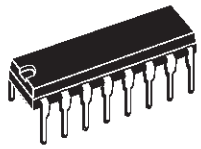
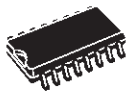
ST202E
ST232E

± 15KV ESD PROTECTED 5V RS-232 TRANSCEIVER

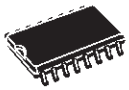
- ESD PROTECTION FOR RS-232 I/O PINS: ± 15 KV HUMAN BODY MODEL
- GUARANTEED 120 kbps DATE RATE
- GUARANTEED SLEW RATE RANGE 3 to 30V/µs
- OPERATE FROM A SINGLE 5V POWER SUPPLY



N
(Plastic Package)



D
(Micro Package)



W
(Micro Package Large)

T
(TSSOP Package)

DESCRIPTION

The ST202E/ST232E are a 2 driver 2 receiver devices designed for RS-232 and V.28 communications in harsh enviroments. Each transmitter output and receiver input is protected against ± 15KV electrostatic discharge (ESD) shocks. The drivers 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.

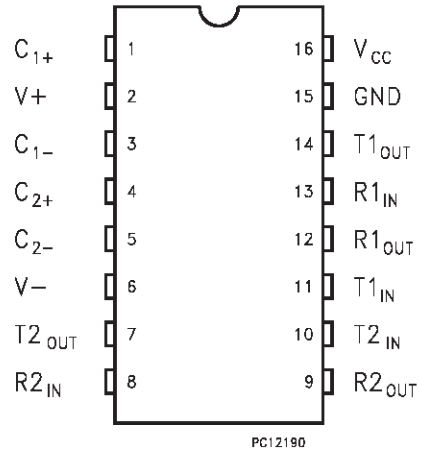
The ST202E/232E use a single 5V supply voltage.

The ST232E operates with four 1µF capacitors, while the ST202E operates with four 0.1µF capacitors, further reducing cost and board space.

ORDER CODES

Type		Temperature Range	Package	Comments
ST202ECN	ST232ECN	0 to 70 °C	DIP-16	25 parts per tube / 40 tube per box
ST202EBN	ST232EBN	-40 to 85 °C	DIP-16	25 parts per tube / 40 tube per box
ST202ECD	ST232ECD	0 to 70 °C	SO-16 (Tube)	50 parts per tube / 20 tube per box
ST202EBD	ST232EBD	-40 to 85 °C	SO-16 (Tube)	50 parts per tube / 20 tube per box
ST202ECDR	ST232ECDR	0 to 70 °C	SO-16 (Tape & Reel)	2500 parts per reel
ST202EBDR	ST232EBDR	-40 to 85 °C	SO-16 (Tape & Reel)	2500 parts per reel
ST202ECW	ST232ECW	0 to 70 °C	SO-16 Large (Tube)	50 parts per tube / 20 tube per box
ST202EBW	ST232EBW	-40 to 85 °C	SO-16 Large (Tube)	50 parts per tube / 20 tube per box
ST202ECWR	ST232ECWR	0 to 70 °C	SO-16 Large (Tape & Reel)	1000 parts per reel
ST202EBWR	ST232EBWR	-40 to 85 °C	SO-16 Large (Tape & Reel)	1000 parts per reel
ST202ECTR	ST232ECTR	0 to 70 °C	TSSOP16 (Tape & Reel)	2500 parts per reel
ST202EBTR	ST232EBTR	-40 to 85 °C	TSSOP16 (Tape & Reel)	2500 parts per reel

PIN CONFIGURATION



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1	C_1+	Positive Terminal for the first Charge Pump Capacitor
2	V+	Doubled Voltage Terminal
3	C_1-	Negative Terminal for the first Charge Pump Capacitor
4	C_2+	Positive Terminal for the second Charge Pump Capacitor
5	C_2-	Negative Terminal for the second Charge Pump Capacitor
6	V-	Inverted Voltage Terminal
7	$T2_{OUT}$	Second Transmitter Output Voltage
8	$R2_{IN}$	Second Receiver Input Voltage
9	$R2_{OUT}$	Second Receiver Output Voltage
10	$T2_{IN}$	Second Transmitter Input Voltage
11	$T1_{IN}$	First Transmitter Input Voltage
12	$R1_{OUT}$	First Receiver Output Voltage
13	$R1_{IN}$	First Receiver Input Voltage
14	$T1_{OUT}$	First Transmitter Output Voltage
15	GND	Ground
16	V_{CC}	Supply Voltage

ABSOLUTE MAXIMUM RATINGS (Note 1)

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+ + 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_{SCTOUT}	Short Circuit Duration on T_{OUT}	infinite	
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.

