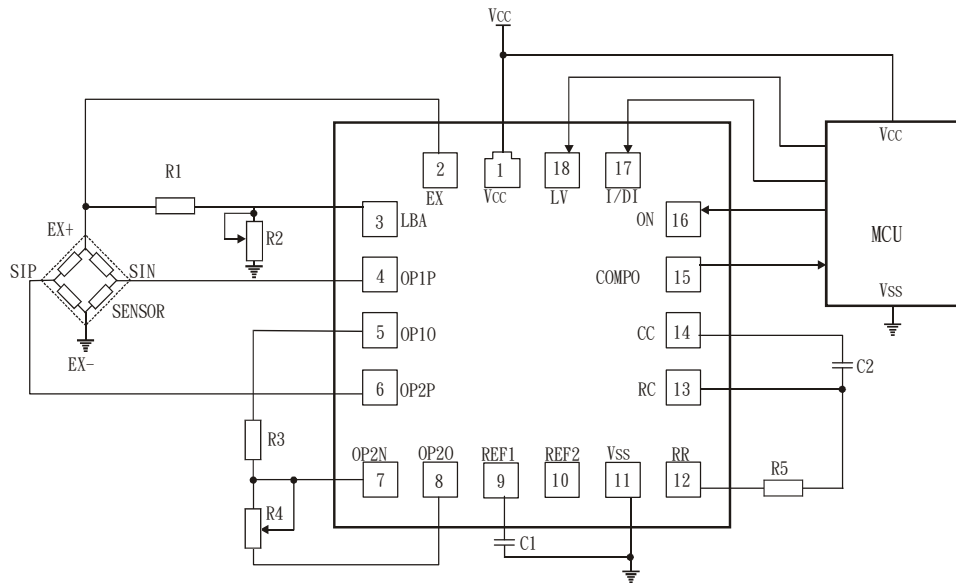
CONTROL SIGNAL AND TIMING DIAGRAM



T1: Integrate Time (preset in programming)
T2: De-integrate Time (proportional to the measured signal)

