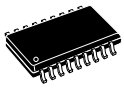
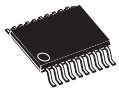
ST3384E

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

- ESD PROTECTIO FOR RS-232 I/O PINS ±15KV (HUMAN BODY MODEL)
- LATCHUP FREE
- 1µA LOW POWER SHUTDOWN
- 300µA SUPPLY CURRENT
- 250Kbps GUARENTEED 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



SO-18



SSOP20

DESCRIPTION

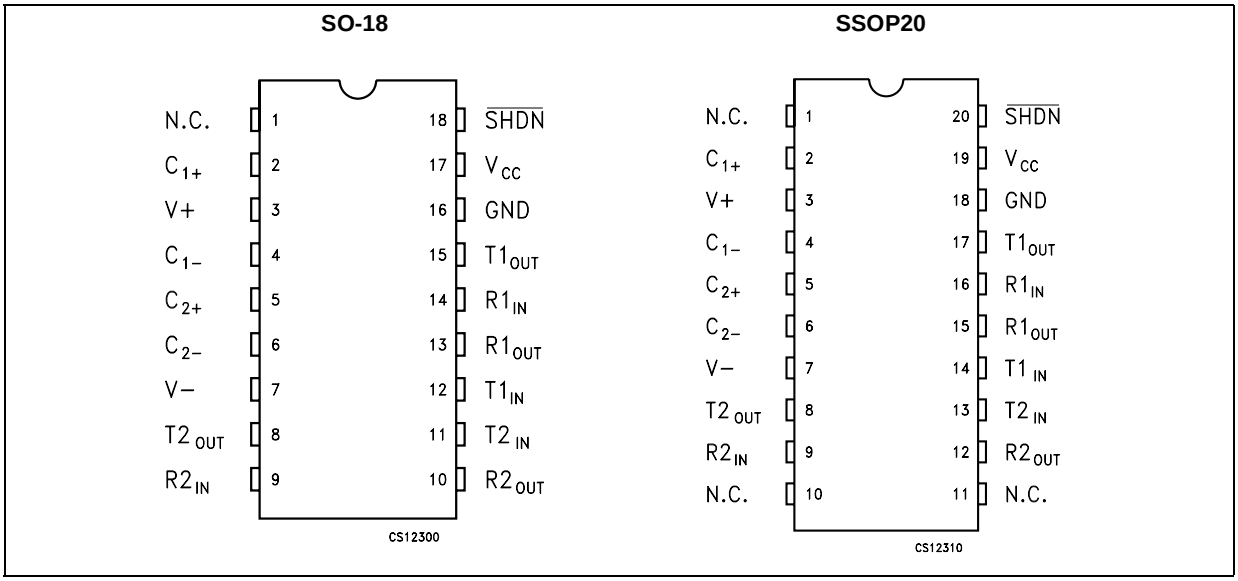
The ST3384E is a 3V powered EIA/TIA-232 and V.28/V.24 communications interface with low power requirements, high data-rate capabilities and enhanced electrostatic discharge (ESD) protection. All transmitter outputs and receiver inputs are protected to ±15kV using the Human Body Model. The ST3384E has 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 require 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	$\overline{SHDN}$	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
$\overline{SHDN}$	Shutdown Input Voltage ($\overline{SHDN}$ 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

$\overline{SHDN}$	T-OUT	R-OUT
L	High Z	High Z
H	Active	Active

ELECTRICAL CHARACTERISTICS

(C_1 - C_4 = 0.1µF, V_{CC} = 3V to 5.5V, tested at 3.3V ±10% C_1 = 0.047µF, C_2 - C_4 = 0.33µF tested at 5V ±10% -40°C < T_A < 85°C unless otherwise noted. Typical values are referred to T_A = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CC}	V_{CC} Power Supply Current	$\overline{SHDN}$ = NO LOAD		0.3	1	mA
I_{SHDN}	SHUTDOWN Supply Current	$\overline{SHDN}$ = 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 = 0.1µF, V_{CC} = 3V to 5.5V, tested at 3.3V ±10% C_1 = 0.047µF, C_2 - C_4 = 0.33µF tested at 5V ±10% -40°C < T_A < 85°C unless otherwise noted. Typical values are referred to T_A = 25°C)