ELECTRICAL CHARACTERISTICS

(C_1 -C_4 = 0.1µF for ST202E, C_1 -C_4 = 1µF for ST232E, V_{CC} = 5V ± 10% T_A = -40 to 85 °C, unless otherwise specified. Typical Valus are referred to T_A = 25 °C)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
I_{SUPPLY}	V_{CC} Power Supply Current	No Load, T_A = 25 °C		5	10	mA

TRANSMITTER ELECTRICAL CHARACTERISTICS

(C_1 -C_4 = 0.1µF for ST202E, C_1 -C_4 = 1µF for ST232, V_{CC} = 5V ± 10%, T_A = -40 to 85 °C, unless otherwise specified. Typical Valus are referred to T_A = 25 °C)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{TOUT}	Output Voltage Swing	All Transmitter outputs are loaded with 3KΩ to GND	±5	±9		V
I_{TIL}	Logic Pull-Up Current	T_{IN} = 0 V to V_{CC}			±10	µA
V_{TIL}	Input Logic Threshold Low		0.8			V
V_{TIH}	Input Logic Threshold High				2	V
SR_T	Transition Slew Rate	T_A = 25 °C, V_{CC} = 5 V, R_L = 3 to 7 KΩ, C_L= 50 to 1000 pF (Note 1)	3	6	30	V/µs
D_R	Data Rate	R_L = 3 to 7 KΩ, C_L= 50 to 1000 pF one trasmitter switching	230	400		Kbits/s
R_{TOUT}	Transmitter Output Resistance	V_{CC} = V+ = V- = 0V V_{OUT} = ± 2 V	300			Ω
I_{SC}	Transmitter Output Short Circuit Current			±10	±60	mA
t_{DT}	Trasmitter Propagation Delay	R_L = 3 KΩ, C_L= 2500 pF All trasmitter loaded		2		µA

