



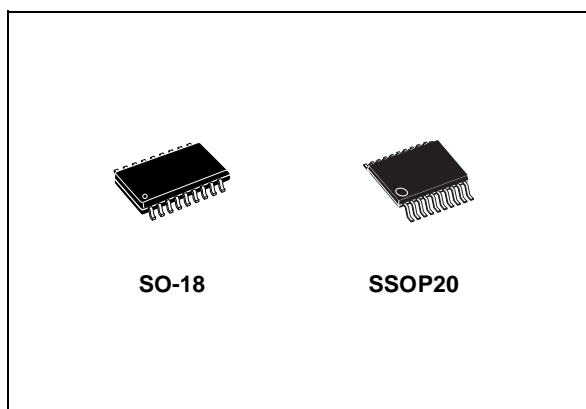
ST3384E

±15KV ESD-PROTECTED, 3 TO 5.5V, LOW POWER, UP TO 250KBPS, RS-232 TRANSCEIVER

- ESD PROTECTION FOR RS-232 I/O PINS
±15KV (HUMAN BODY MODEL)
- LATCHUP FREE
- 1µA LOW POWER SHUTDOWN
- 300µA SUPPLY CURRENT
- 250Kbps GUARANTEED DATA RATE
- 20µs TYPICAL TIME TO EXIT SHUTDOWN
- 6V/µs GUARANTEED SLEW RATE
- MEET EIA/TIA-232 SPECIFICATIONS DOWN
TO 3V
- PACKAGES: SO-18 AND SSOP-20

DESCRIPTION

The ST3384E is a 3V powered EIA/TIA-232 and V.28/V.24 communications interface with low power requirements, high data-rate capabilities and enhanced electrostatic discharge (ESD) protection. All transmitter outputs and receiver inputs are protected to ±15kV using the Human Body Model. The ST3384E has a proprietary low dropout transmitter output stage enabling true RS-232 performance from 3 to 5.5V supplies with a dual charge pump. The charge pump requires only four small 0.1µF external capacitors for operation from a 3.3V supply.



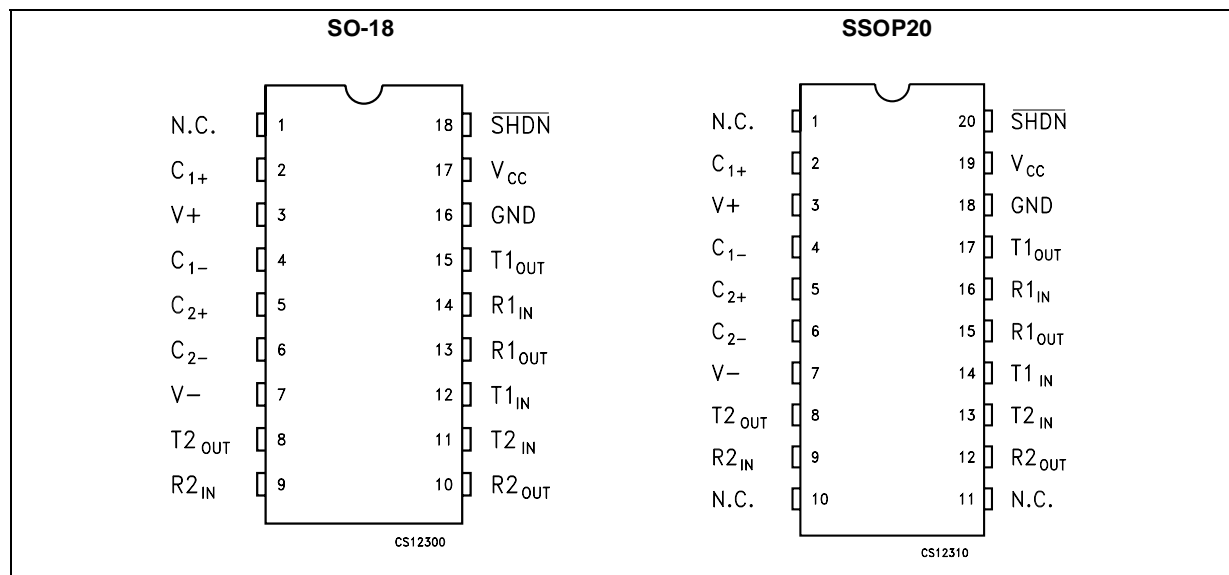
The device is guaranteed to run at data rates of 250Kbps while maintaining RS-232 output levels. The ST3384E has two receivers and two drivers. It features a 1µA shutdown mode that reduces power consumption and extends battery life in portable systems.