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

TRANSMITTER ELECTRICAL CHARACTERISTICS

(C_1 - C_4 = 0.1µF, V_{CC} = 3V to 5.5V, tested at 3.3V ±10% C_1 = 0.047µF, C_2 - C_4 = 0.33µF tested at 5V ±10% -40°C < T_A < 85°C unless otherwise noted. Typical values are referred to T_A = 25°C)

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

RECEIVER DC TARGET ELECTRICAL CHARACTERISTICS

(C_1 - C_4 = 0.1µF, V_{CC} = 3V to 5.5V, tested at 3.3V ±10% C_1 = 0.047µF, C_2 - C_4 = 0.33µF tested at 5V ±10% -40°C < T_A < 85°C unless otherwise noted. Typical values are referred to T_A = 25°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°C V_{CC} = 3.3V	0.6	1.2		V
		T_A = 25°C V_{CC} = 5.5V	0.8	1.5		
V_{RITH}	Input Threshold High	T_A = 25°C V_{CC} = 3.3V		1.5	2.4	V
		T_A = 25°C V_{CC} = 5.5V		1.8	2.4	
V_{RIH}	Input Hysteresis			0.5		V
R_{RIN}	Input Resistance	T_A = 25°C	3	5	7	KΩ
V_{ROL}	TTL/CMOS Output Voltage Low	I_{OUT} = 2 mA			0.4	V
V_{ROH}	TTL/CMOS Output Voltage High	I_{OUT} = -1 mA	V_{CC}-0.6	V_{CC}-0.1		V

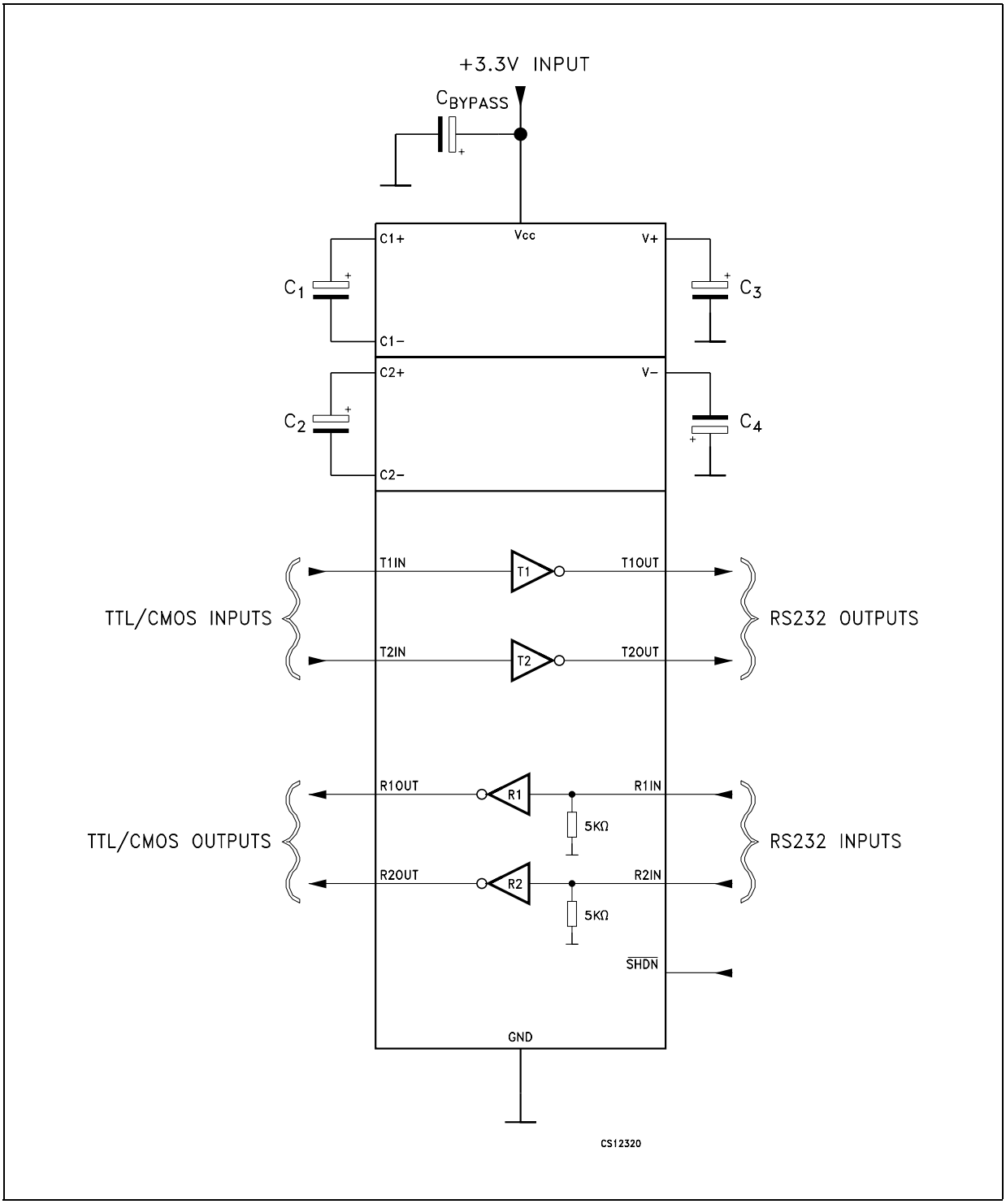
TIMING TARGET ELECTRICAL CHARACTERISTICS