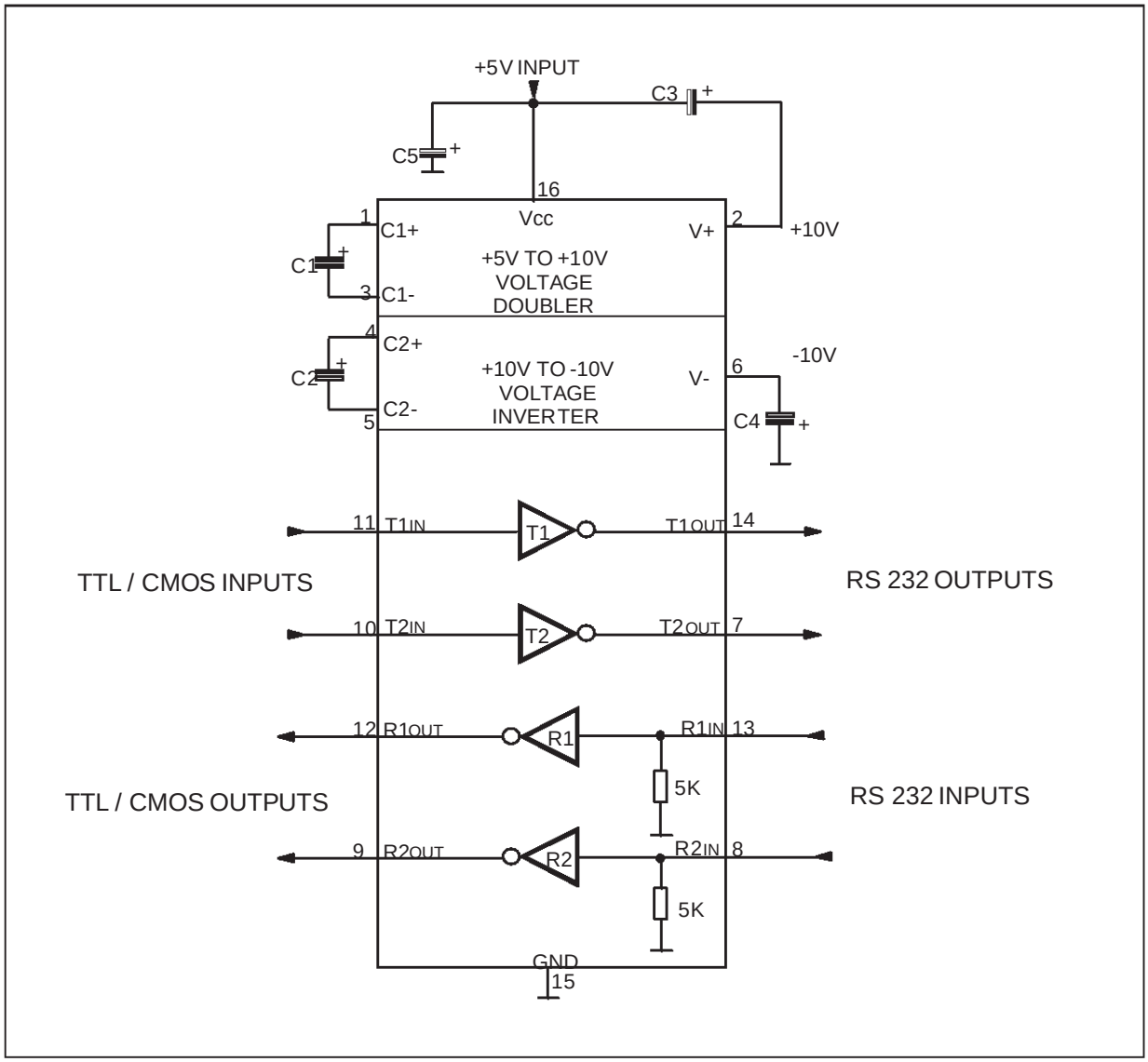
Note 1: Measured from 3V to -3V or from -3V to 3V.
Note 2: One trasmitter output is loaded with R_L = 3KΩ to 7KΩ, C_L = 50 to 1000pF

RECEIVER ELECTRICAL CHARACTERISTICS

(C_1 -C_4 = 0.1µF for ST202E, C_1 -C_4 = 1µF for ST232E, V_{CC} = 5V ± 10%, T_A = -40 to 85 °C, unless otherwise specified. Typical Valus are referred to T_A = 25 °C)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{RIN}	Receiver Input Voltage Operating Range		-30		30	V
R_{RIN}	RS-232 Input Resistance	T_A = 25 °C, V_{CC} = 5 V	3	5	7	KΩ
V_{RIL}	RS-232 Input Logic Threshold Low	T_A = 25 °C, V_{CC} = 5 V	0.8	1.2		V
V_{RIH}	RS-232 Input Logic Threshold High	T_A = 25 °C, V_{CC} = 5 V		1.7	2.4	V
V_{RIHYS}	RS-232 Input Hysteresis	V_{CC} = 5 V	0.2	0.5	1	V
V_{ROL}	TTL/CMOS Output Voltage Low	I_{OUT} = 3.2mA			0.4	V
V_{ROH}	TTL/CMOS Output Voltage High	I_{OUT} = -1mA	3.5	V_{CC}-0.4		V
t_{dR}	Propagation Delay Time	C_L=150pF		0.5	10	µs

APPLICATION CIRCUITS (note 1, note 2)

