



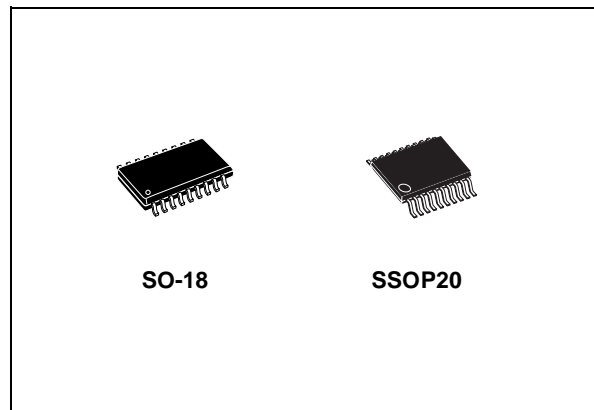
ST3384E

±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.



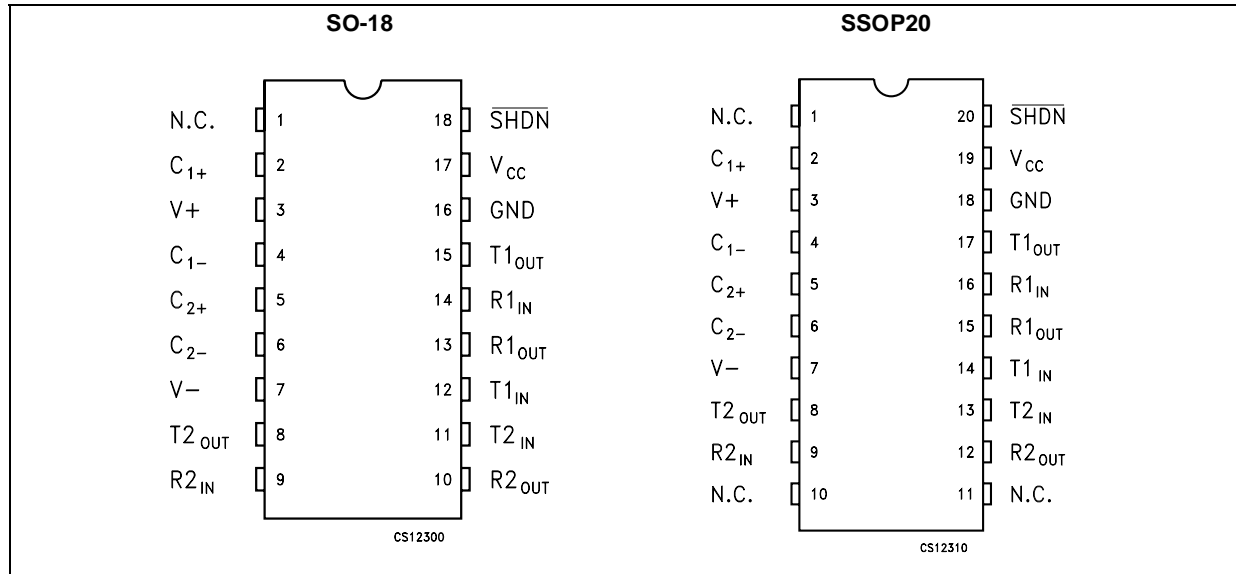
The device is guaranteed to run at data rates of 250Kbps while maintaining RS-232 output levels. The ST3384E has two receivers and two drivers. It features a 1µA shutdown mode that reduces power consumption and extends battery life in portable systems.