(C_1 - C_4 = 0.1µF, V_{CC} = 3V to 5.5V, tested at 3.3V ±10% C_1 = 0.047µF, C_2 - C_4 = 0.33µF tested at 5V ±10% -40°C < T_A < 85°C unless otherwise noted. Typical values are referred to T_A = 25°C)

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

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

TYPICAL OPERATING CIRCUIT

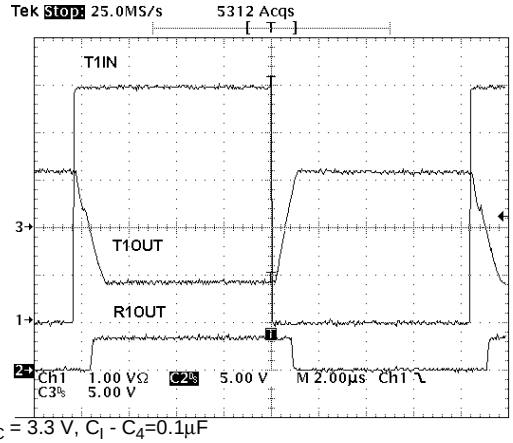


CAPACITANCE VALUE (µF)

C1	C2	C3	C4	Cbypass
0.1	0.1	0.1	0.1	0.1

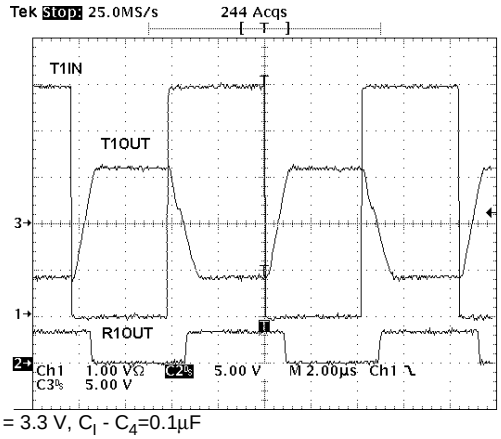
TYPICAL PERFORMANCE CHARACTERISTICS (unless otherwise specified T_j = 25°C)