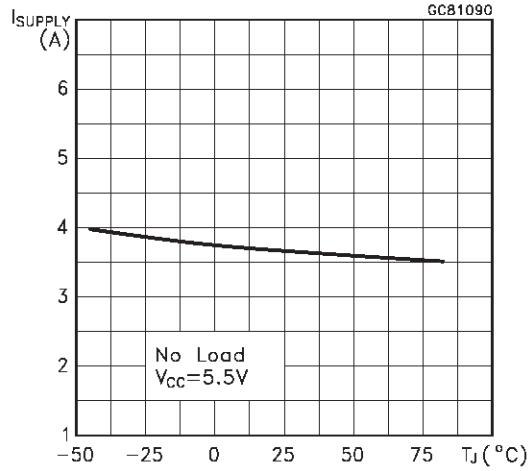


Note 1: C_{1-4} capacitors can even be 1 µF ones.
Note 2: C_{1-4} can be common or biased capacitors.

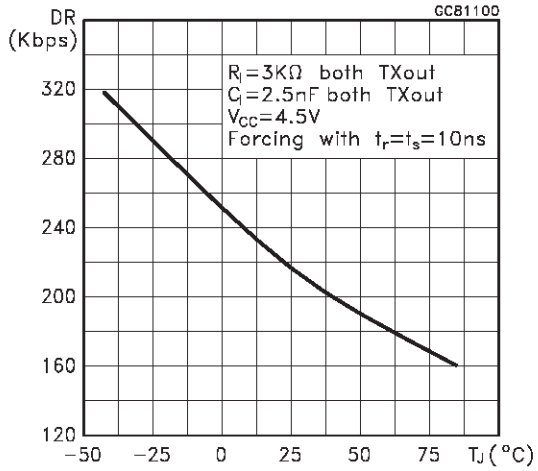
Capacitance Value (µF)