Typical applications are in Notebook, Sub-notebook, and Palmtop Computers, Battery Powered Equipment, Hand-Held Equipment, Peripherals, Printers.

ORDERING CODES

Type	Temperature Range	Package	Comments
ST3384ECD	0 to 70 °C	SO-18 (Tube)	50 parts per tube / 20 tube per box
ST3384EBD	-40 to 85 °C	SO-18 (Tube)	50 parts per tube / 20 tube per box
ST3384ECDR	0 to 70 °C	SO-18 (Tape & Reel)	1000 parts per reel
ST3384EBDR	-40 to 85 °C	SO-18 (Tape & Reel)	1000 parts per reel
ST3384ECPR	0 to 70 °C	SSOP20 (Tape & Reel)	1350 parts per reel
ST3384EBPR	-40 to 85 °C	SSOP20 (Tape & Reel)	1350 parts per reel

PIN CONFIGURATION



PIN DESCRIPTION

PIN N° (SO-18)	PIN N° (SSOP20)	SYMBOL	NAME AND FUNCTION
1	1, 10, 11	N.C.	Not Connected
2	2	C ₁₊	Positive Terminal for the first Charge Pump Capacitor
3	3	V+	5.5V Generated By The Charge Pump
4	4	C ₁₋	Negative Terminal for the first Charge Pump Capacitor
5	5	C ₂₊	Positive Terminal for the second Charge Pump Capacitor
6	6	C ₂₋	Negative Terminal for the second Charge Pump Capacitor
7	7	V-	-5.5V Generated By The Charge Pump
8	8	T2 _{OUT}	Second Transmitter Output Voltage
9	9	R2 _{IN}	Second Receiver Input Voltage
10	12	R2 _{OUT}	Second Receiver Output Voltage
11	13	T2 _{IN}	Second Transmitter Input Voltage
12	14	T1 _{IN}	First Transmitter Input Voltage
13	15	R1 _{OUT}	First Receiver Output Voltage
14	16	R1 _{IN}	First Receiver Input Voltage
15	17	T1 _{OUT}	First Transmitter Output Voltage
16	18	GND	Ground
17	19	V _{CC}	3V to 5.5V Supply Voltage. Connect a 0.1µF capacitor to GND
18	20	SHDN	Active Low Shutdown Control Input. Drive Low To Shut-down Transmitters, receiver and Charge Pump

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage (V_{CC} to GND)	-0.3 to 6	V
V+	Doubled Voltage Terminal (V+ to GND) (Note 1)	($V_{CC} - 0.3$) to 7	V
V-	Inverted Voltage Terminal (V- to GND) (Note 1)	0.3 to -7	V
$V+ + V- $	(Note 1)	13	V
T_{IN}	Transmitter Input Voltage	-0.3 to 6	V
SHDN	Shutdown Input Voltage (SHDN to GND)	-0.3 to 6	V
R_{IN}	Receiver Input Voltage (R_{IN} to GND)	± 25	V
T_{OUT}	Transmitter Output Voltage (T_{OUT} to GND)	± 13.2	V
R_{OUT}	Receiver Output Voltage	-0.3 to ($V_{CC} + 0.3$)	V
t_{SHORT}	Transmitter Output Short to GND Time	Continuous	

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied. V+ and V- can have a maximum magnitude of +7V, but their absolute addition cannot exceed 13 V.

Note 1: V+ and V- can have maximum magnitude of 7V, but their absolute difference cannot exceed 13V.