Figure 1 : Loopback Test Result at 120 kbps



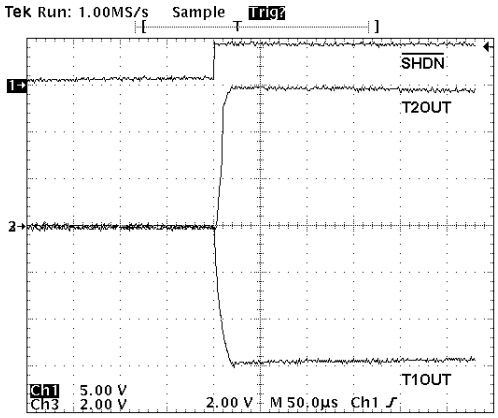
V_{CC} = 3.3 V, C_I - C_4=0.1µF

Figure 2 : Loopback Test Result at 250 kbps



V_{CC} = 3.3 V, C_I - C_4=0.1µF

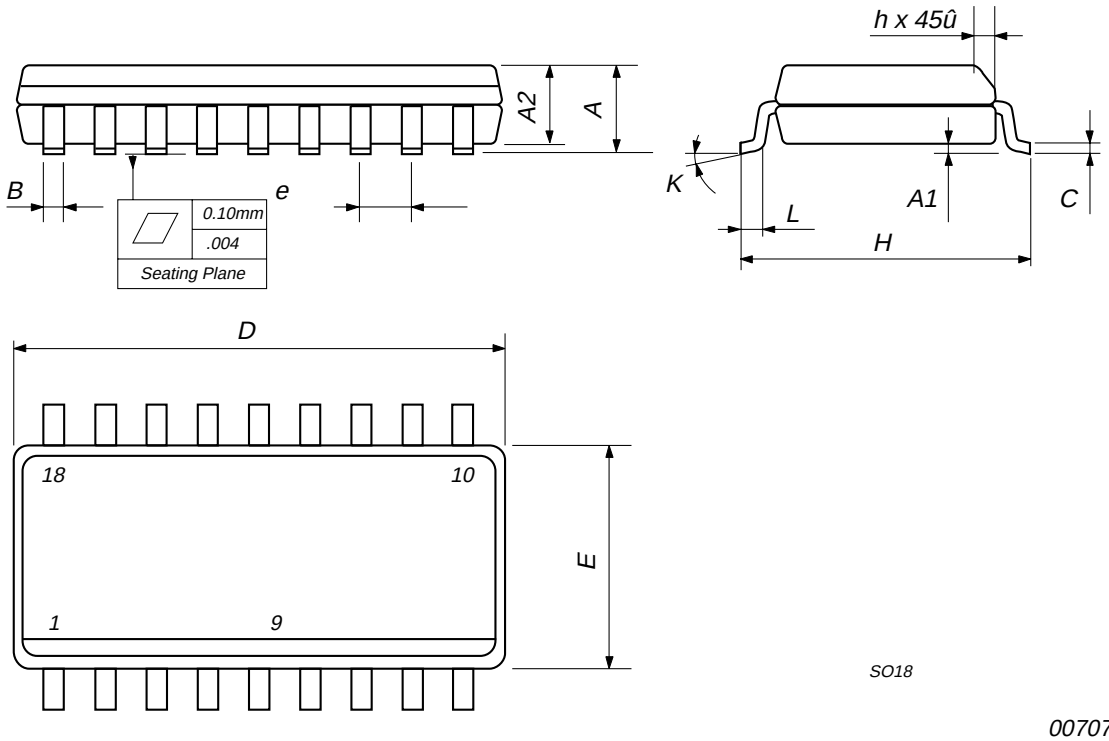
Figure 3 : Transmitter Outputs Exiting Shutdown or Powering Up