DEVICES	C1	C2	C3	C4	C5
ST202E	0.1	0.1	0.1	0.1	0.1
ST232E	1	1	1	1	1

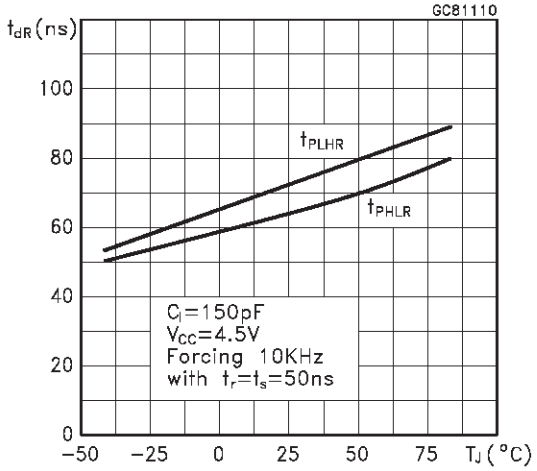
Supply Current vs Temperature



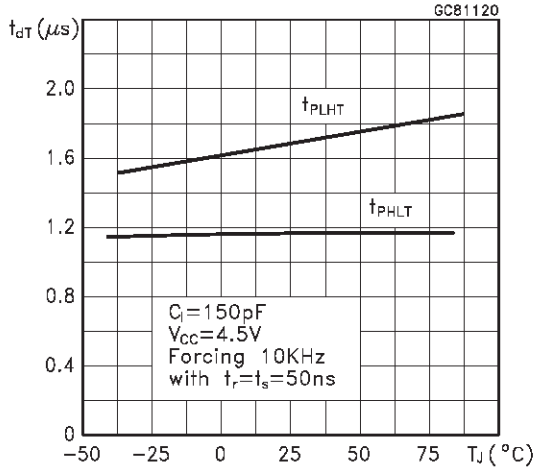
Data Rate vs Temperature



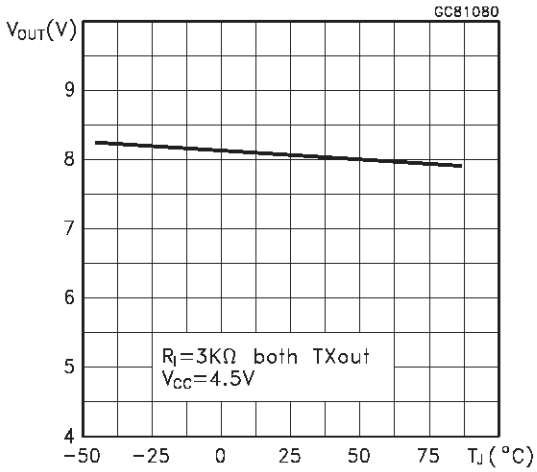
Receiver Propagation Delay



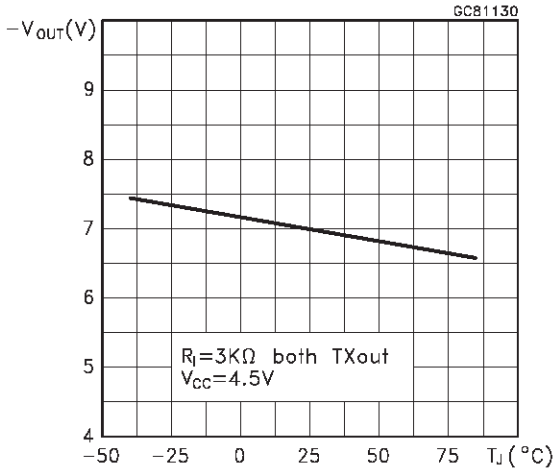
Driver Propagation Delay



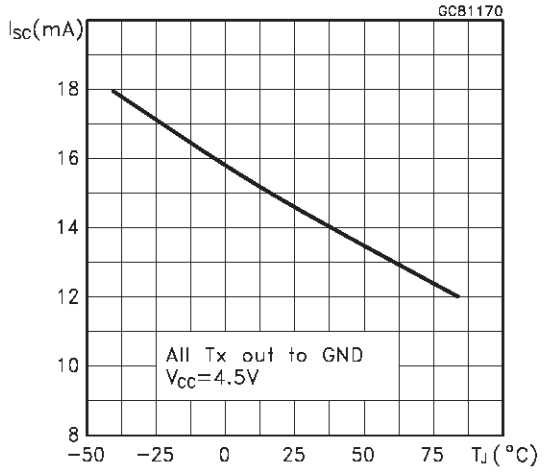
High Level Output Voltage Swing vs Temperature



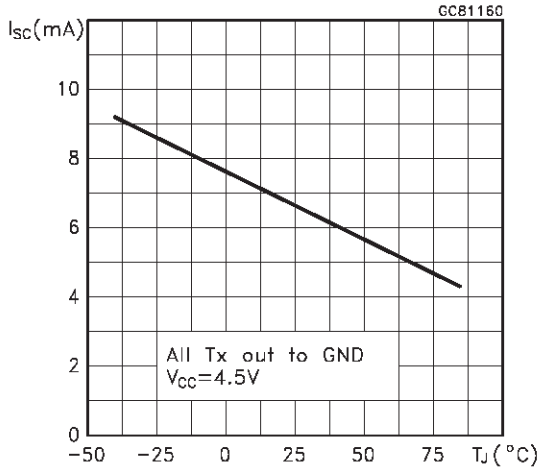
Low Level Output Voltage Swing vs Temperature



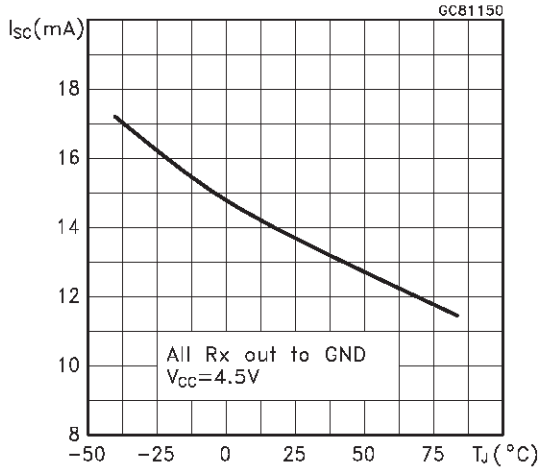
High Level Trasmitter Output Short Circuit Current vs Temperature