SHUTDOWN TRUTH TABLE

SHDN	T-OUT	R-OUT
L	High Z	High Z
H	Active	Active

ELECTRICAL CHARACTERISTICS

($C_1 - C_4 = 0.1\mu F$, $V_{CC} = 3V$ to $5.5V$, tested at $3.3V \pm 10\%$ $C_1 = 0.047\mu F$, $C_2 - C_4 = 0.33\mu F$ tested at $5V \pm 10\%$ $-40^\circ C < T_A < 85^\circ C$ unless otherwise noted. Typical values are referred to $T_A = 25^\circ C$)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CC}	V_{CC} Power Supply Current	SHDN = NO LOAD		0.3	1	mA
I_{SHDN}	SHUTDOWN Supply Current	SHDN = GND		1	10	μA
ESD	R-IN, T-OUT Electrostatic Discharge Immunity	Human Body Model		± 15		kV

LOGIC INPUT ELECTRICAL CHARACTERISTICS

($C_1 - C_4 = 0.1\mu F$, $V_{CC} = 3V$ to $5.5V$, tested at $3.3V \pm 10\%$ $C_1 = 0.047\mu F$, $C_2 - C_4 = 0.33\mu F$ tested at $5V \pm 10\%$ $-40^\circ C < T_A < 85^\circ C$ unless otherwise noted. Typical values are referred to $T_A = 25^\circ C$)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{IL}	Input Logic Threshold Low	T-IN, SHDN			0.8	V
V_{IH}	Input Logic Threshold High	T-IN, SHDN $V_{CC} = 3.3V$	2			V
		T-IN, SHDN $V_{CC} = 5.0V$	2.4			
V_{HYS}	Transmitter Input Hysteresis			0.5		V
I_{IL}	Input Leakage Current	T-IN, SHDN		± 0.01	± 1	μA

TRANSMITTER ELECTRICAL CHARACTERISTICS

($C_1 - C_4 = 0.1\mu\text{F}$, $V_{CC} = 3\text{V}$ to 5.5V , tested at $3.3\text{V} \pm 10\%$ $C_1 = 0.047\mu\text{F}$, $C_2 - C_4 = 0.33\mu\text{F}$ tested at $5\text{V} \pm 10\%$ $-40^\circ\text{C} < T_A < 85^\circ\text{C}$ unless otherwise noted. Typical values are referred to $T_A = 25^\circ\text{C}$)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{TOUT}	Output Voltage Swing	All Transmitter outputs loaded with $3\text{K}\Omega$ to GND	± 5	± 5.4		V
R_{TOUT}	Transmitter Output Resistance	$V_{CC} = V_+ = V_- = 0\text{V}$ Transmitter output = $\pm 2\text{V}$	300	10M		Ω
I_{TSC}	Output Short Circuit Current			± 50		mA
I_{TOL}	Output Leakage Current	$V_{CC} = 0\text{V}$ or 3V to 5.5V $V_{\text{OUT}} = \pm 12\text{V}$ Transmitters Disabled			± 25	μA

RECEIVER DC TARGET ELECTRICAL CHARACTERISTICS

($C_1 - C_4 = 0.1\mu\text{F}$, $V_{CC} = 3\text{V}$ to 5.5V , tested at $3.3\text{V} \pm 10\%$ $C_1 = 0.047\mu\text{F}$, $C_2 - C_4 = 0.33\mu\text{F}$ tested at $5\text{V} \pm 10\%$ $-40^\circ\text{C} < T_A < 85^\circ\text{C}$ unless otherwise noted. Typical values are referred to $T_A = 25^\circ\text{C}$)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{OL}	Output Leakage Current	R-OUT, Receiver Disabled		± 0.05	± 10	μA
V_{RIN}	Input Voltage Operating Range		-25		± 25	V
V_{RIL}	Input Threshold Low	$T_A = 25^\circ\text{C}$ $V_{CC} = 3.3\text{V}$	0.6	1.2		V
		$T_A = 25^\circ\text{C}$ $V_{CC} = 5.5\text{V}$	0.8	1.5		
V_{RITH}	Input Threshold High	$T_A = 25^\circ\text{C}$ $V_{CC} = 3.3\text{V}$		1.5	2.4	V
		$T_A = 25^\circ\text{C}$ $V_{CC} = 5.5\text{V}$		1.8	2.4	
V_{RIH}	Input Hysteresis			0.5		V
R_{RIN}	Input Resistance	$T_A = 25^\circ\text{C}$	3	5	7	$\text{K}\Omega$
V_{ROL}	TTL/CMOS Output Voltage Low	$I_{\text{OUT}} = 2\text{mA}$			0.4	V
V_{ROH}	TTL/CMOS Output Voltage High	$I_{\text{OUT}} = -1\text{mA}$	$V_{CC}-0.6$	$V_{CC}-0.1$		V

