

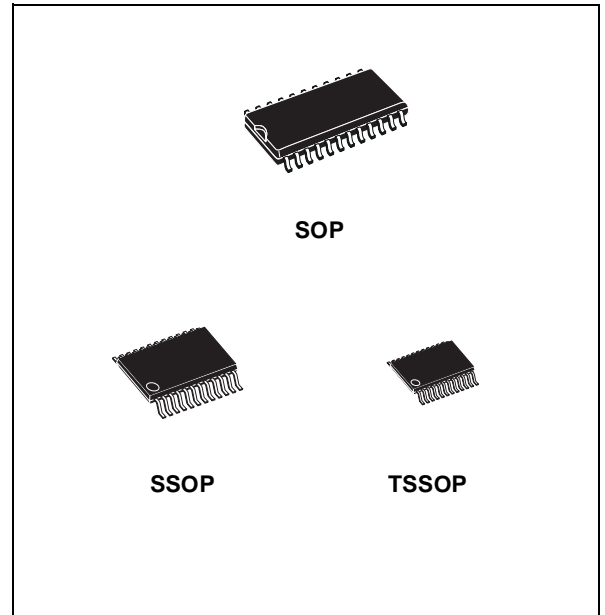
## ± 15KV ESD PROTECTED 5V RS-232 TRANSCEIVER

- ESD PROTECTION FOR RS-232 I/O PINS:  
±15 KV HUMAN BODY MODEL
- 230kbps DATE RATE
- GUARANTEED SLEW RATE 3V/μs (Min)
- OPERATES FROM A SINGLE 5V POWER SUPPLY
- PACKAGED IN SO-24, SSO-24 AND TSSOP24

### DESCRIPTION

The ST207E is a 5 driver and 3 receiver devices designed for RS-232 and V.28 communications in harsh environments. Each transmitter output and receiver input is protected against ±15KV electrostatic discharge (ESD) shocks. The drivers and receivers of the ST207E meet all EIA/TIA-232E and CCITT V.28 specifications at data rates up to 120Kbps, when loaded in accordance with the EIA/TIA-232E specification.

The ST207E operates with four 0.1μF capacitors. It came in 24-pin SO and TSSOP packages.



**Table 1: Order Codes**

Type	Temperature Range	Package	Comments
ST207ECD	0 to 70 °C	SO-24 (Tube)	33parts per tube / 25tube per box
ST207EBD	-40 to 85 °C	SO-24 (Tube)	33parts per tube / 25tube per box
ST207EAD	-40 to 125 °C	SO-24 (Tube)	33parts per tube / 25tube per box
ST207ECDR	0 to 70 °C	SO-24 (Tape & Reel)	1000 parts per reel
ST207EBDR	-40 to 85 °C	SO-24 (Tape & Reel)	1000 parts per reel
ST207EADR	-40 to 125 °C	SO-24 (Tape & Reel)	1000 parts per reel
ST207ECPR	0 to 70 °C	SSOP-24 (Tape & Reel)	1350 parts per reel
ST207EBPR	-40 to 85 °C	SSOP-24 (Tape & Reel)	1350 parts per reel
ST207EAPR	-40 to 125 °C	SSOP-24 (Tape & Reel)	1350 parts per reel
ST207ECTR	0 to 70 °C	TSSOP24 (Tape & Reel)	2500 parts per reel
ST207EBTR	-40 to 85 °C	TSSOP24 (Tape & Reel)	2500 parts per reel
ST207EATR	-40 to 125 °C	TSSOP24 (Tape & Reel)	2500 parts per reel