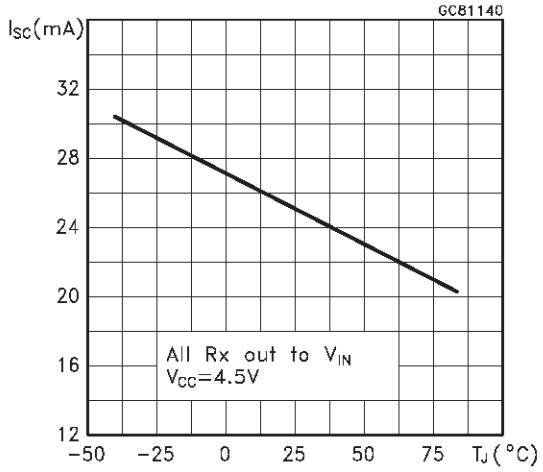
Low Level Trasmitter Output Short Circuit Current vs Temperature



High Level Receiver Output Short Circuit Current vs Temperature

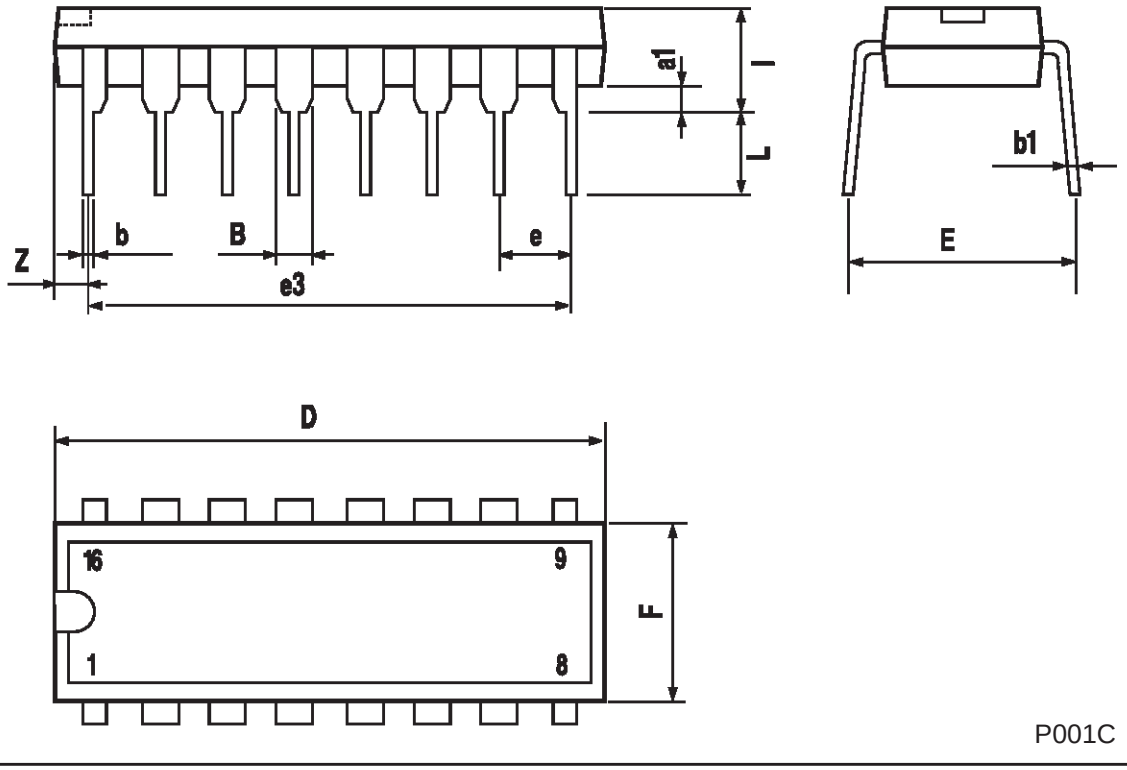


Low Level Receiver Output Short Circuit Current vs Temperature



Plastic DIP-16 (0.25) MECHANICAL DATA

