# ST207E

± 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

SOP

SSOP   TSSOP

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.
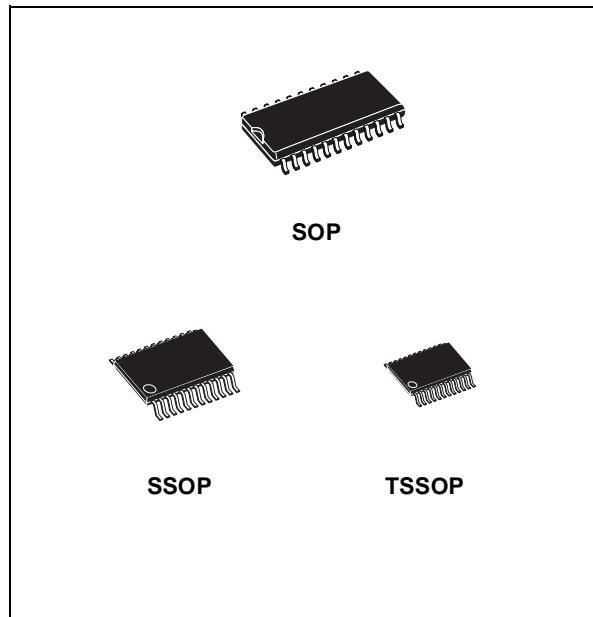
Table 1: Order Codes

| 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
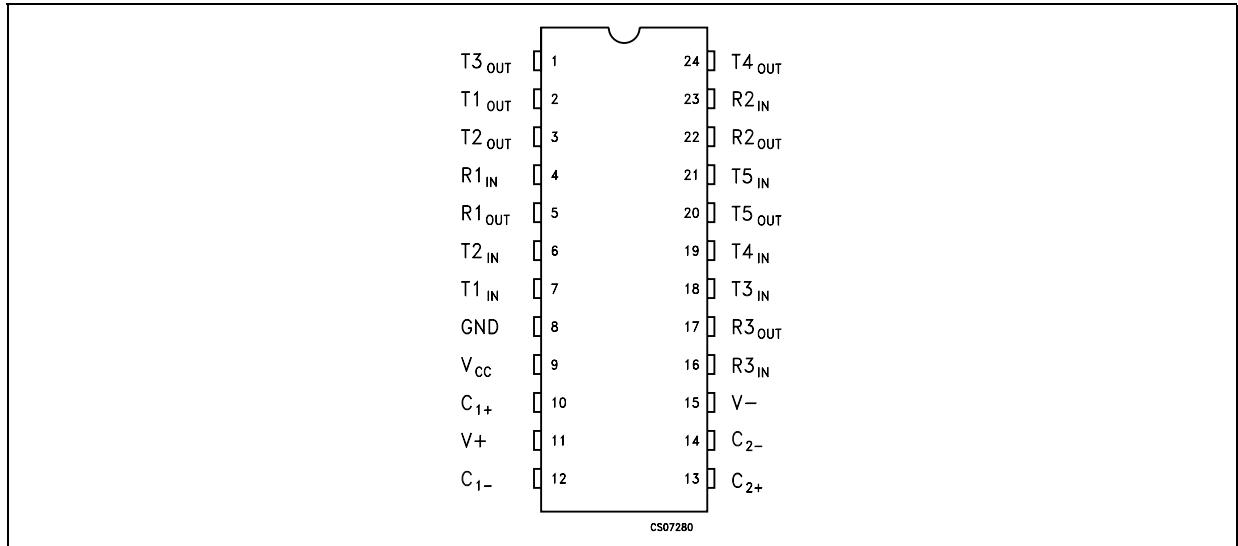
Table 2: Pin Description