Figure 1: Pin Configuration

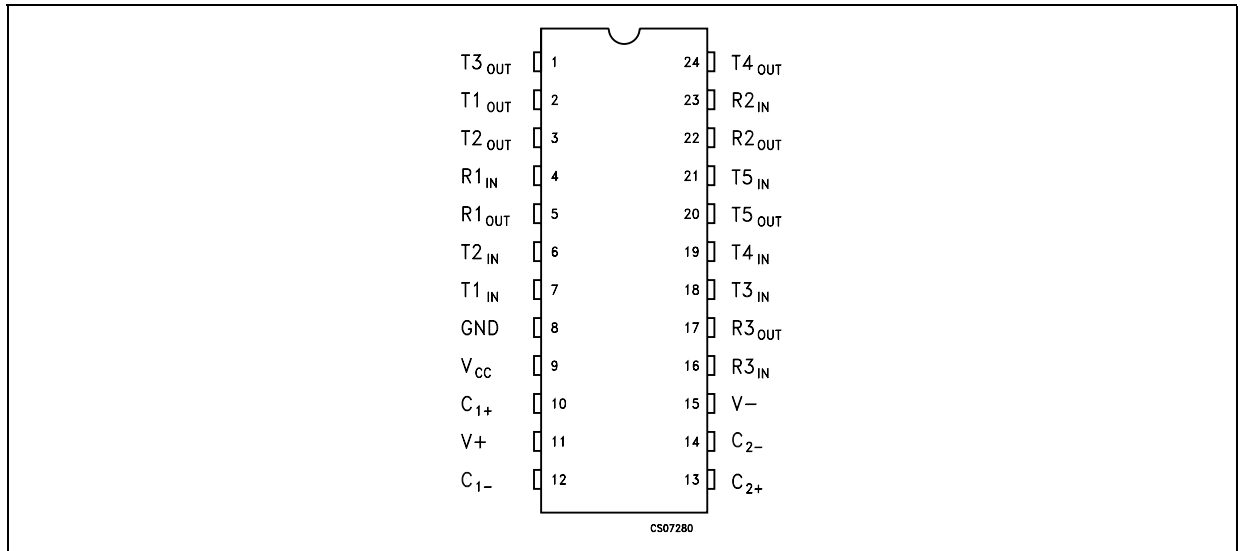


Table 2: Pin Description

PIN N°	SYMBOL	NAME AND FUNCTION
1	T3 <sub>OUT</sub>	RS-232 Driver Output
2	T1 <sub>OUT</sub>	RS-232 Driver Output
3	T2 <sub>OUT</sub>	RS-232 Driver Output
4	R1 <sub>IN</sub>	RS-232 Receiver Input
5	R1 <sub>OUT</sub>	TTL/CMOS Receiver Output
6	T2 <sub>IN</sub>	TTL/CMOS Driver Input Internal Pull-up to V <sub>CC</sub>
7	T1 <sub>IN</sub>	TTL/CMOS Driver Input Internal Pull-up to V <sub>CC</sub>
8	GND	Ground
9	V <sub>CC</sub>	4.75V to 5.25V Supply Voltage
10	C <sub>1+</sub>	Terminal For Positive Charge-pump Capacitor
11	V <sub>+</sub>	2V <sub>CC</sub> Generated by The Charge-pump
12	C <sub>1-</sub>	Terminal For Negative Charge-pump Capacitor
13	C <sub>2+</sub>	Terminal For Positive Charge-pump Capacitor
14	C <sub>2-</sub>	Terminal For Negative Charge-pump Capacitor
15	V <sub>-</sub>	-2V <sub>CC</sub> Generated by The Charge-pump
16	R3 <sub>IN</sub>	RS-232 Receiver Input
17	R3 <sub>OUT</sub>	TTL/CMOS Receiver Output
18	T3 <sub>IN</sub>	TTL/CMOS Driver Input Internal Pull-up to V <sub>CC</sub>
19	T4 <sub>IN</sub>	TTL/CMOS Driver Input Internal Pull-up to V <sub>CC</sub>
20	T5 <sub>OUT</sub>	RS-232 Driver Output
21	T5 <sub>IN</sub>	TTL/CMOS Driver Input Internal Pull-up to V <sub>CC</sub>
22	R2 <sub>OUT</sub>	TTL/CMOS Receiver Output
23	R2 <sub>IN</sub>	RS-232 Receiver Input
24	T4 <sub>OUT</sub>	RS-232 Driver Output

**Table 3: Absolute Maximum Ratings**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	-0.3 to 6	V
V+	Extra Positive Voltage	( $V_{CC} - 0.3$ ) to 14	V
V-	Extra Negative Voltage	-14 to 0.3	V
$T_{IN}$	Transmitter Input Voltage Range	-0.3 to ( $V_{CC} + 0.3$ )	V
$R_{IN}$	Receiver Input Voltage Range	$\pm 30$	V
$T_{OUT}$	Transmitter Output Voltage Range	(V- - 0.3) to (V+ + 0.3)	V
$R_{OUT}$	Receiver Output Voltage Range	-0.3 to ( $V_{CC} + 0.3$ )	V
$T_{SHORT}$	Short Circuit Duration on $T_{OUT}$	Continuous	
$T_{stg}$	Storage Temperature Range	-65 to 150	°C

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 can not exceed 13 V.

**Table 4: ESD Performance: Transmitter Outputs, Receiver Inputs**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
ESD	ESD Protection Voltage	Human Body Model	$\pm 15$			KV
ESD	ESD Protection Voltage	IEC-1000-4-2 Contact Discharge	$\pm 8$			KV

**Table 5: Electrical Characteristics** ( $C_1 - C_4 = 0.1\mu\text{F}$ ,  $V_{CC} = 5V \pm 5\%$ ,  $T_A = \text{MIN to MAX}$ , unless otherwise specified. Typical values are referred to  $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SUPPLY}$	$V_{CC}$ Power Supply Current	No Load $T_A = 25^\circ\text{C}$		2	5	mA

**Table 6: Receiver Electrical Characteristics** ( $C_1 - C_4 = 0.1\mu\text{F}$ ,  $V_{CC} = 5V \pm 5\%$ ,  $T_A = \text{MIN to MAX}$ , unless otherwise specified. Typical values are referred to  $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{RIN}$	Receiver Input Voltage Operating Range		-30		30	V
$V_{RIL}$	Input Threshold Low	$T_A = 25^\circ\text{C}$ $V_{CC} = 5V$	0.8	1.2		V
$V_{RIH}$	Input Threshold High	$T_A = 25^\circ\text{C}$ $V_{CC} = 5V$		1.7	2.4	V
$V_{RIHYS}$	Input Hysteresis	$V_{CC} = 5V$ , no hysteresis in shutdown	0.2	0.5	1	V
$R_{RIN}$	Input Resistance	$T_A = 25^\circ\text{C}$ $V_{CC} = 5V$	3	5	7	K $\Omega$
$V_{OL}$	Output Voltage Low				0.4	V
$V_{OH}$	Output Voltage High	$I_{OUT} = -1\text{mA}$	3.5	$V_{CC}-0.4$		V