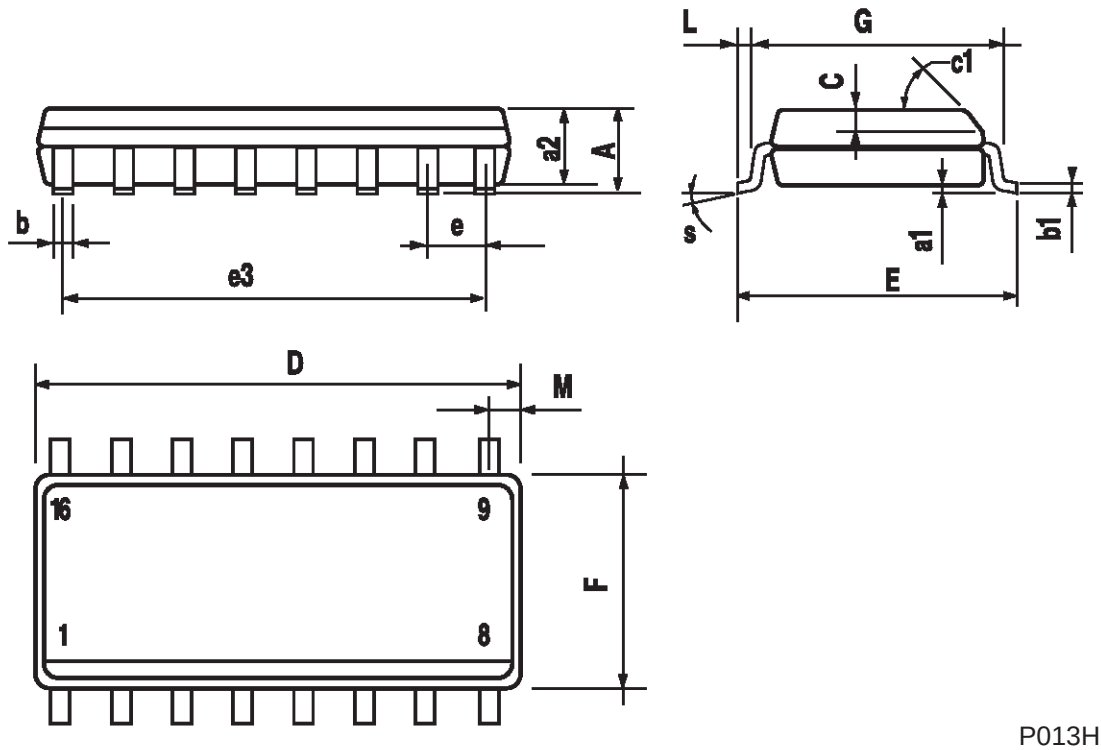
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

SO-16 MECHANICAL DATA

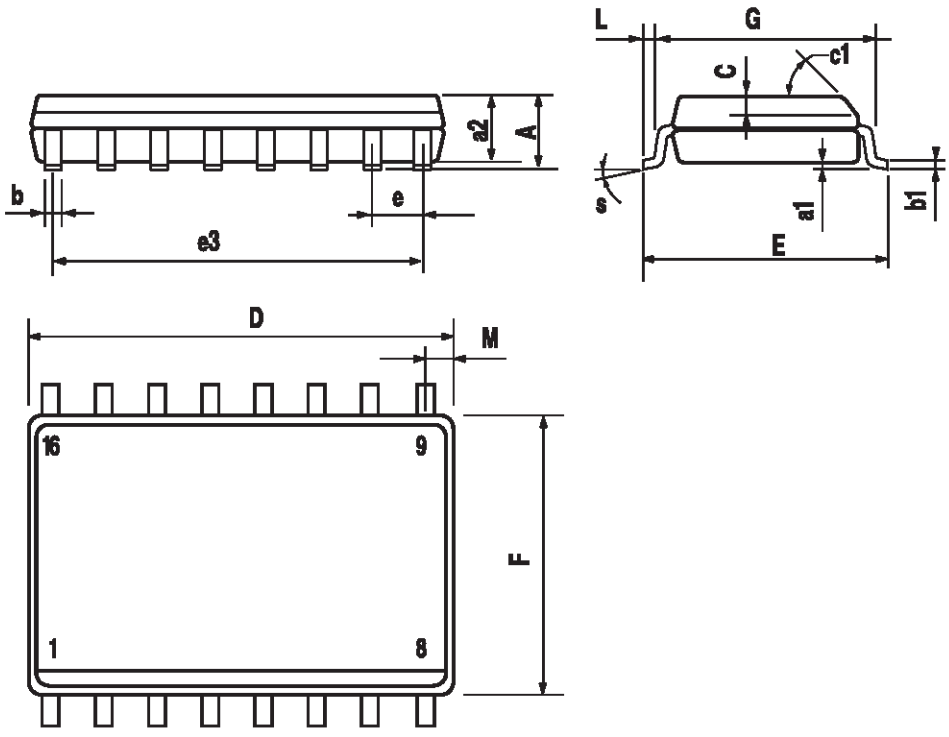
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.004		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45 (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8 (max.)					