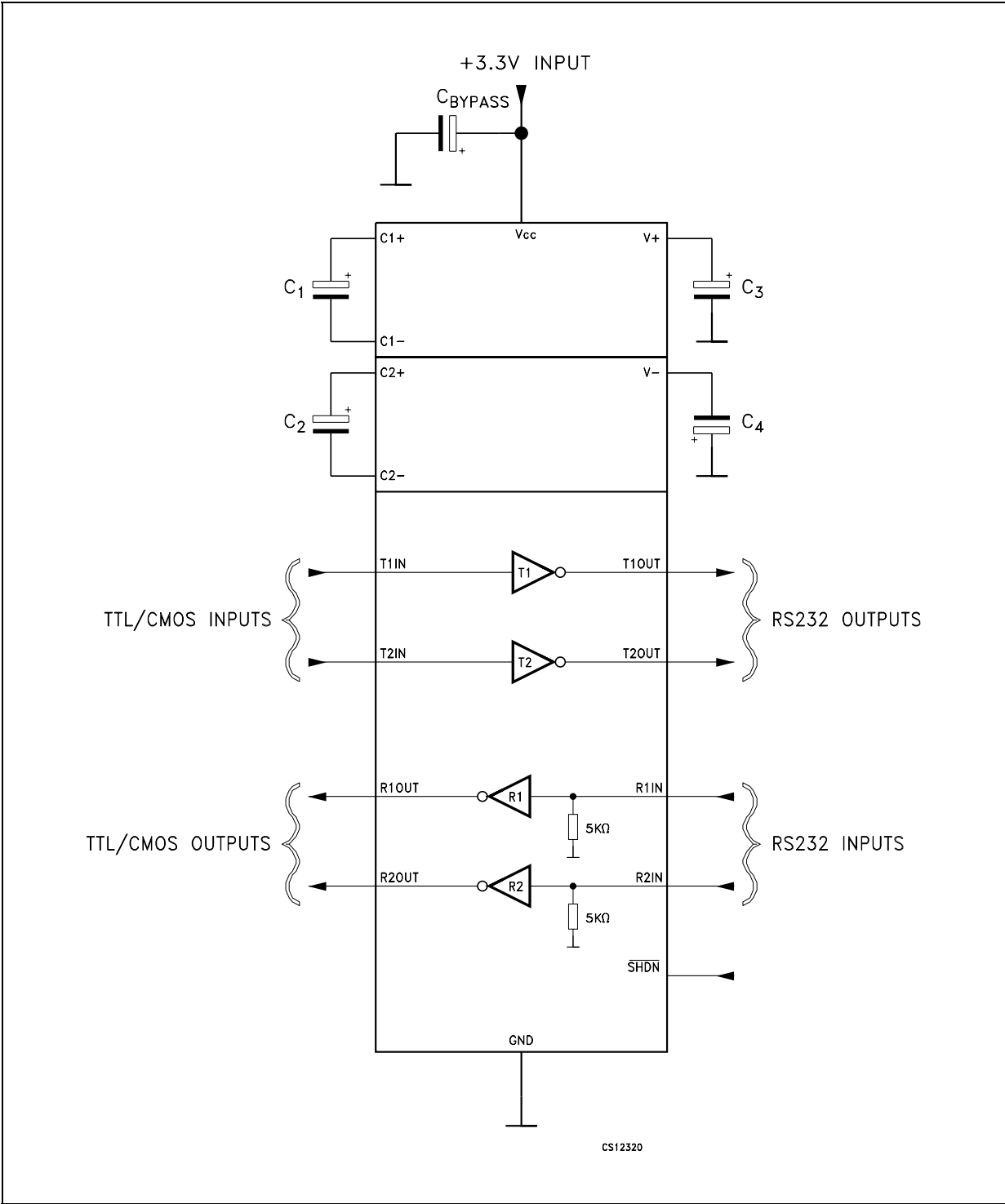
TIMING TARGET ELECTRICAL CHARACTERISTICS