V_{CC} = 5 V, C_I - C_4=0.1µF

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



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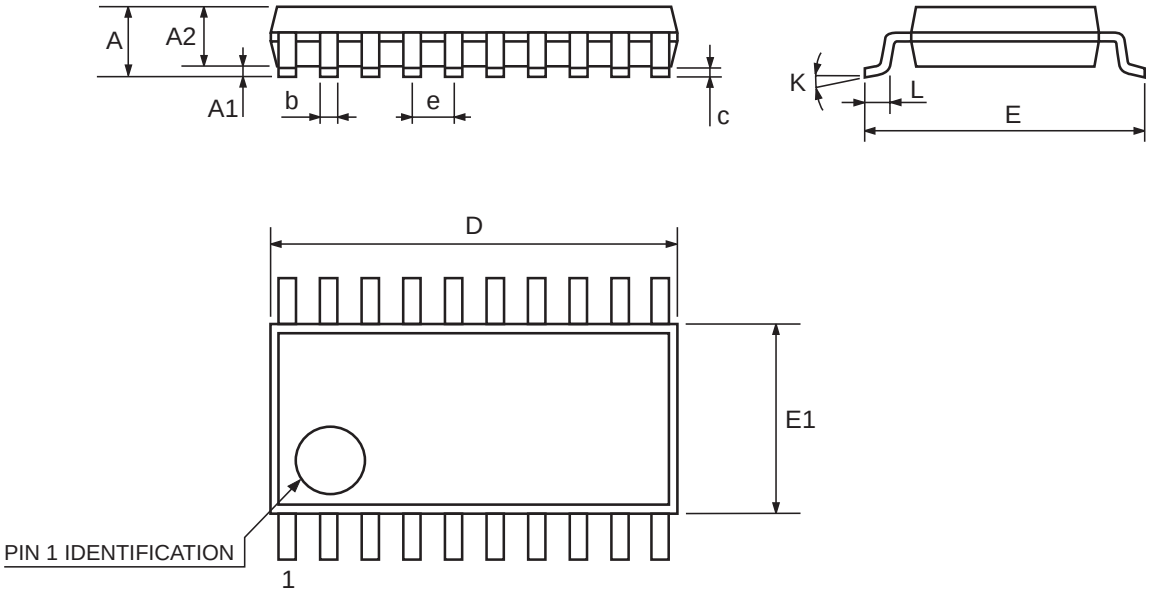
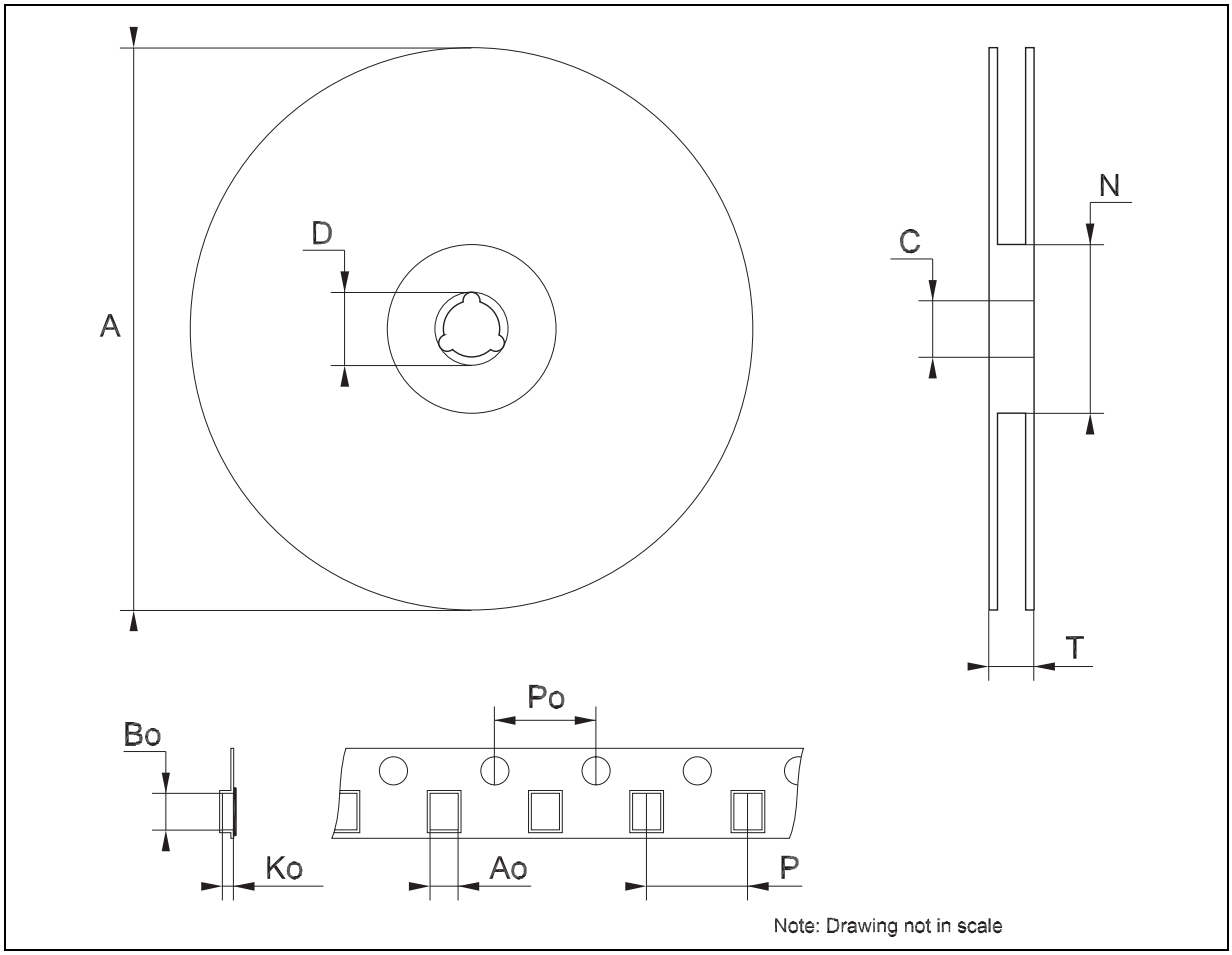
SSOP20 MECHANICAL DATA