PIN N°	SYMBOL	NAME AND FUNCTION
1	$T3_{OUT}$	RS-232 Driver Output
2	$T1_{OUT}$	RS-232 Driver Output
3	$T2_{OUT}$	RS-232 Driver Output
4	$R1_{IN}$	RS-232 Receiver Input
5	$R1_{OUT}$	TTL/CMOS Receiver Output
6	$T2_{IN}$	TTL/CMOS Driver Input Internal Pull-up to V_{CC}
7	$T1_{IN}$	TTL/CMOS Driver Input Internal Pull-up to V_{CC}
8	GND	Ground
9	V_{CC}	4.75V to 5.25V Supply Voltage
10	C_{1+}	Terminal For Positive Charge-pump Capacitor
11	V_{+}	$2V_{CC}$ Generated by The Charge-pump
12	C_{1-}	Terminal For Negative Charge-pump Capacitor
13	C_{2+}	Terminal For Positive Charge-pump Capacitor
14	C_{2-}	Terminal For Negative Charge-pump Capacitor
15	V_{-}	$-2V_{CC}$ Generated by The Charge-pump
16	$R3_{IN}$	RS-232 Receiver Input
17	$R3_{OUT}$	TTL/CMOS Receiver Output
18	$T3_{IN}$	TTL/CMOS Driver Input Internal Pull-up to V_{CC}
19	$T4_{IN}$	TTL/CMOS Driver Input Internal Pull-up to V_{CC}
20	$T5_{OUT}$	RS-232 Driver Output
21	$T5_{IN}$	TTL/CMOS Driver Input Internal Pull-up to V_{CC}
22	$R2_{OUT}$	TTL/CMOS Receiver Output
23	$R2_{IN}$	RS-232 Receiver Input
24	$T4_{OUT}$	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	± 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	± 15			KV
ESD	ESD Protection Voltage	IEC-1000-4-2 Contact Discharge	± 8			KV

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

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

Table 6: Receiver Electrical Characteristics (C_1 - C_4 = 0.1μF, V_{CC} = 5V $\pm$ 5%, T_A = MIN to MAX, unless otherwise specified. Typical values are referred to T_A = 25°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°C $\quad$ V_{CC} = 5V	0.8	1.2		V
V_{RIH}	Input Threshold High	T_A = 25°C $\quad$ V_{CC} = 5V		1.7	2.4	V
V_{RIHYS}	Input Hysteresys	V_{CC} = 5V, no hysteresis in shutdown	0.2	0.5	1	V
R_{RIN}	Input Resistance	T_A = 25°C $\quad$ V_{CC} = 5V	3	5	7	KΩ
V_{OL}	Output Voltage Low				0.4	V
V_{OH}	Output Voltage High	I_{OUT} = -1mA	3.5	V_{CC}-0.4		V

Table 7: Transmitter Electrical Characteristics (C_1 - C_4 = 0.1µF, V_{CC} = 5V ± 5%, T_A = MIN to MAX, unless otherwise specified. Typical values are referred to T_A = 25°C)

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

Table 8: Timing Characteristics (C_1 - C_4 = 0.1µF, V_{CC} = 5V ± 5%, T_A = MIN to MAX, unless otherwise specified. Typical values are referred to T_A = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
D_R	Maximum Data Rate	R_L = 3KΩ to 7KΩ C_L= 50pF to 1000pF one transmitter switching	150	240		Kbps
		R_L = 3KΩ to 7KΩ C_L= 50pF to 150pF one transmitter switching	230	300		Kbps
t_{PHLR} t_{PLHR}	Receiver Propagation Delay	All drivers loaded with 3KΩ to GND		0.2	10	µs
t_{PHLT} t_{PLHT}	Transmitter Propagation Delay	R_L = 3KΩ C_L= 2500pF All transmitter loaded		2	3	µs
SR	Transition-Region Slew Rate	T_A = 25°C R_L = 3 to 7KΩ V_{CC} = 5V C_L = 50pF to 1000pF measured from +3V to -3V or -3V to +3V	3	7	30	V/µs