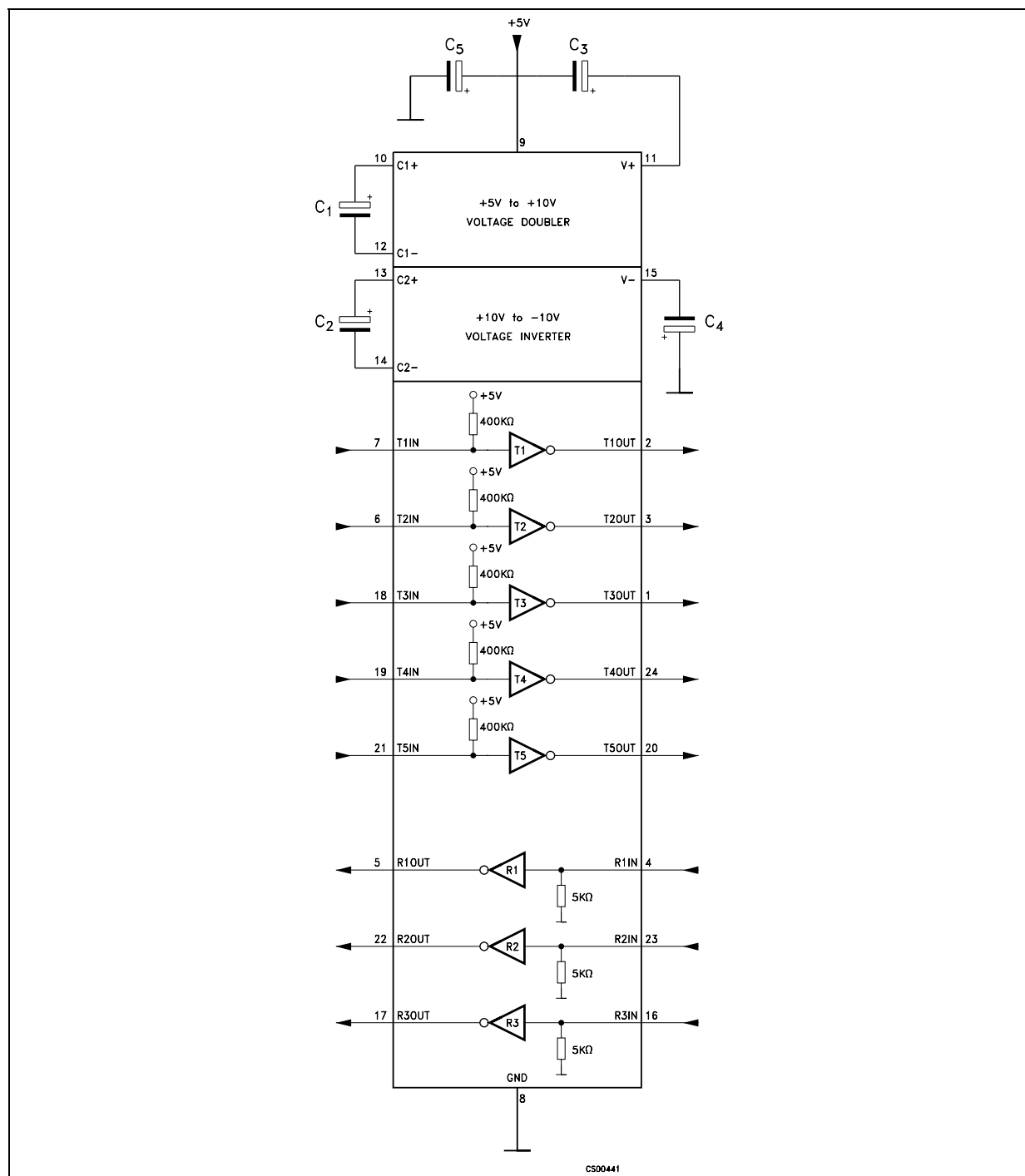
**Table 7: Transmitter Electrical Characteristics** ( $C_1 - C_4 = 0.1\mu\text{F}$ ,  $V_{\text{CC}} = 5\text{V} \pm 5\%$ ,  $T_A = \text{MIN to MAX}$ , unless otherwise specified. Typical values are referred to  $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{\text{TOUT}}$	Output Voltage Swing	All Driver loaded with $3\text{K}\Omega$ to GND	$\pm 5$	$\pm 8.5$		V
$R_{\text{OUT}}$	Transmitter Output Resistance	$V_{\text{CC}} = V_+ = V_- = 0\text{V}$ $V_{\text{OUT}} = \pm 2\text{V}$	300			$\Omega$
$I_{\text{SC}}$	Output Short Circuit Current			$\pm 18$	$\pm 60$	mA
$I_{\text{IL}}$	Input Pull-Up Current	$T_{\text{IN}} = 0\text{V}$		15	200	$\mu\text{A}$
$V_{\text{TIL}}$	Input Logic Threshold Low				0.8	V
$V_{\text{TIH}}$	Input Logic Threshold High		2			V