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	T _{2OUT}	Second Transmitter Output Voltage
9	9	R _{2IN}	Second Receiver Input Voltage
10	12	R _{2OUT}	Second Receiver Output Voltage
11	13	T _{2IN}	Second Transmitter Input Voltage
12	14	T _{1IN}	First Transmitter Input Voltage
13	15	R _{1OUT}	First Receiver Output Voltage
14	16	R _{1IN}	First Receiver Input Voltage
15	17	T _{1OUT}	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

(C₁ - C₄ = 0.1μF, V_{CC} = 3V to 5.5V, tested at 3.3V ±10% C₁ = 0.047μF, C₂ - C₄ = 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	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

(C₁ - C₄ = 0.1μF, V_{CC} = 3V to 5.5V, tested at 3.3V ±10% C₁ = 0.047μF, C₂ - C₄ = 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, 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

($C_1 - C_4 = 0.1\mu\text{F}$, $V_{\text{CC}} = 3\text{V}$ 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	$V_{\text{CC}} = V_+ = V_- = 0\text{V}$ Transmitter output = $\pm 2\text{V}$	300	10M		Ω
I_{TSC}	Output Short Circuit Current			± 50		mA
I_{TOL}	Output Leakage Current	$V_{\text{CC}} = 0\text{V}$ or 3V to 5.5V $V_{\text{OUT}} = \pm 12\text{V}$ Transmitters Disabled			± 25	μA

RECEIVER DC TARGET ELECTRICAL CHARACTERISTICS

($C_1 - C_4 = 0.1\mu\text{F}$, $V_{\text{CC}} = 3\text{V}$ 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	$T_A = 25^\circ\text{C}$ $V_{\text{CC}} = 3.3\text{V}$	0.6	1.2		V
		$T_A = 25^\circ\text{C}$ $V_{\text{CC}} = 5.5\text{V}$	0.8	1.5		
V_{RITH}	Input Threshold High	$T_A = 25^\circ\text{C}$ $V_{\text{CC}} = 3.3\text{V}$		1.5	2.4	V
		$T_A = 25^\circ\text{C}$ $V_{\text{CC}} = 5.5\text{V}$		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	$I_{\text{OUT}} = -1\text{mA}$	$V_{\text{CC}} - 0.6$	$V_{\text{CC}} - 0.1$		V

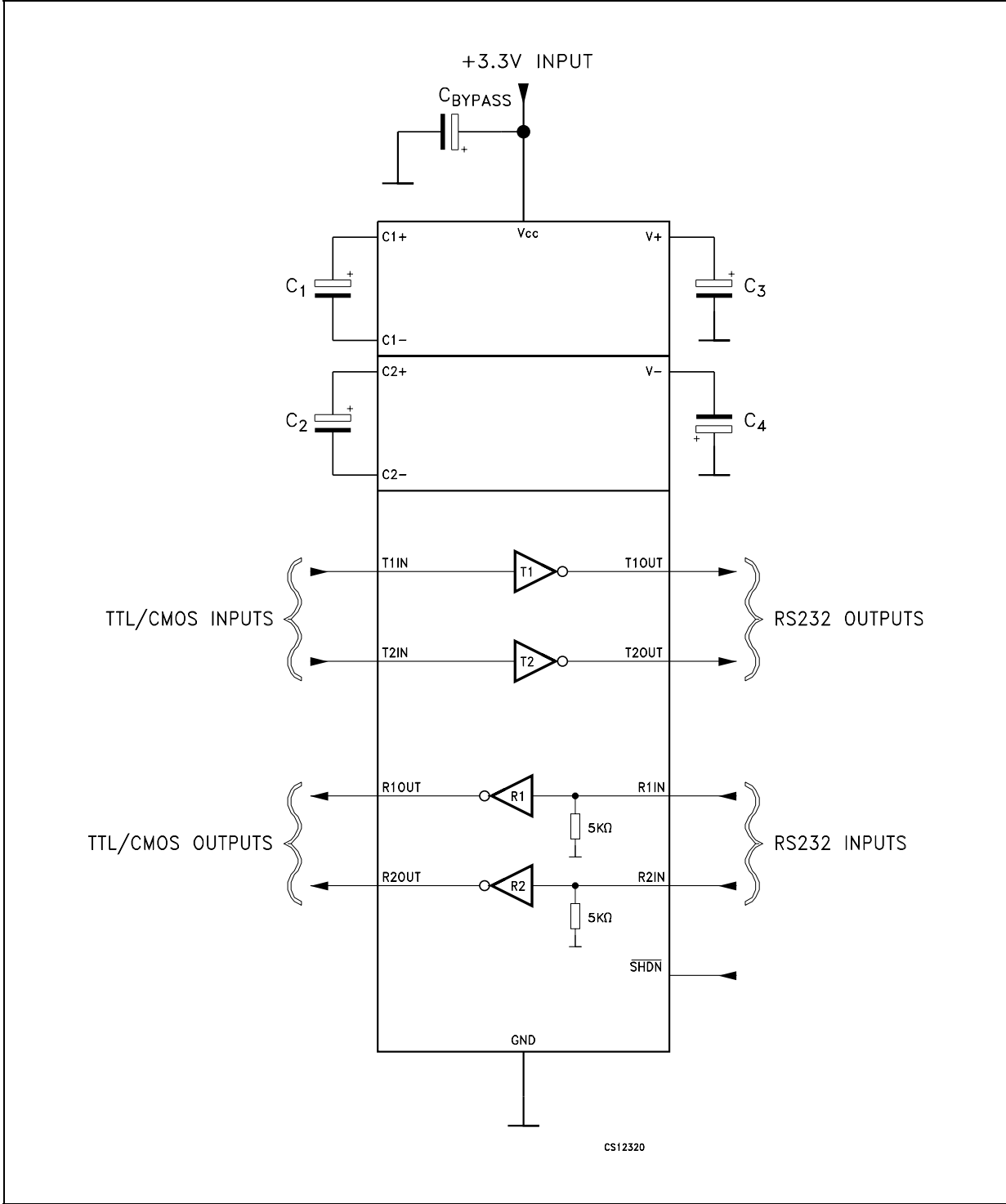
TIMING TARGET ELECTRICAL CHARACTERISTICS