($C_1 - C_4 = 0.1\mu\text{F}$, $V_{CC} = 3\text{V}$ to 5.5V , tested at $3.3\text{V} \pm 10\%$ $C_1 = 0.047\mu\text{F}$, $C_2 - C_4 = 0.33\mu\text{F}$ tested at $5\text{V} \pm 10\%$ $-40^\circ\text{C} < T_A < 85^\circ\text{C}$ unless otherwise noted. Typical values are referred to $T_A = 25^\circ\text{C}$)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
D_R	Maximum Data Rate	$R_L = 3\text{K}\Omega$ $C_{L2} = 1000\text{pF}$ one transmitter switching	250			Kbps
t_{PHLR} t_{PLHR}	Receiver Propagation Delay	R_{XIN} to R_{XOUT} $C_L = 150\text{pF}$		0.15		μs
$ t_{\text{PHLT}} - t_{\text{PLHT}} $	Transmitter Propagation Delay Difference (Note 1)	(Note 1)		150		ns
$ t_{\text{PHLR}} - t_{\text{PLHR}} $	Receiver Propagation Delay Difference			100		ns
t_{EX}	Time to Exit Shutdown	$V_{\text{OUT}} \geq 3\text{V}$, R_{LOAD} at $V_+ = 3\text{K}\Omega$		20		μs
S_{RT}	Transition Slew Rate	$T_A = 25^\circ\text{C}$ $R_L = 3\text{K}\Omega$ to $7\text{K}\Omega$ $V_{CC} = 3.3\text{V}$ Measured from $+3\text{V}$ to -3V or -3V to $+3\text{V}$ $C_L = 150\text{pF}$ to 1000pF $C_L = 150\text{pF}$ to 2500pF	6 4	8 8	30 30	$\text{V}/\mu\text{s}$ $\text{V}/\mu\text{s}$

(Note 1) Transmitter Skew is measured at the transmitter zero cross points.

TYPICAL OPERATING CIRCUIT

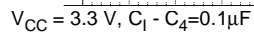
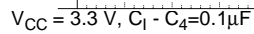


CAPACITANCE VALUE (μF)