Figure 2: Application Circuits
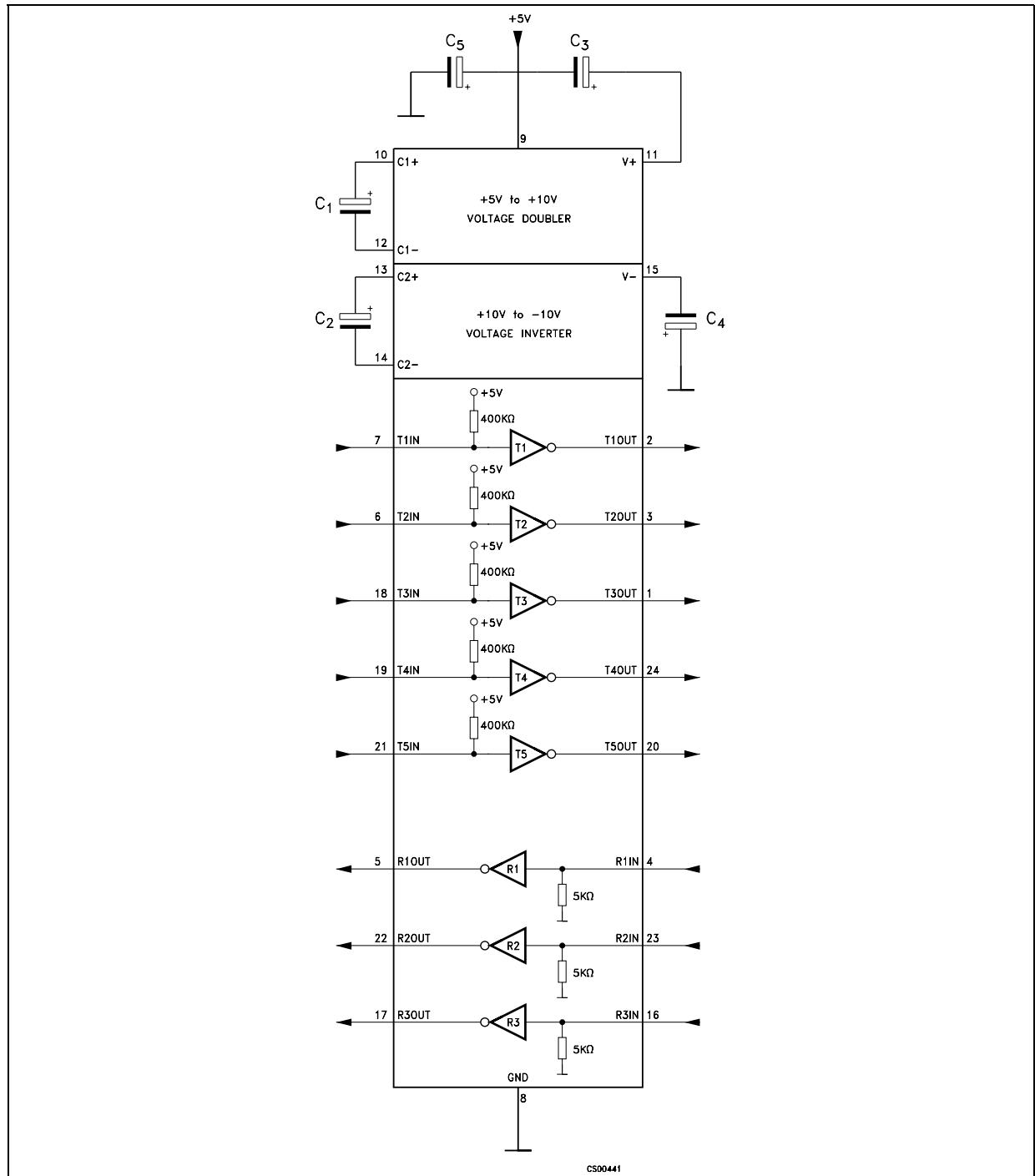
Table 9: Capacitance Value (μF)