($C_1 - C_4 = 0.1\mu\text{F}$, $V_{\text{CC}} = 3\text{V}$ 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	$R_{\text{L}} = 3\text{K}\Omega$ $C_{\text{L}2} = 1000\text{pF}$ one transmitter switching	250			Kbps
t_{PHLR} t_{PLHR}	Receiver Propagation Delay	R_{XIN} to R_{XOUT} $C_{\text{L}} = 150\text{pF}$		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	$T_A = 25^\circ\text{C}$ $R_{\text{L}} = 3\text{K}\Omega$ to $7\text{K}\Omega$ $V_{\text{CC}} = 3.3\text{V}$ Measured from $+3\text{V}$ to -3V or -3V to $+3\text{V}$ $C_{\text{L}} = 150\text{pF}$ to 1000pF $C_{\text{L}} = 150\text{pF}$ to 2500pF	6	8	30	$\text{V}/\mu\text{s}$
			4	8	30	$\text{V}/\mu\text{s}$

(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



TYPICAL PERFORMANCE CHARACTERISTICS (unless otherwise specified $T_j = 25^\circ\text{C}$)

Figure 1 : Loopback Test Result at 120 kbps

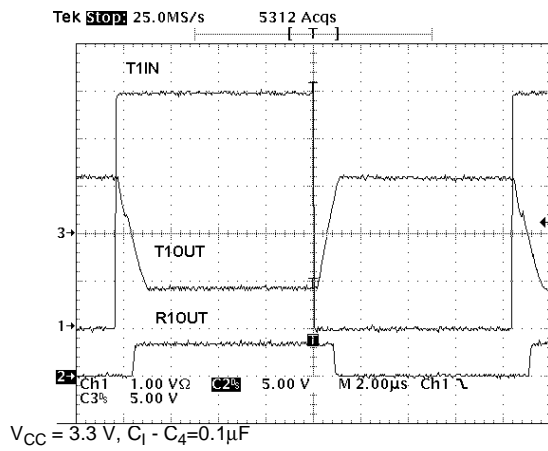


Figure 3 : Transmitter Outputs Exiting Shutdown or Powering Up

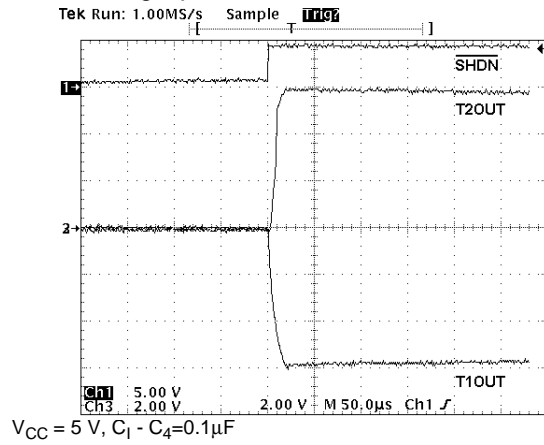
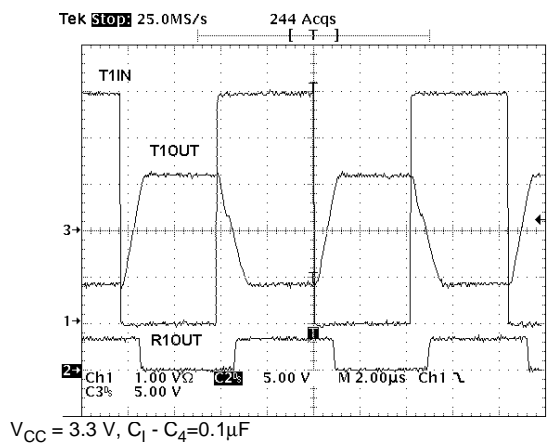
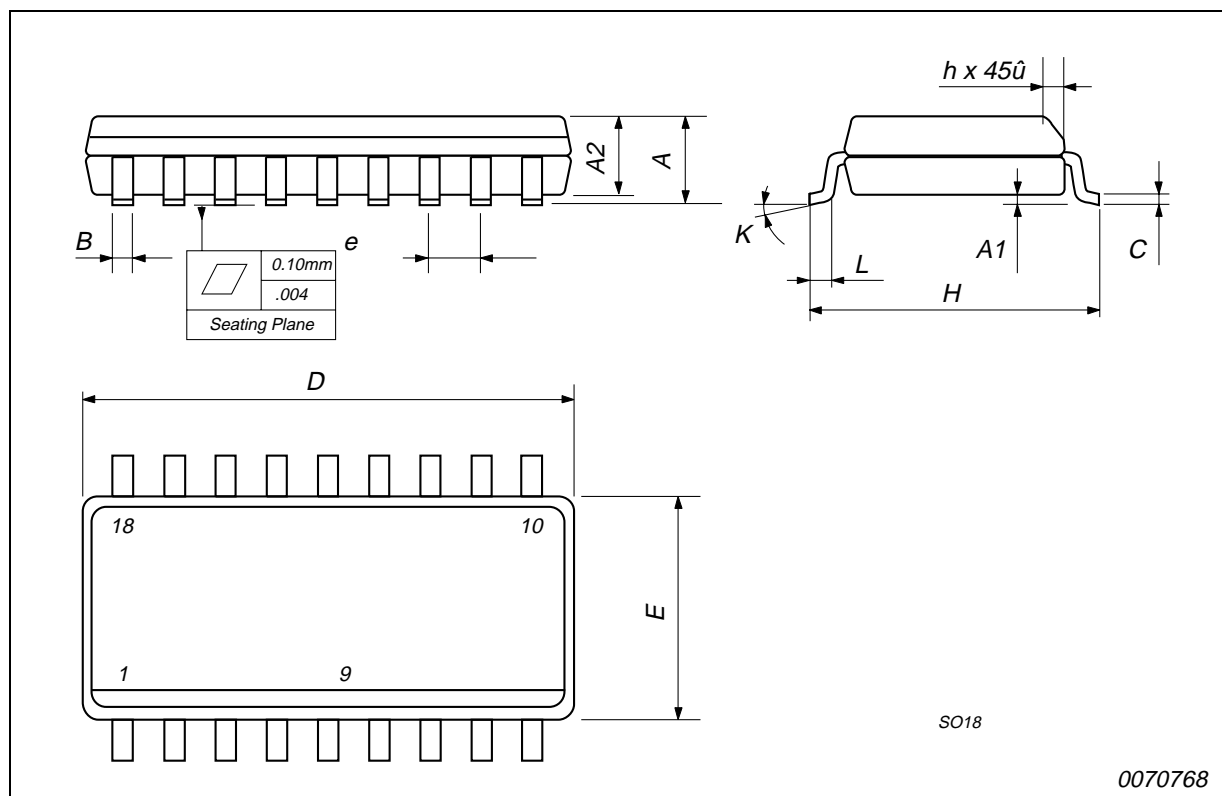