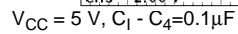
C1	C2	C3	C4	Cbypass
0.1	0.1	0.1	0.1	0.1



Figure 1 : Loopback Test Result at 120 kbps

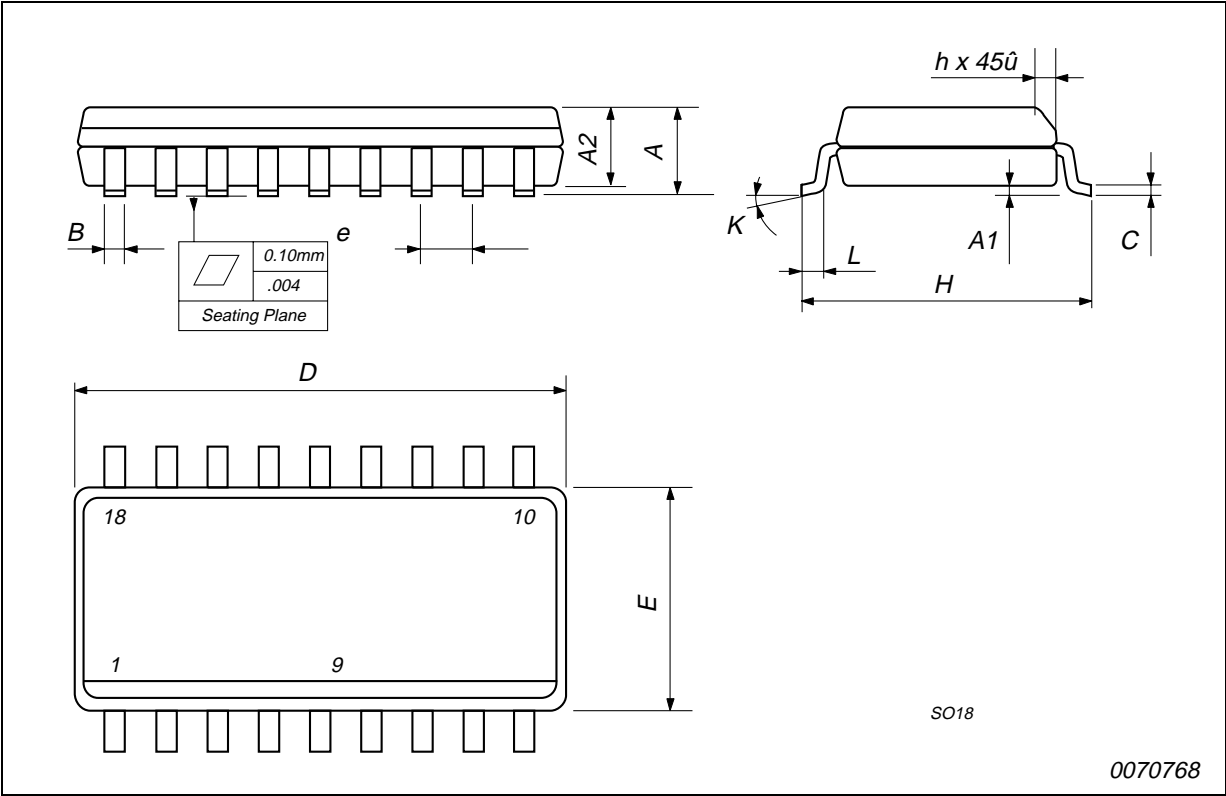


Tek Run: 1.00MS/s Sample Trig



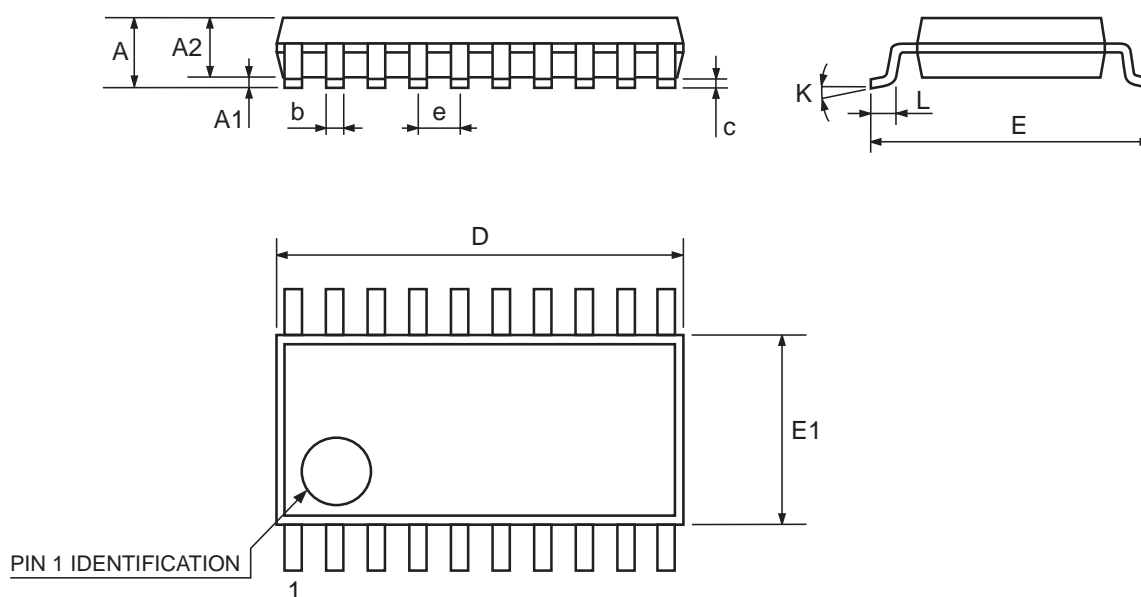
SO-18 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	2.35		2.65	0.092		0.104
A1	0.1		0.3	0.004		0.012
A2			2.55			0.100
B	0.33		0.51	0.013		0.020
C	0.23		0.32	0.009		0.012
D	11.35		11.75	0.447		0.462
E	7.4		7.6	0.291		0.299
e		1.27			0.050	
H	10.00		10.65	0.393		0.419
h	0.25		0.75	0.010		0.029
k	8 ° (max.)					
L	0.4		1.27	0.016		0.050