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

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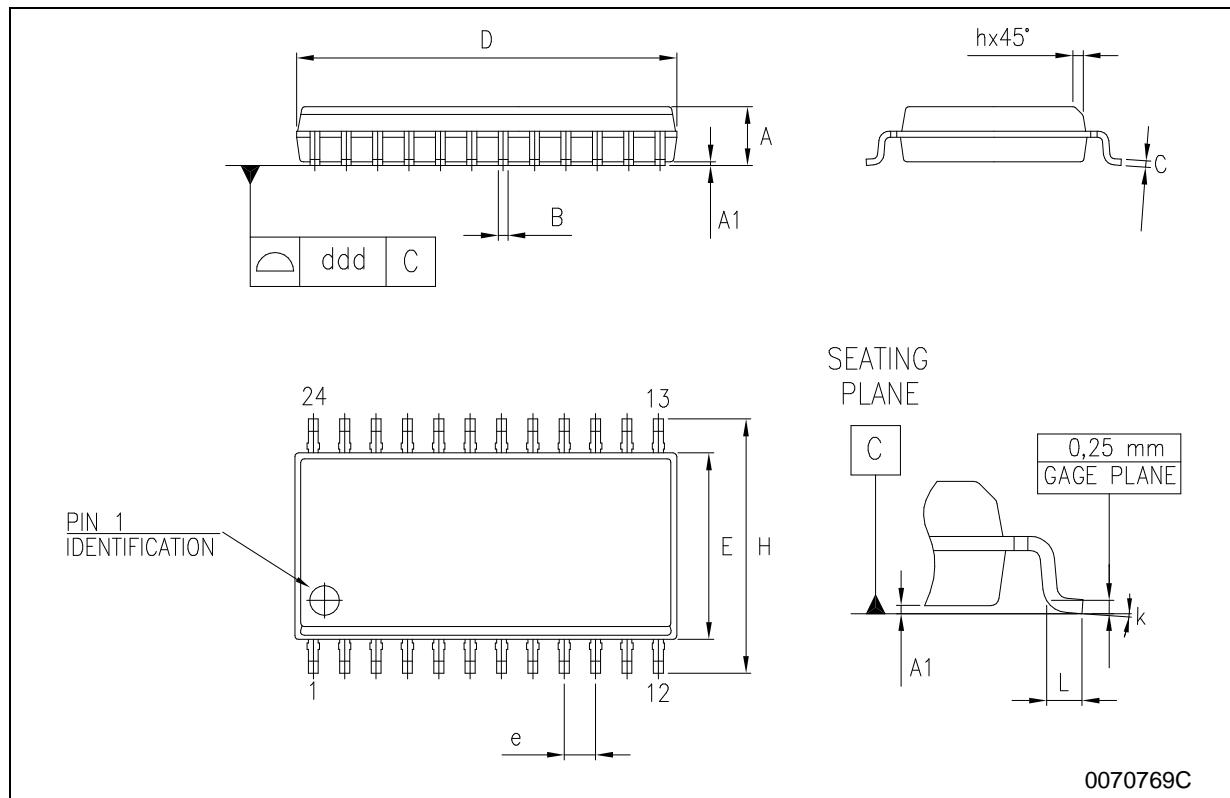
SSOP24 MECHANICAL DATA

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

PIN 1 IDENTIFICATION

1
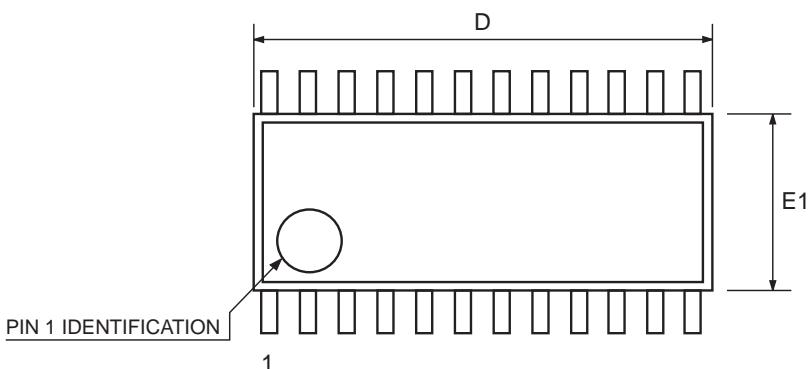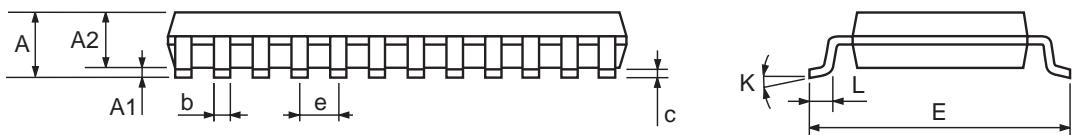
0053237/C