Figure 2 : Loopback Test Result at 250 kbps



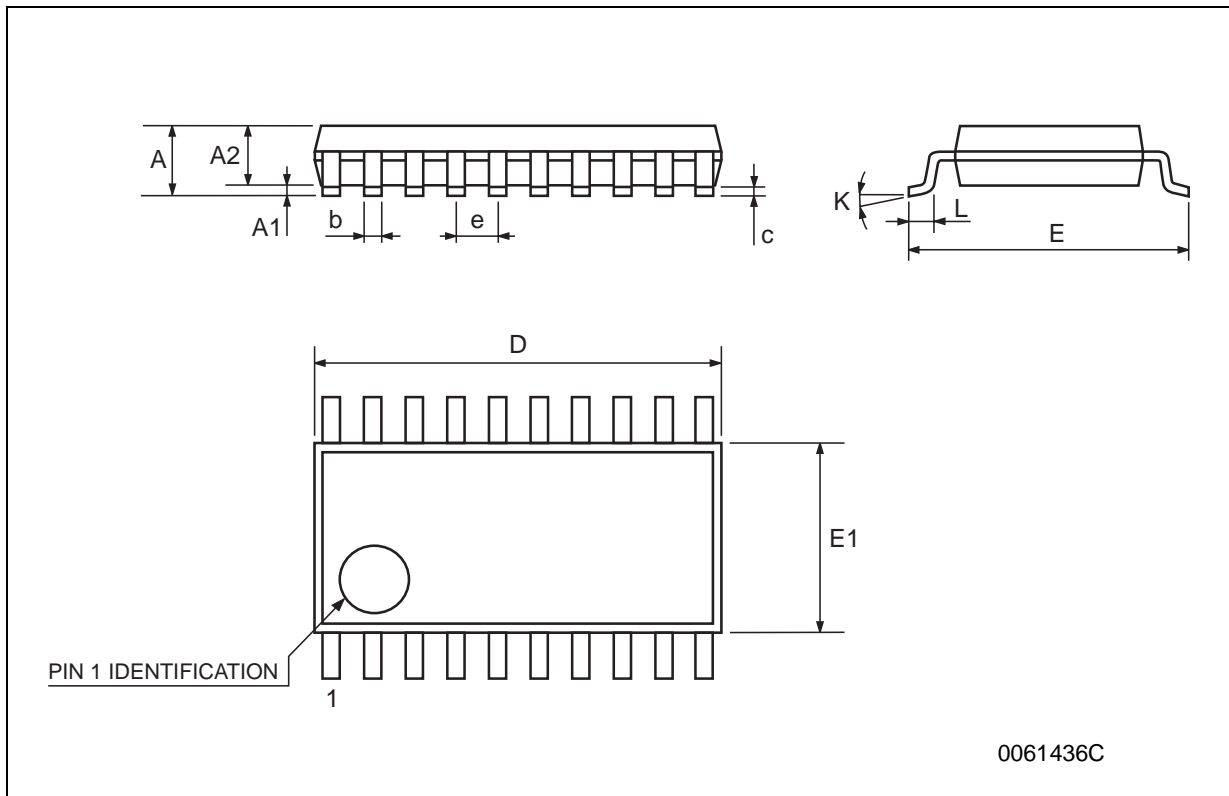
SO-18 MECHANICAL DATA

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