PROGRAMMING FLOW

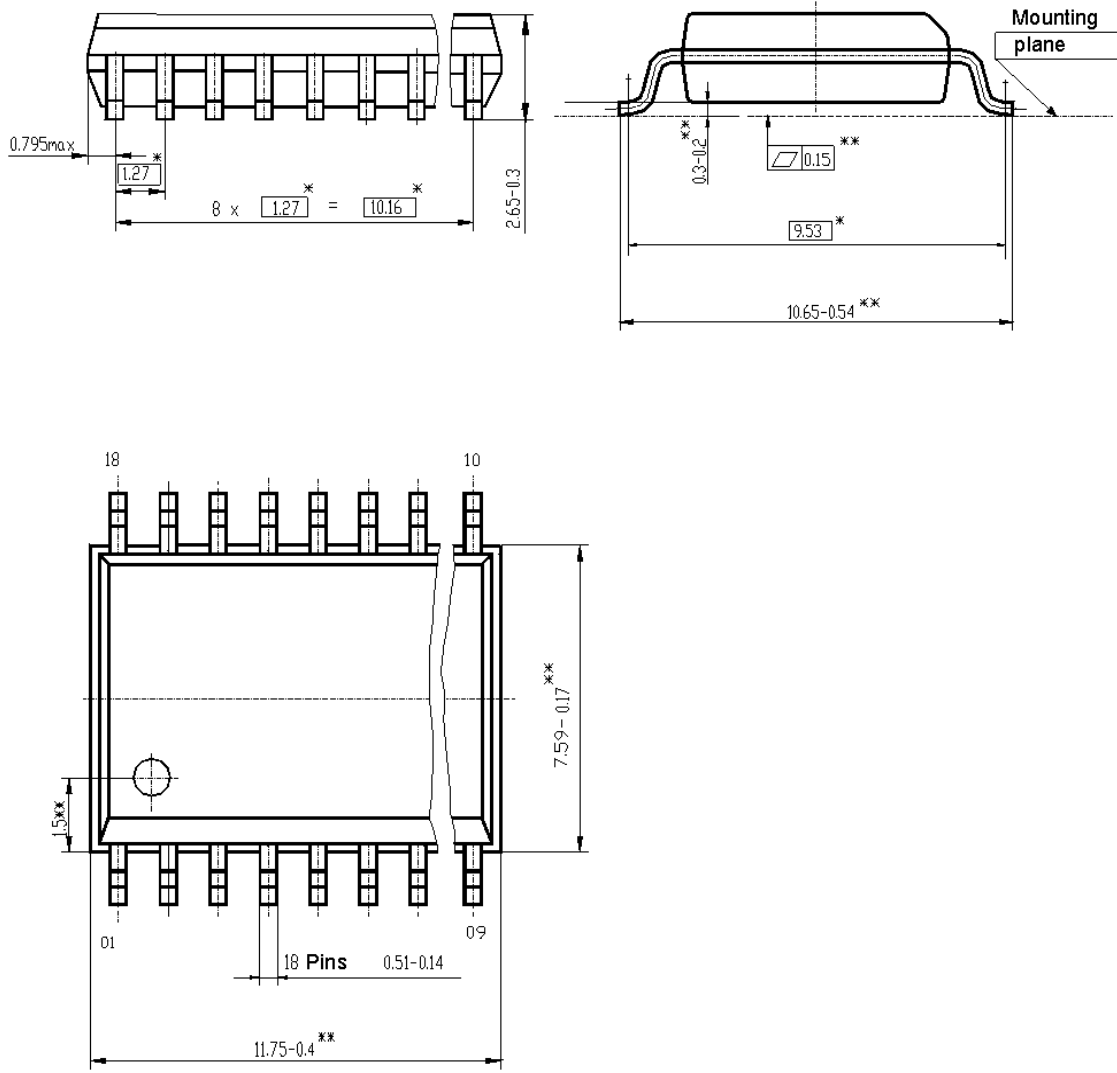


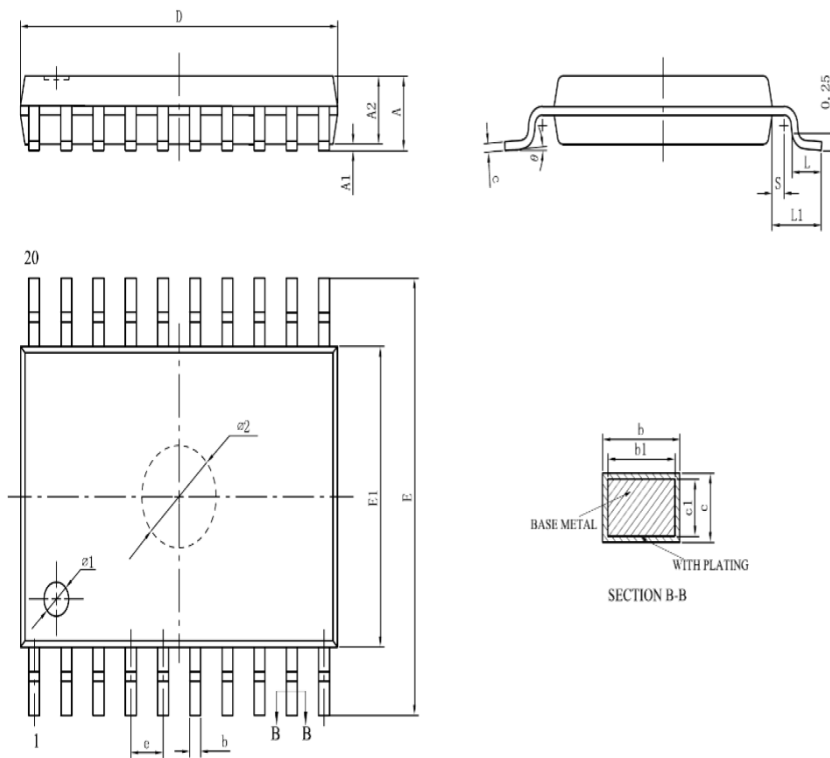
APPLICATION CIRCUIT

NOTES:

- R3, R4 and R5 must use $\pm 1\%$ metal film and low temperature coefficient resistor.
- The capacitor C2 should choose good quality metalized polyester or polypropylene film type and $\pm 5\%$.
- $0.1\mu\text{F}$ capacitor is recommended to across REF1 and GND for noise rejection.
- Fine trim of R4 should be designed by a fixed resistor in-series with a small resistance VR.
- Shorten path of PCB tracks between sensor and HT8314.
- Enable and warm-up the HT8314 chip about 20-50ms before conversion, it is because of stabilization of pressure sensor and other components are required.