**Table 8: Timing Characteristics** ( $C_1 - C_4 = 0.1\mu\text{F}$ ,  $V_{\text{CC}} = 5\text{V} \pm 5\%$ ,  $T_A = \text{MIN to MAX}$ , unless otherwise specified. Typical values are referred to  $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$D_{\text{R}}$	Maximum Data Rate	$R_{\text{L}} = 3\text{K}\Omega$ to $7\text{K}\Omega$ $C_{\text{L}} = 50\text{pF}$ to $1000\text{pF}$ one transmitter switching	150	240		Kbps
		$R_{\text{L}} = 3\text{K}\Omega$ to $7\text{K}\Omega$ $C_{\text{L}} = 50\text{pF}$ to $150\text{pF}$ one transmitter switching	230	300		Kbps
$t_{\text{PHLR}}$ $t_{\text{PLHR}}$	Receiver Propagation Delay	All drivers loaded with $3\text{K}\Omega$ to GND		0.2	10	$\mu\text{s}$
$t_{\text{PHLT}}$ $t_{\text{PLHT}}$	Transmitter Propagation Delay	$R_{\text{L}} = 3\text{K}\Omega$ $C_{\text{L}} = 2500\text{pF}$ All transmitter loaded		2	3	$\mu\text{s}$
SR	Transition-Region Slew Rate	$T_A = 25^\circ\text{C}$ $R_{\text{L}} = 3$ to $7\text{K}\Omega$ $V_{\text{CC}} = 5\text{V}$ $C_{\text{L}} = 50\text{pF}$ to $1000\text{pF}$ measured from $+3\text{V}$ to $-3\text{V}$ or $-3\text{V}$ to $+3\text{V}$	3	7	30	$\text{V}/\mu\text{s}$

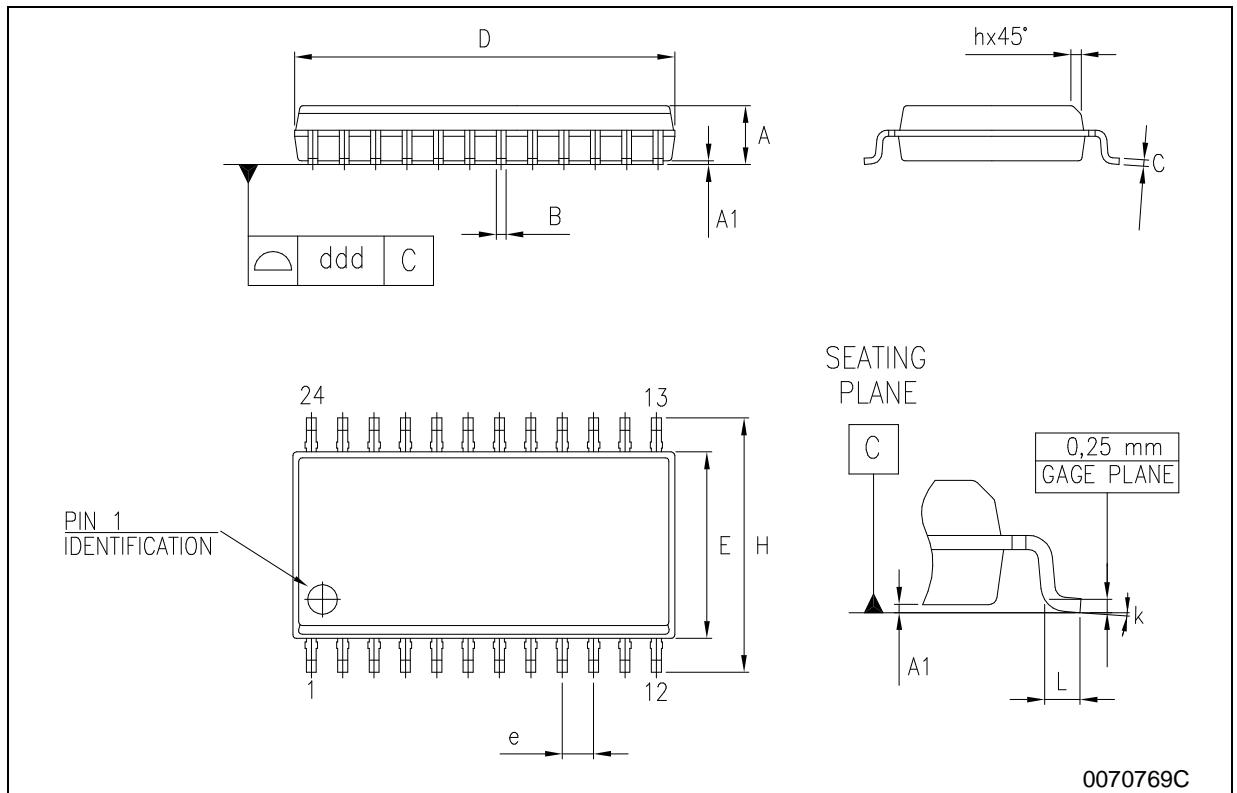
Figure 2: Application Circuits

Table 9: Capacitance Value ( $\mu\text{F}$ )