P013H

SO16L MECHANICAL DATA

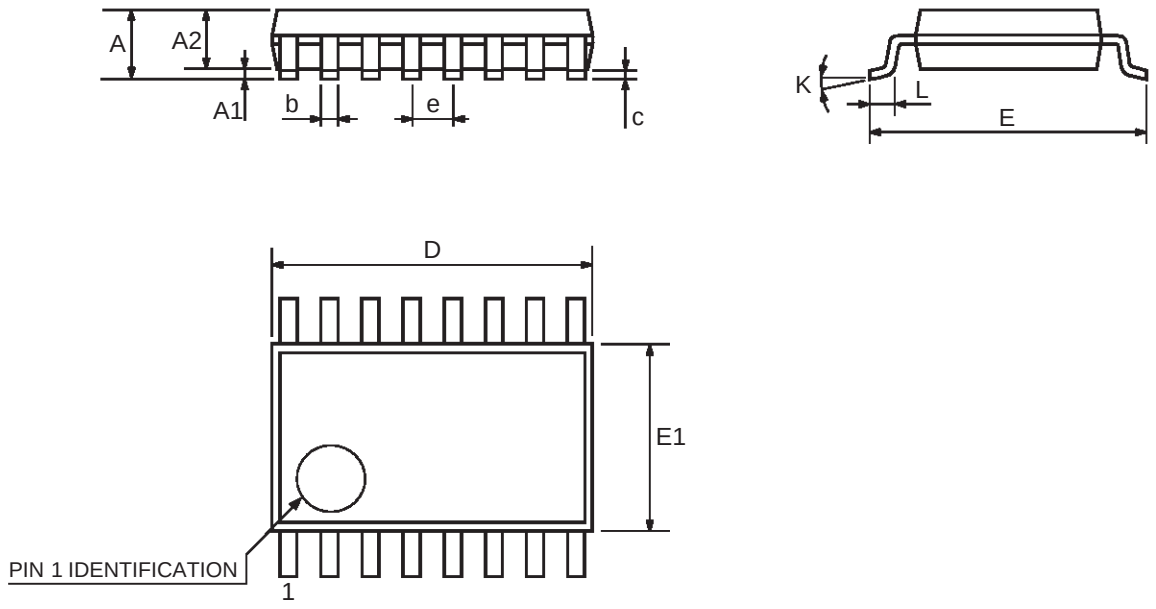
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.2	0.004		0.008
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.012
C		0.5			0.020	
c1	45 (typ.)					
D	10.1		10.5	0.397		0.413
E	10.0		10.65	0.3.93		0.419
e		1.27			0.050	
e3		8.89			0.350	
F	7.4		7.6	0.291		0.300
L	0.5		1.27	0.020		0.050
M			0.75			0.029
S	8 (max.)					



P013I

TSSOP16 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.1			0.433
A1	0.05	0.10	0.15	0.002	0.004	0.006
A2	0.85	0.9	0.95	0.335	0.354	0.374
b	0.19		0.30	0.0075		0.0118
c	0.09		0.20	0.0035		0.0079
D	4.9	5	5.1	0.193	0.197	0.201
E	6.25	6.4	6.5	0.246	0.252	0.256
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0^o	4^o	8^o	0^o	4^o	8^o
L	0.50	0.60	0.70	0.020	0.024	0.028



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