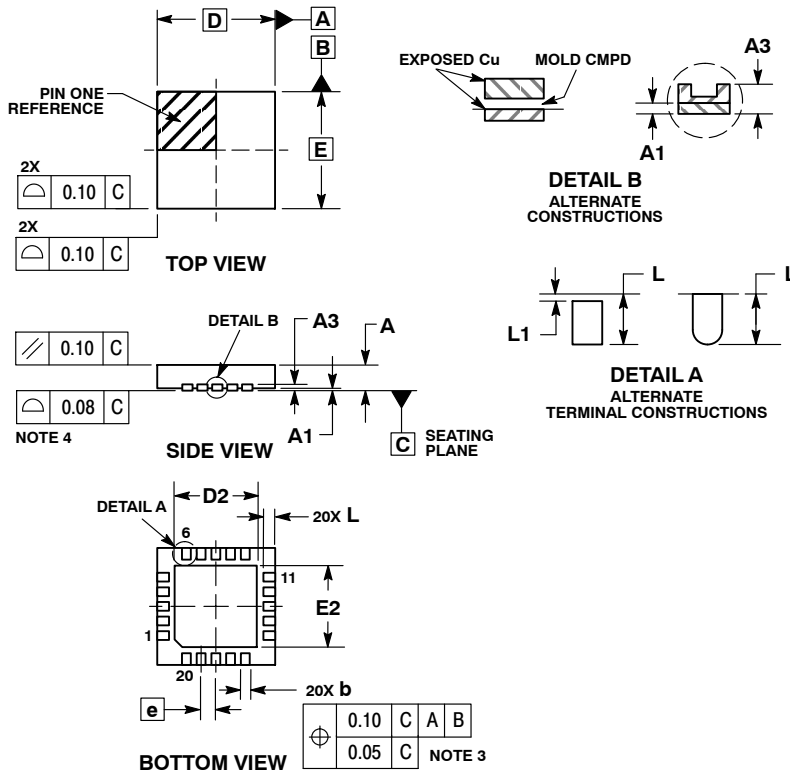
Package dimensions

WSOP18



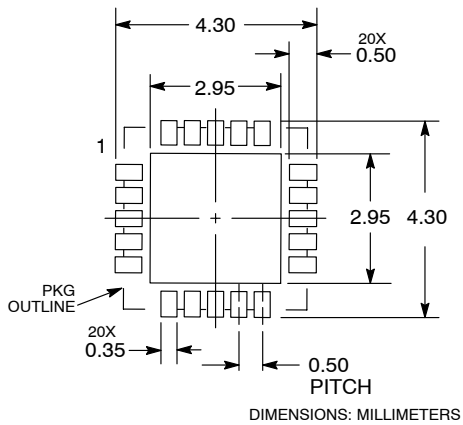
TSSOP20


SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.80	1.00	1.05
b	0.19	—	0.30
b1	0.19	0.22	0.25
c	0.09	—	0.20
c1	0.09	—	0.16
D	6.40	6.50	6.60
E1	4.30	4.40	4.50
E	6.20	6.40	6.60
e	0.65BSC		
L	0.45	0.60	0.75
L1	1.00BSC		
S	0.20	—	—
Ø1	Ø0.8X0.05-0.10DP		
Ø2	Ø1.50X0.05-0.15DP		
θ	0	—	8°
L/P载体尺寸 (mil)	118*165 (C)		

QFN20 4x4, 0.5P

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

DIM	MILLIMETERS	
	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.20	REF
b	0.25	0.35
D	4.00	BSC
D2	2.75	2.85
E	4.00	BSC
E2	2.75	2.85
e	0.50	BSC
L	0.25	0.35
L1	0.00	0.15

SOLDERING FOOTPRINT*


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