C1	C2.	C3	C4	C5
0.1	0.1	0.1	0.1	0.1

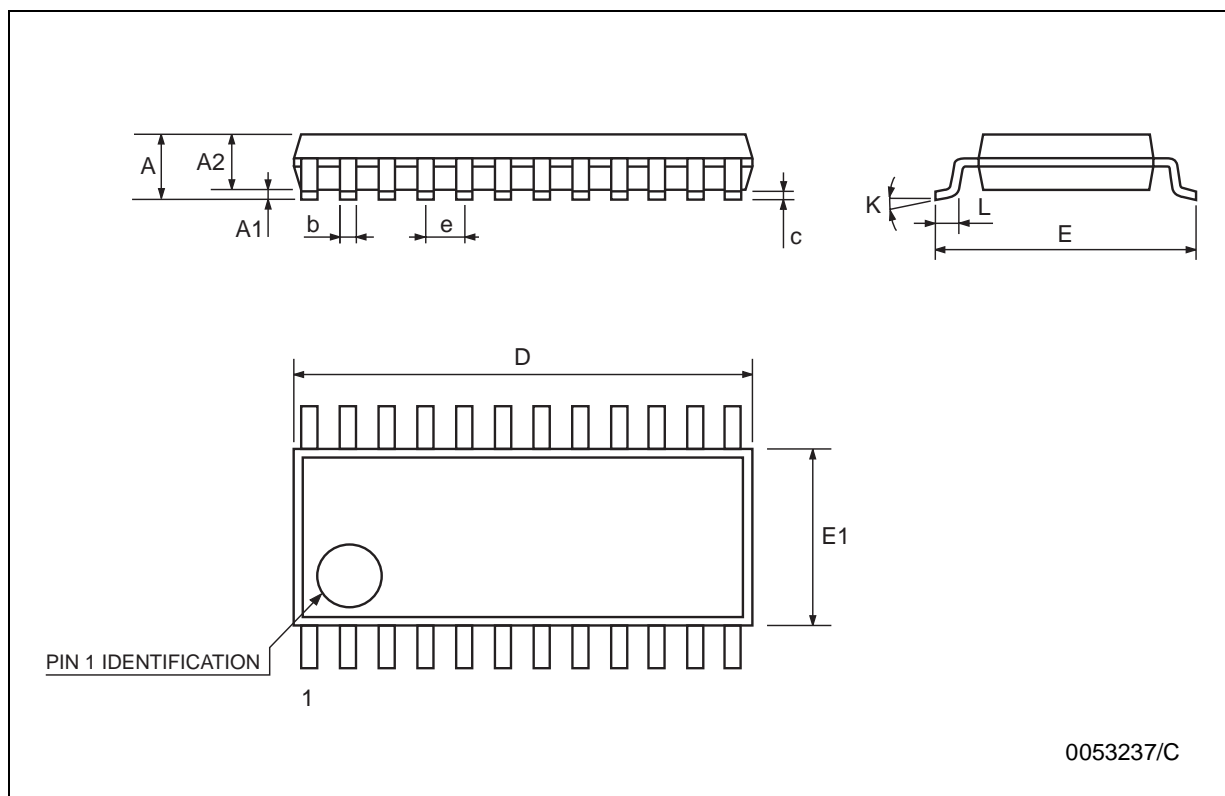
## SO-24 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.35		2.65	0.093		0.104
A1	0.1		0.30	0.004		0.012
B	0.33		0.51	0.013		0.020
C	0.23		0.32	0.009		0.013
D	15.20		15.60	0.598		0.614
E	7.4		7.6	0.291		0.299
e		1.27			0.050	
H	10.00		10.65	0.394		0.419
h	0.25		0.75	0.010		0.030
L	0.4		1.27	0.016		0.050
k	0°		8°	0°		8°
ddd			0.100			0.004