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

PIN 1 IDENTIFICATION

1
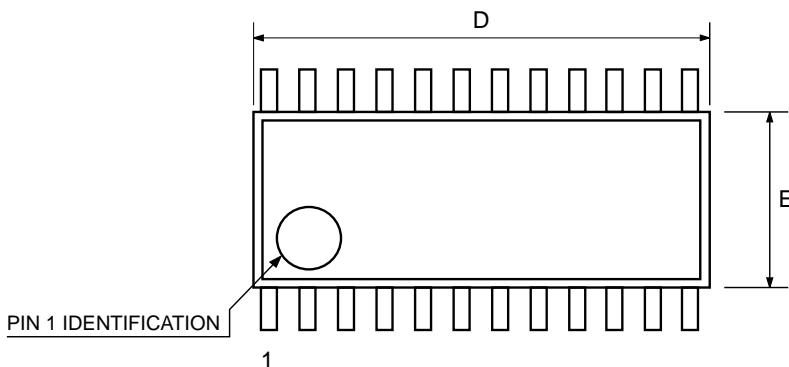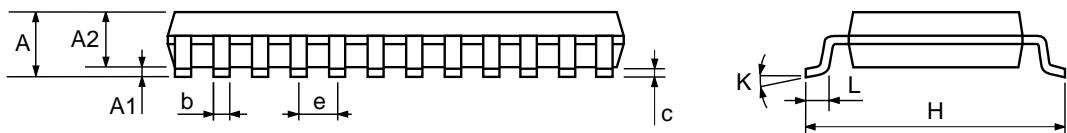
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Tape & Reel SO-24 MECHANICAL DATA

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

Note: Drawing not in scale
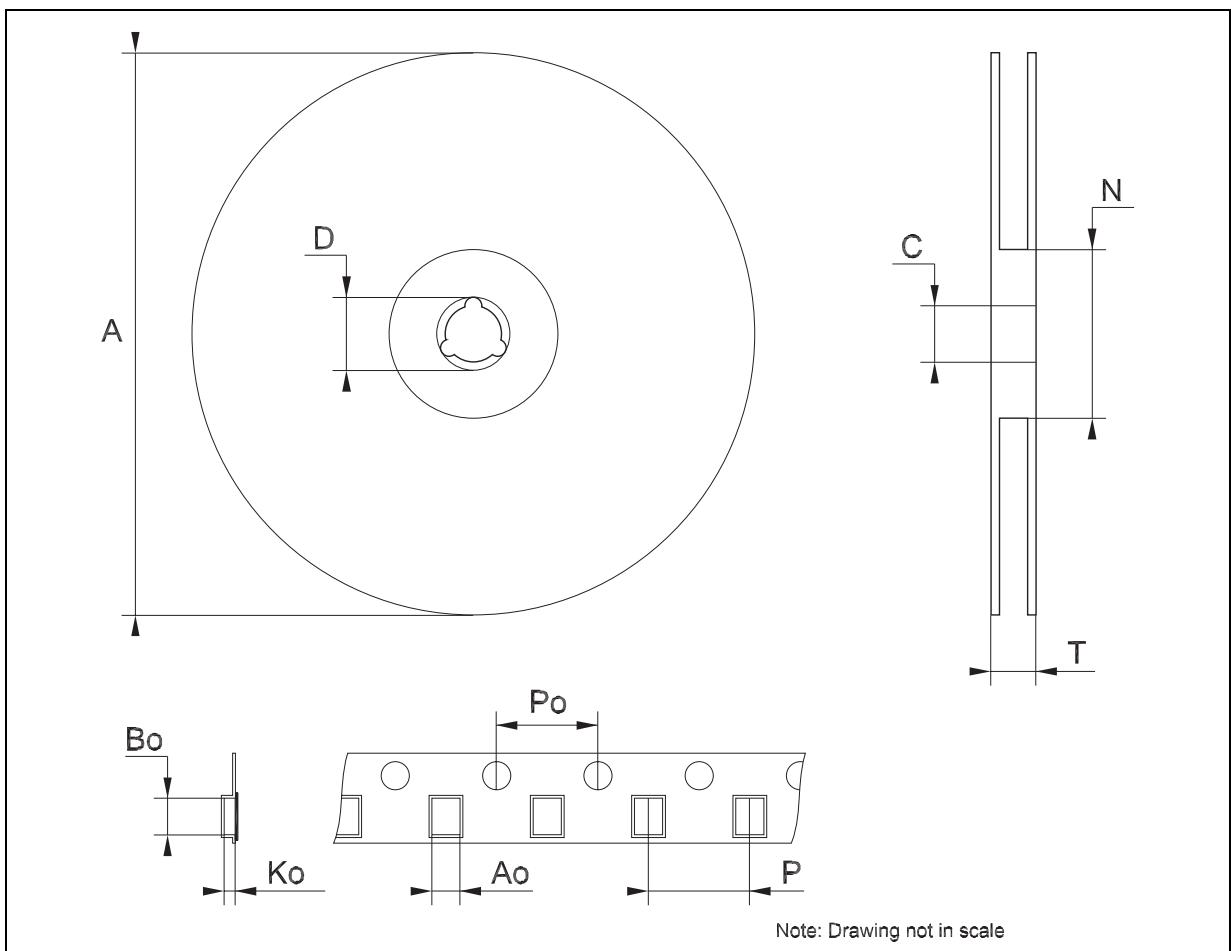
Tape & Reel SSOP24 MECHANICAL DATA