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



Tape & Reel SO-18 MECHANICAL DATA

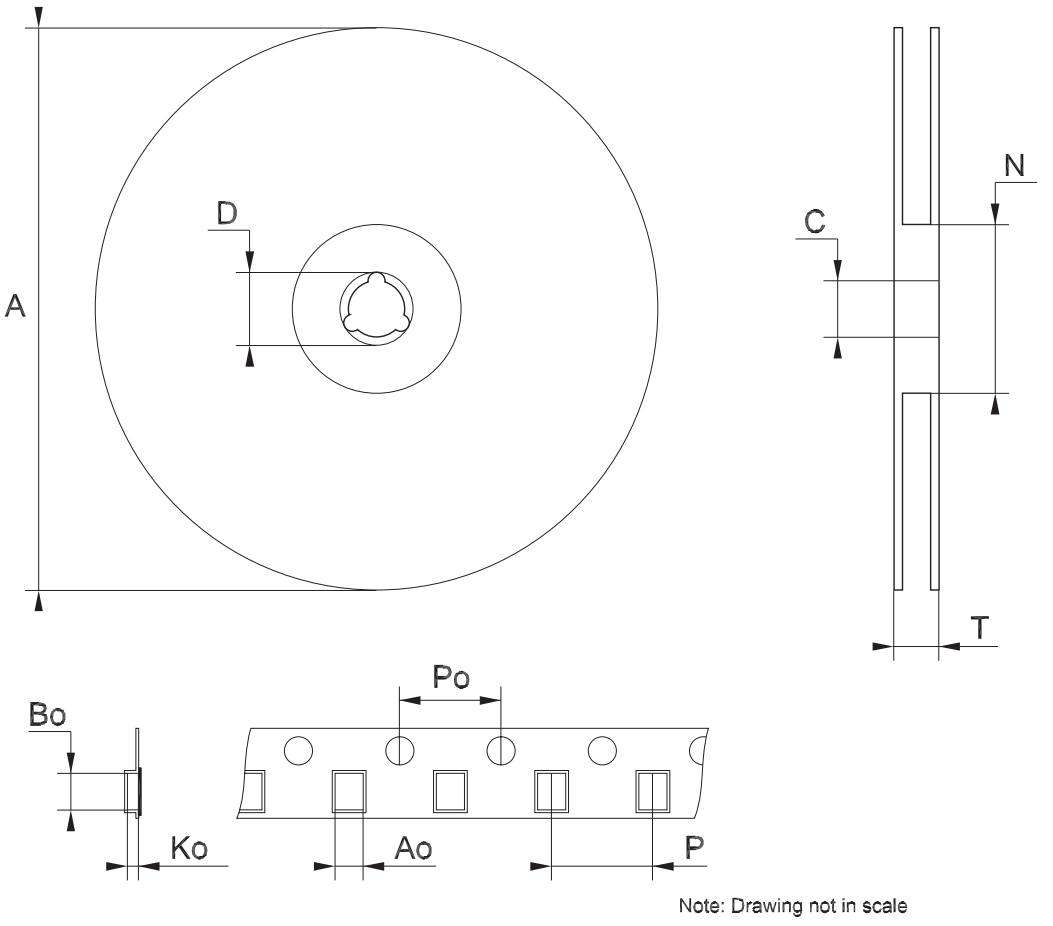
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	10.8		11.0	0.425		0.433
Bo	11.9		12.1	0.468		0.476
Ko	2.9		3.1	0.114		0.122
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



Note: Drawing not in scale

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



Note: Drawing not in scale