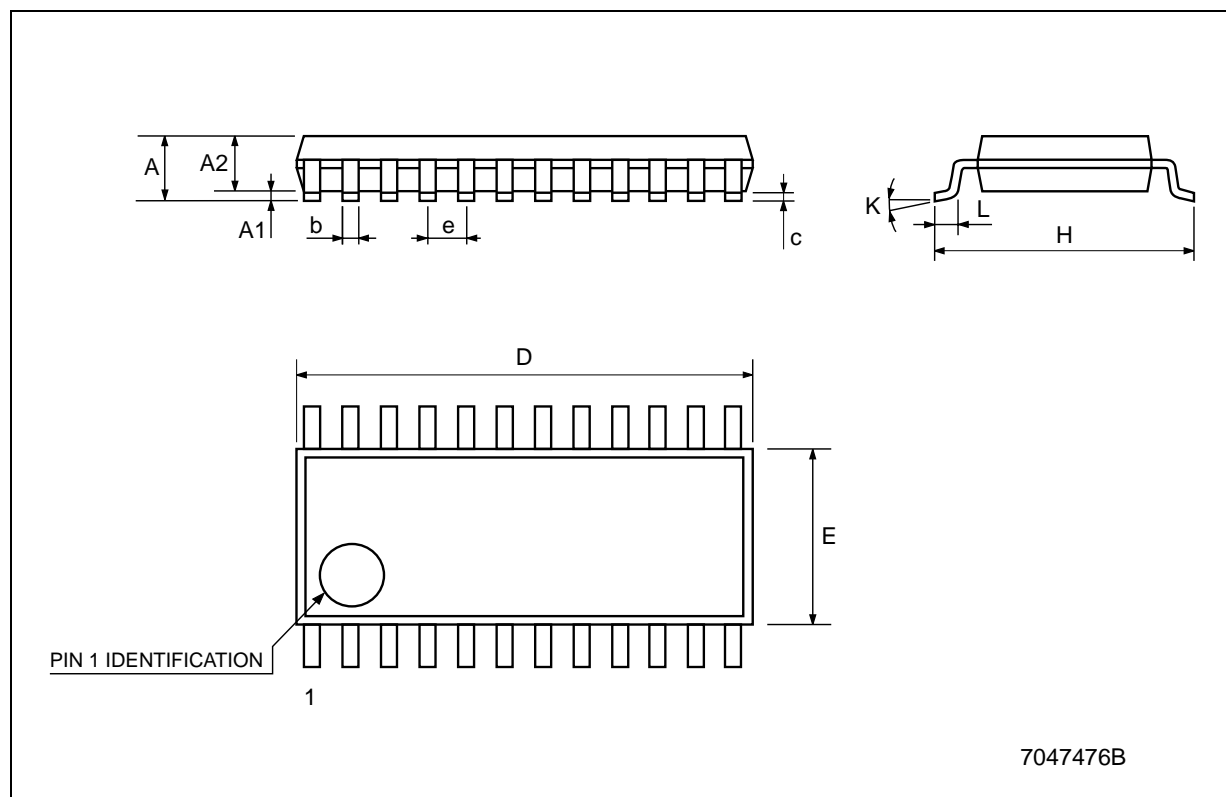
## SSOP24 MECHANICAL DATA

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	7.9	8.2	8.5	0.311	0.323	0.335
E	7.4	7.8	8.2	0.291	0.307	0.323
E1	5.00	5.3	5.6	0.197	0.209	0.220
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.55	0.75	0.95	0.022	0.030	0.037



## TSSOP24 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.1			0.043
A1	0.05		0.15	0.002		0.006
A2		0.9			0.035	
b	0.19		0.30	0.0075		0.0118
c	0.09		0.20	0.0035		0.0079
D	7.7		7.9	0.303		0.311
E	4.3		4.5	0.169		0.177
e		0.65 BSC			0.0256 BSC	
H	6.25		6.5	0.246		0.256
K	0°		8°	0°		8°
L	0.50		0.70	0.020		0.028