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

Note: Drawing not in scale
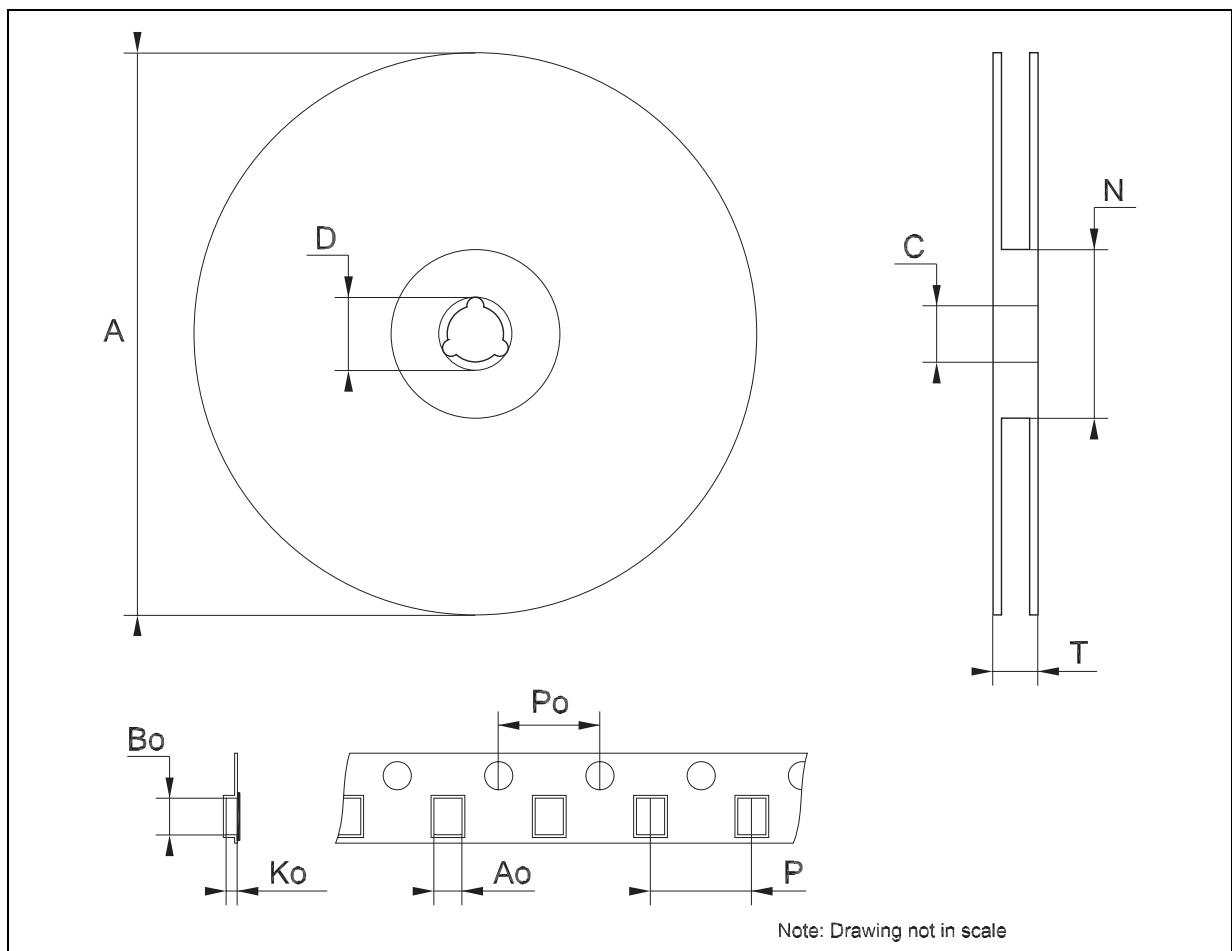
Tape & Reel TSSOP24 MECHANICAL DATA