SSOP20 MECHANICAL DATA

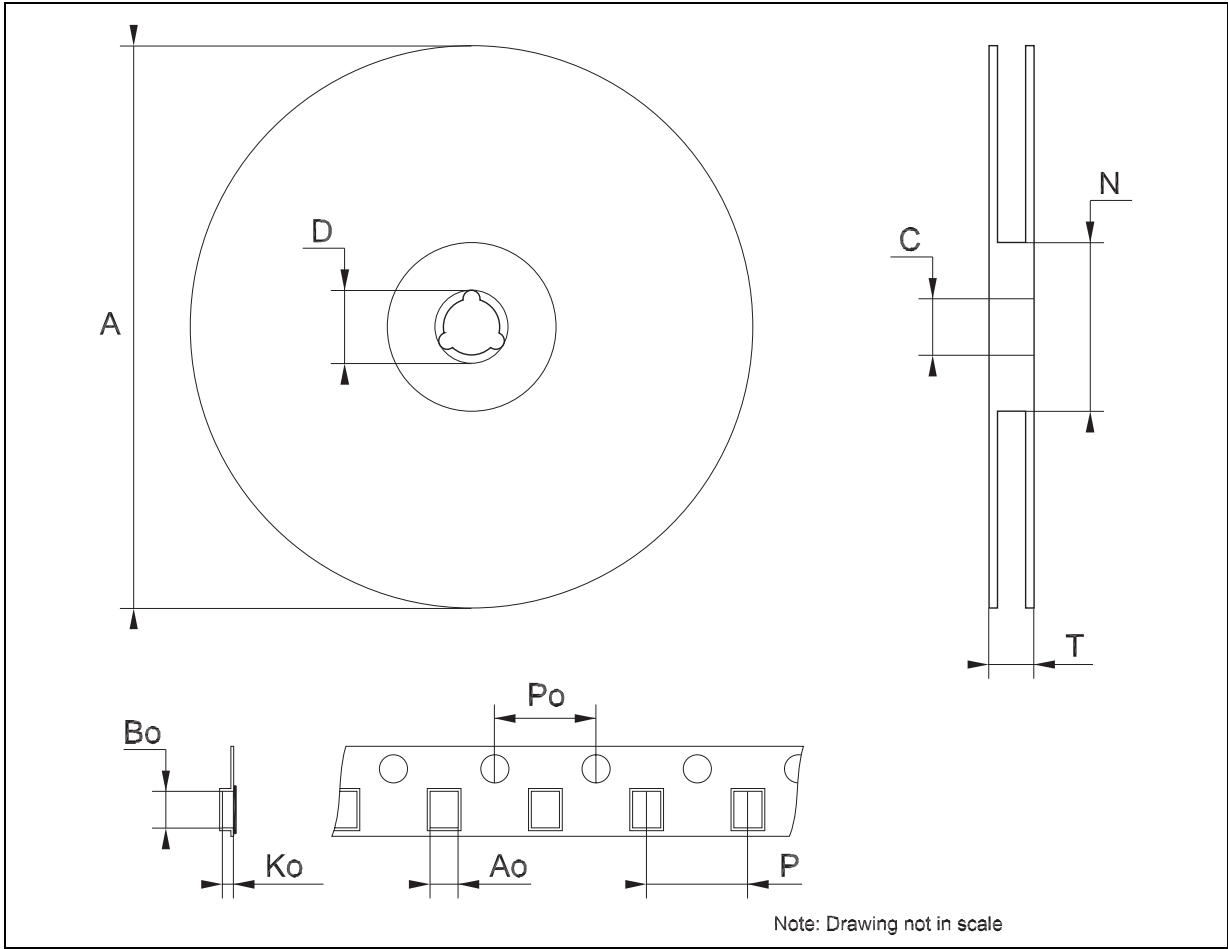
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2			0.079
A1	0.05			0.002		
A2	1.65	1.75	1.85	0.065	0.069	0.073
b	0.22		0.38	0.009		0.015
c	0.09		0.25	0.004		0.010
D	6.9	7.2	7.5	0.272	0.283	0.295
E	7.4	7.8	8.2	0.291	0.307	0.323
E1	5	5.3	5.6	0.197	0.209	0.220
e		0.65 BSC			0.0256 BSC	
K	0°	4°	8°	0°	4°	8°
L	0.55	0.75	0.95	0.022	0.030	0.037