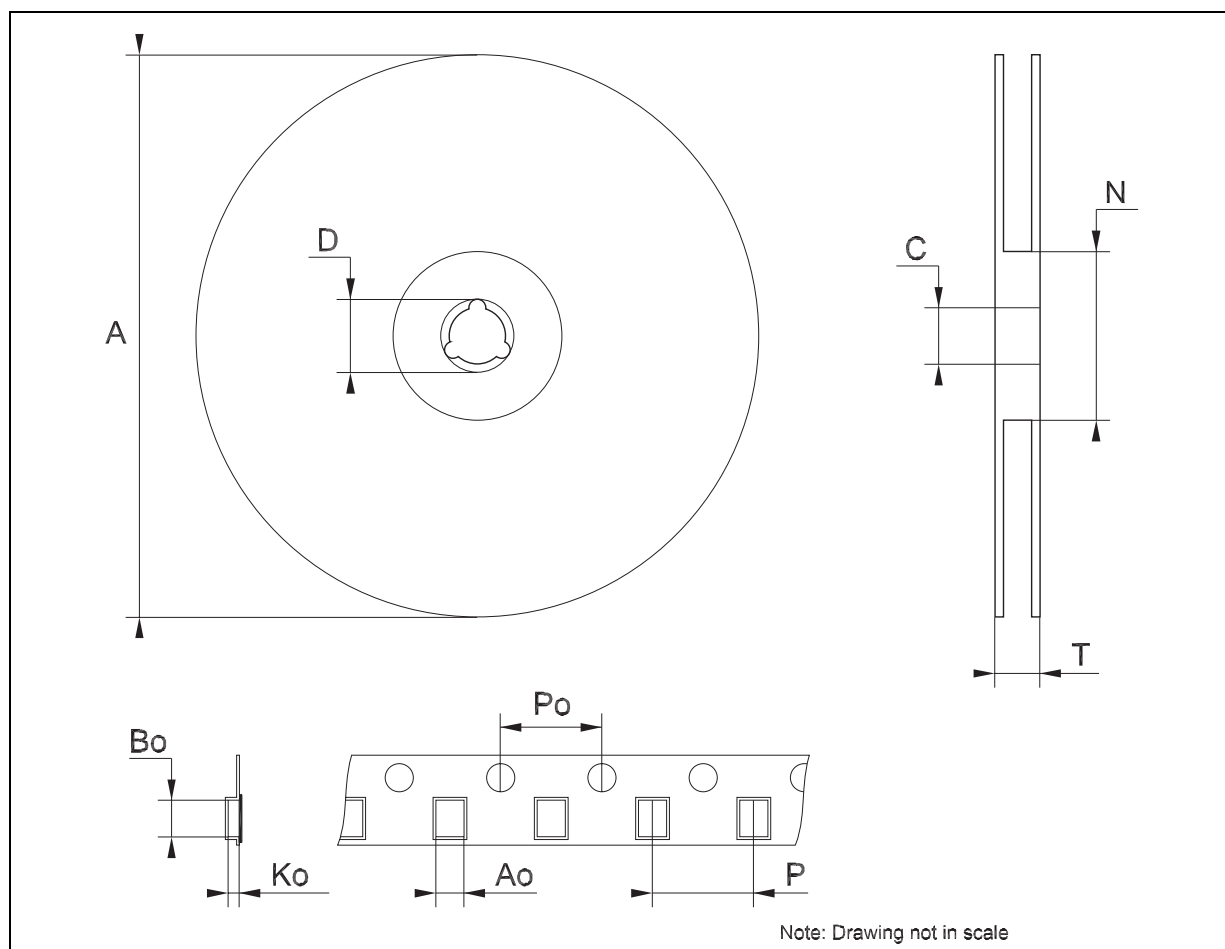


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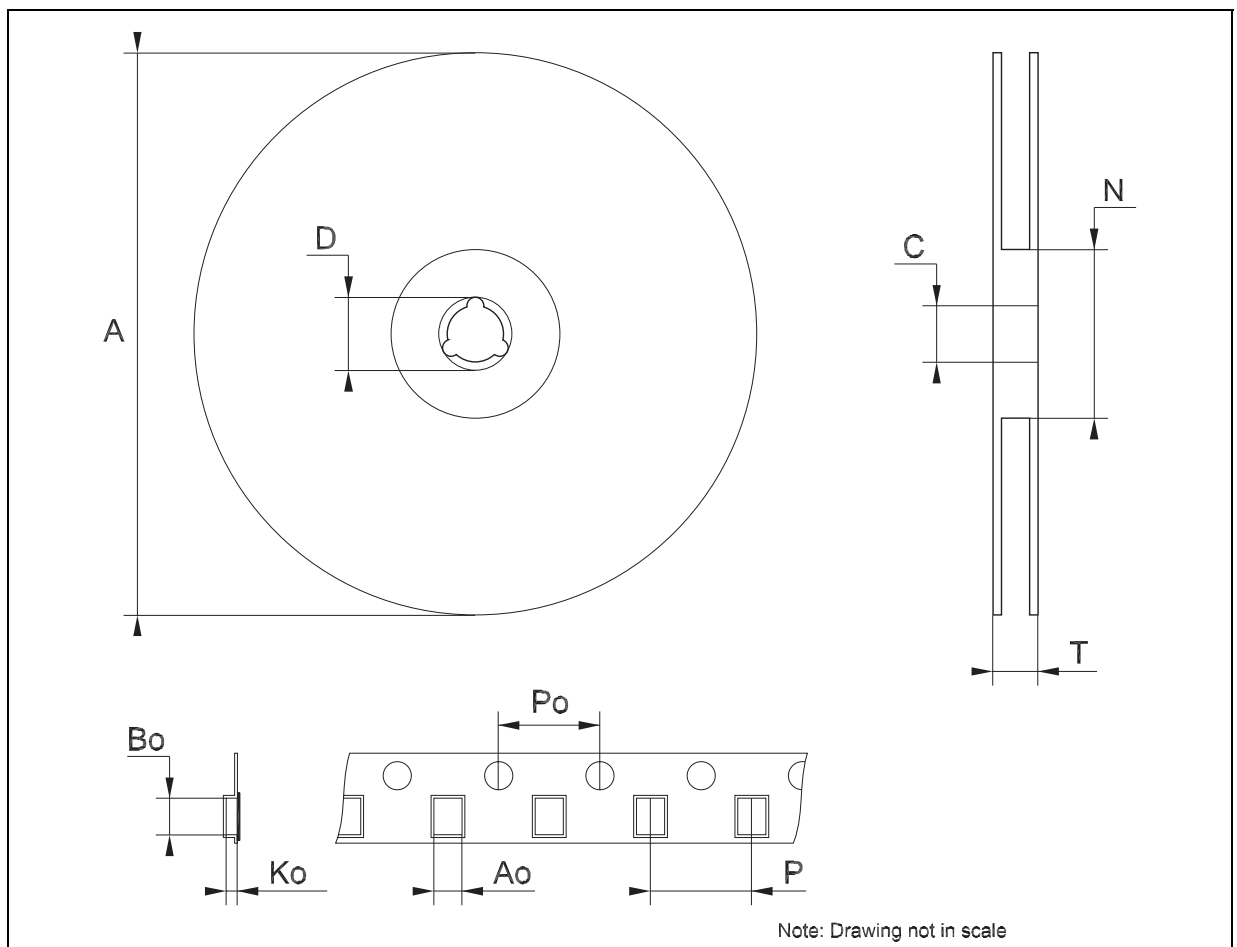
## Tape &amp; Reel SO-24 MECHANICAL DATA