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

Note: Drawing not in scale
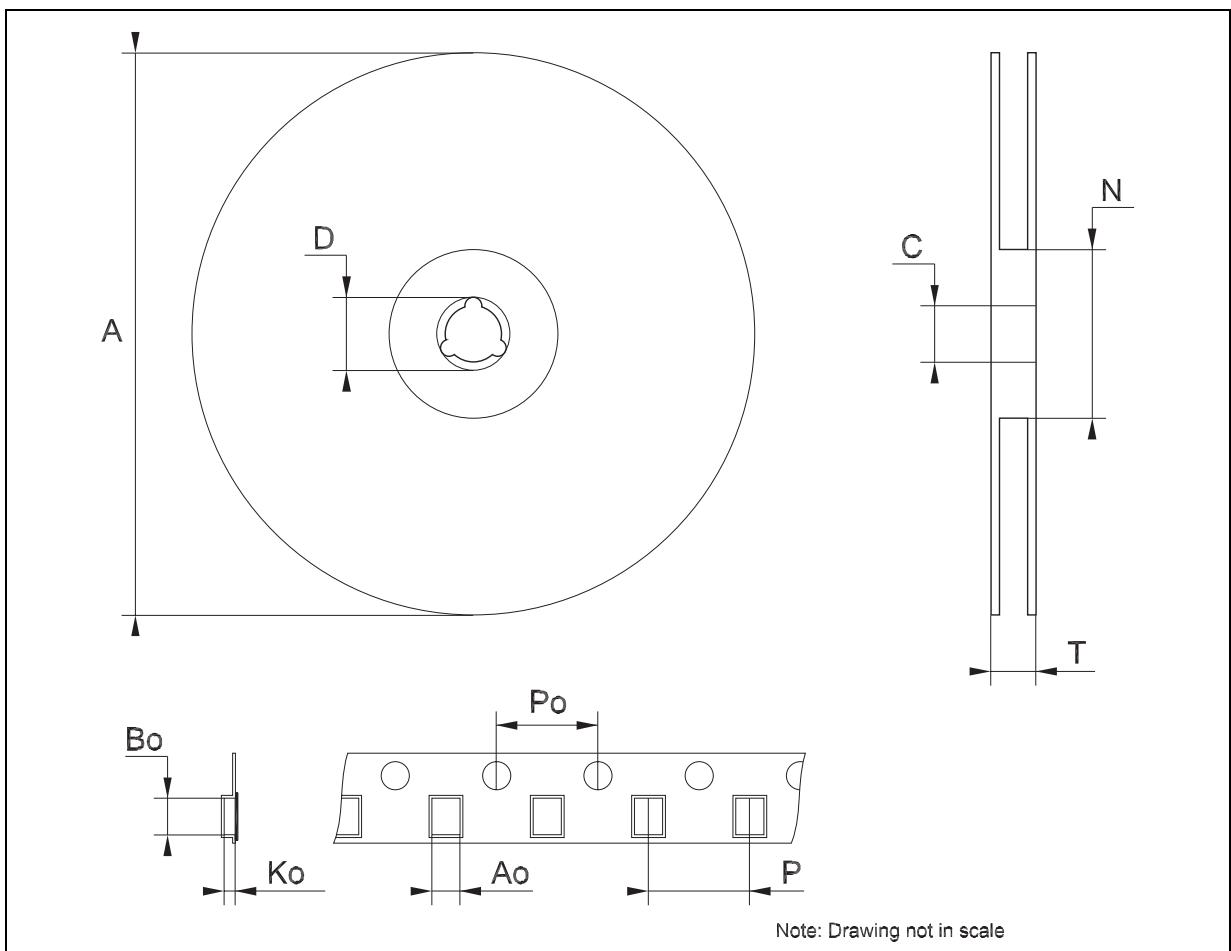
Table 10: Revision History

Date	Revision	Description of Changes
25-Jan-2005	13	Mistake on Table 1.