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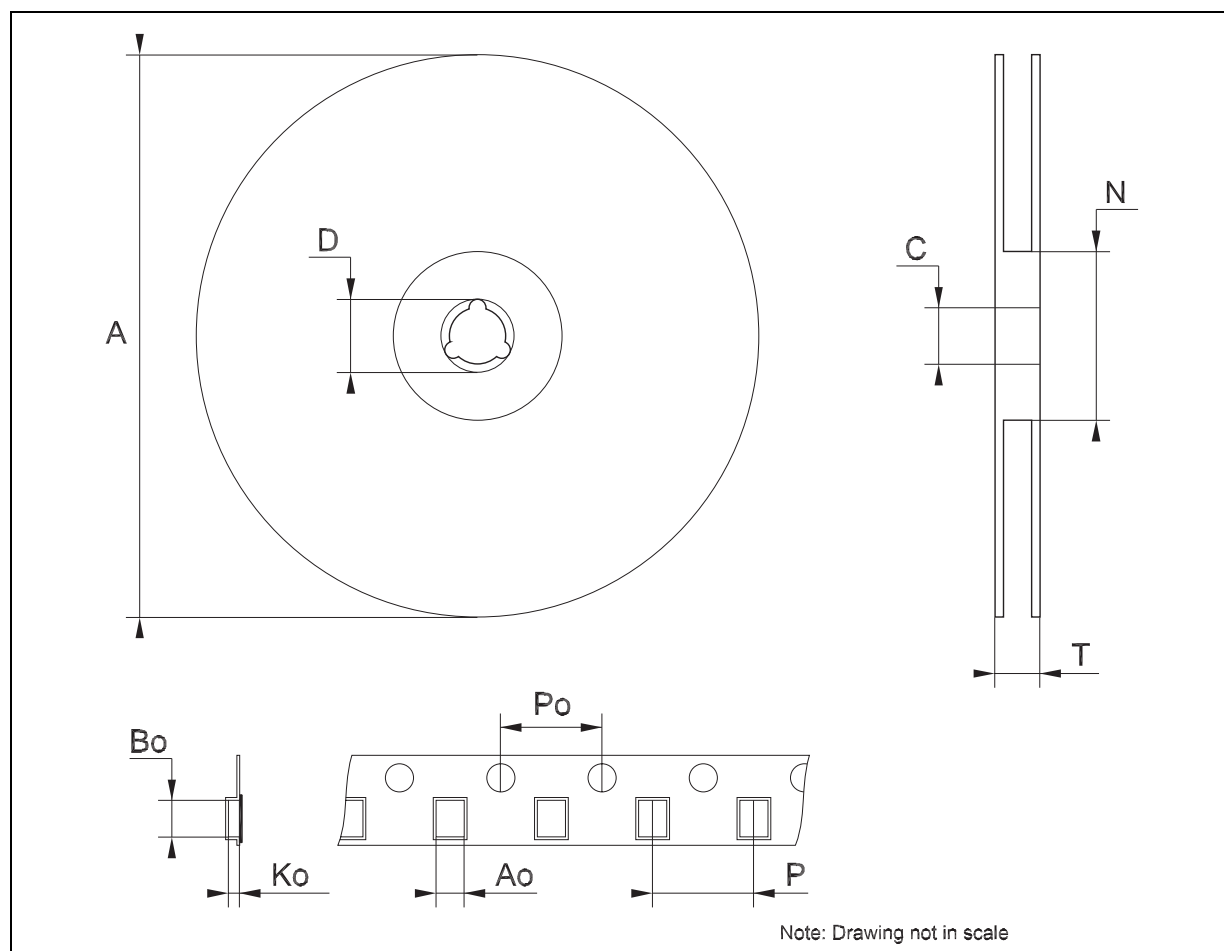
Tape & Reel SO-18 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	10.8		11.0	0.425		0.433
Bo	11.9		12.1	0.468		0.476
Ko	2.9		3.1	0.114		0.122
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



Tape & Reel SSOP20 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	8.4		8.6	0.331		0.339
Bo	7.7		7.9	0.303		0.311
Ko	2.9		3.1	0.114		0.122
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



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