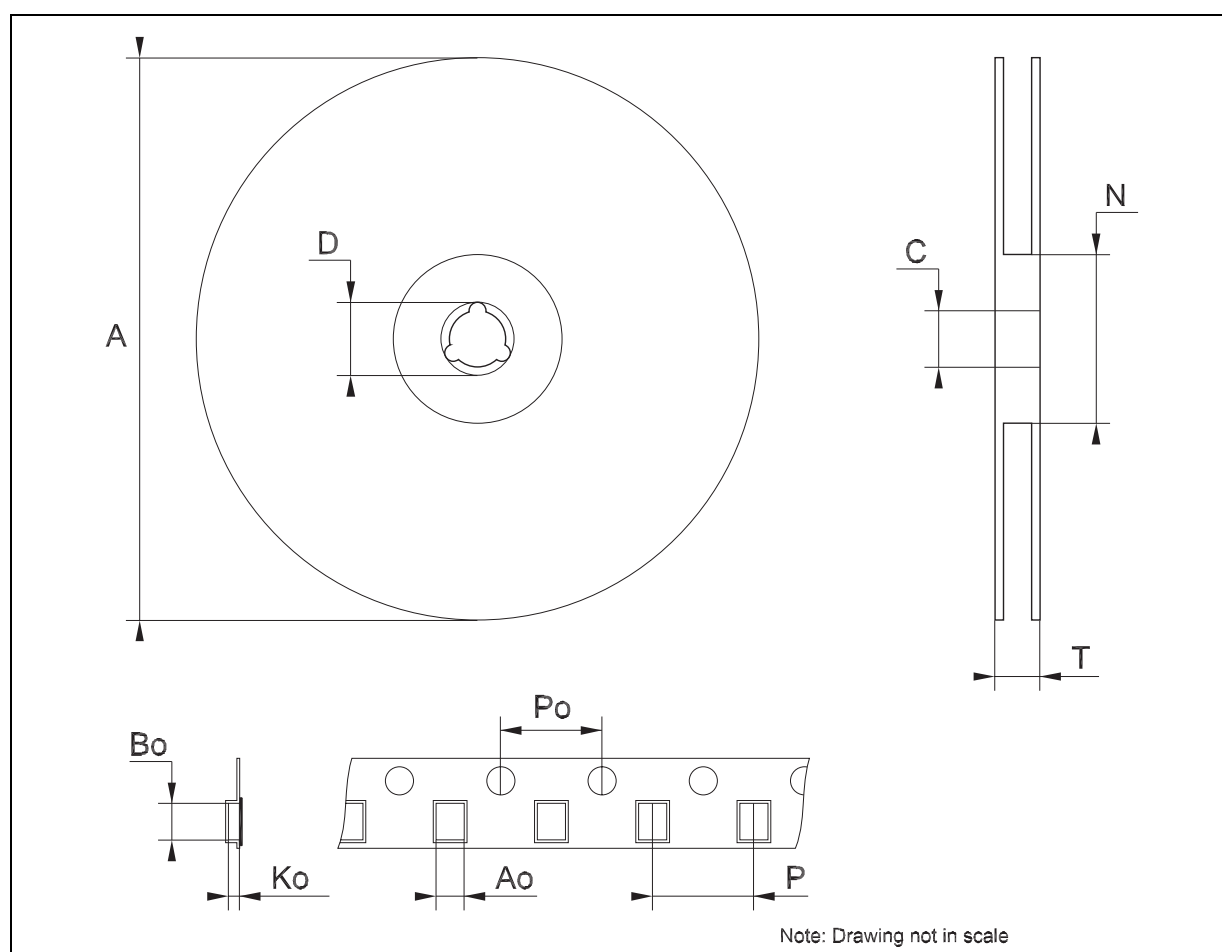
SSOP20 MECHANICAL DATA

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



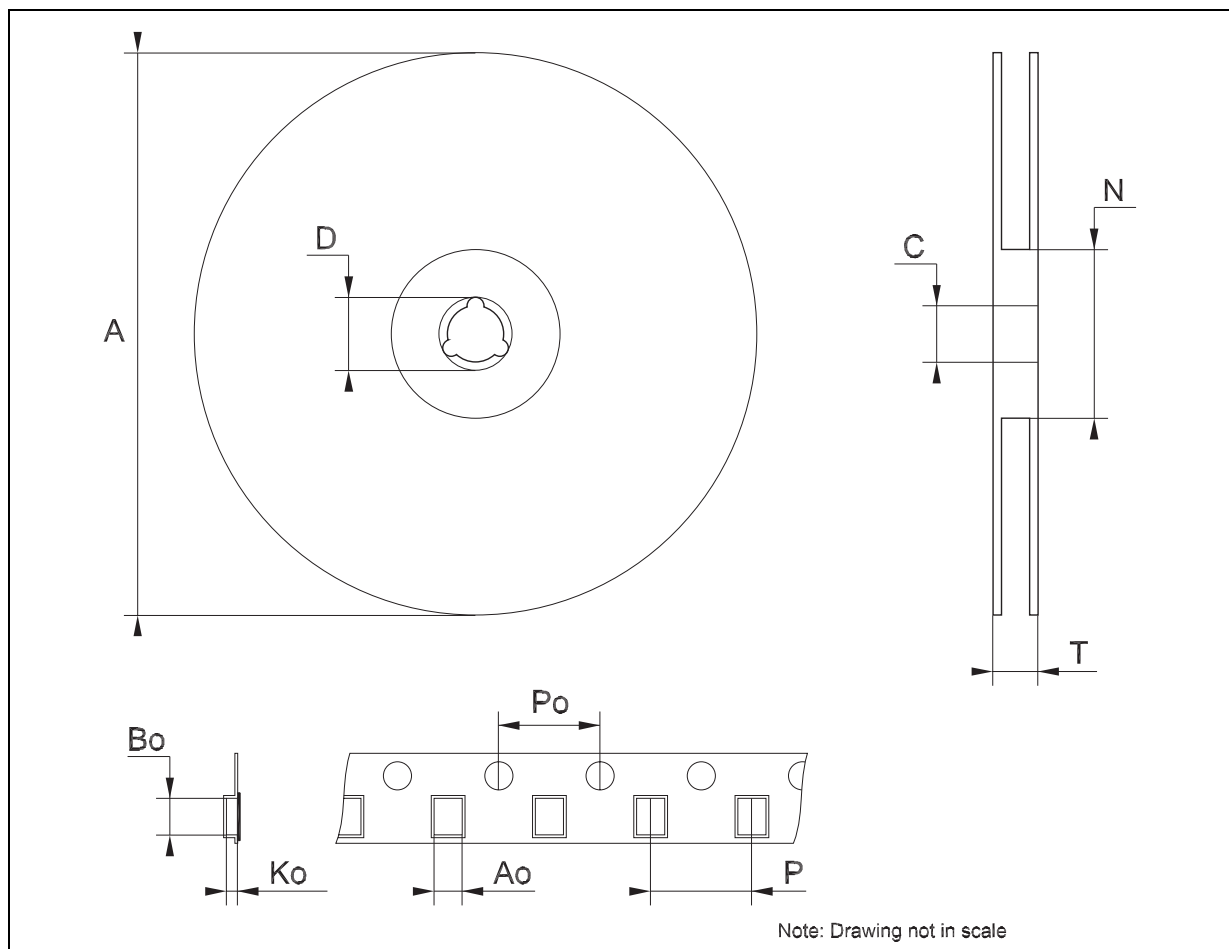
Tape & Reel SO-18 MECHANICAL DATA

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



Note: Drawing not in scale

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