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			30.4			1.197
Ao	10.8		11.0	0.425		0.433
Bo	15.7		15.9	0.618		0.626
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



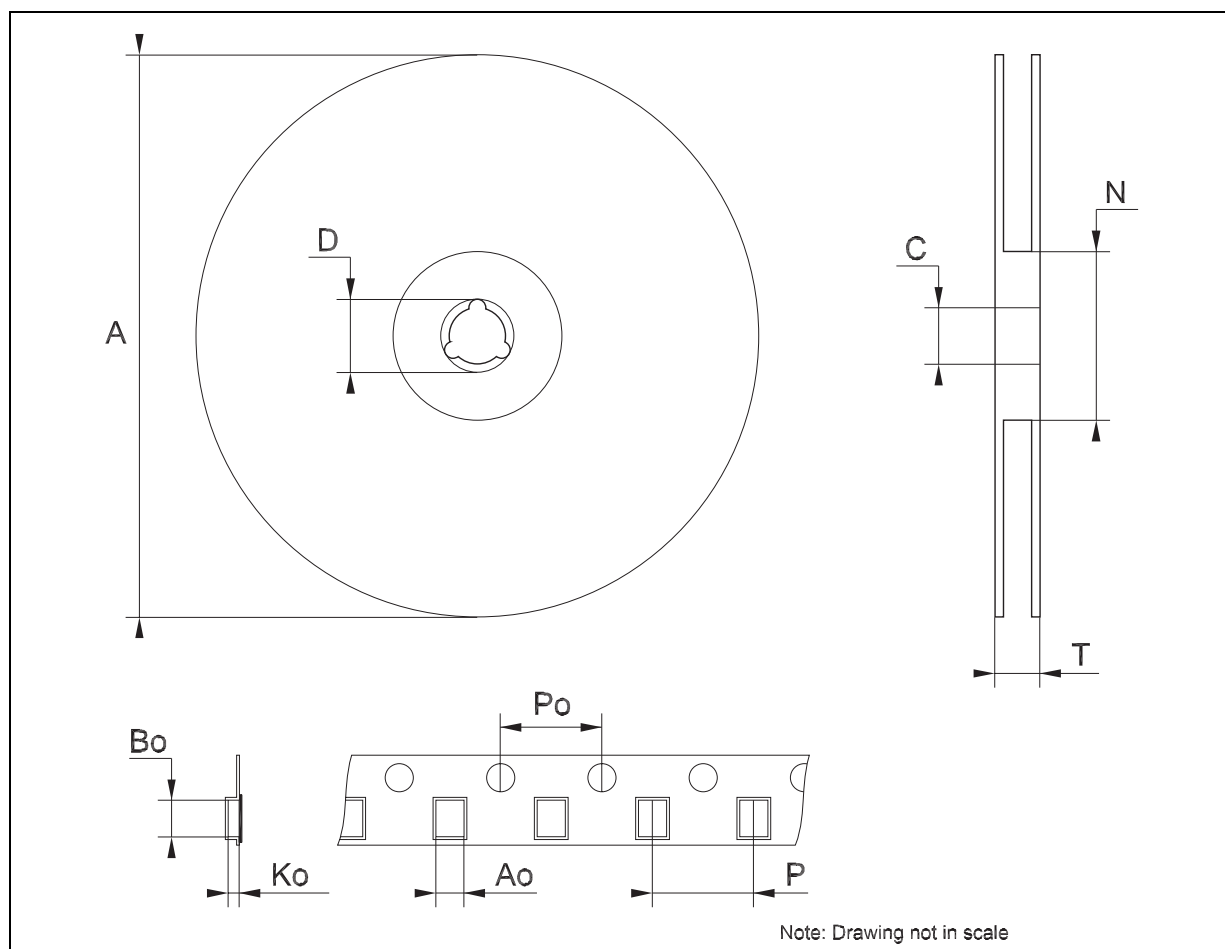
## Tape & Reel SSOP24 MECHANICAL DATA

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	8.7		8.9	0.343		0.351
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 TSSOP24 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	6.8		7	0.268		0.276
Bo	8.2		8.4	0.323		0.331
Ko	1.7		1.9	0.067		0.075
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



**Table 10: Revision History**

<b>Date</b>	<b>Revision</b>	<b>Description of Changes</b>
25-Jan-2005	13	Mistake on Table 1.

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