



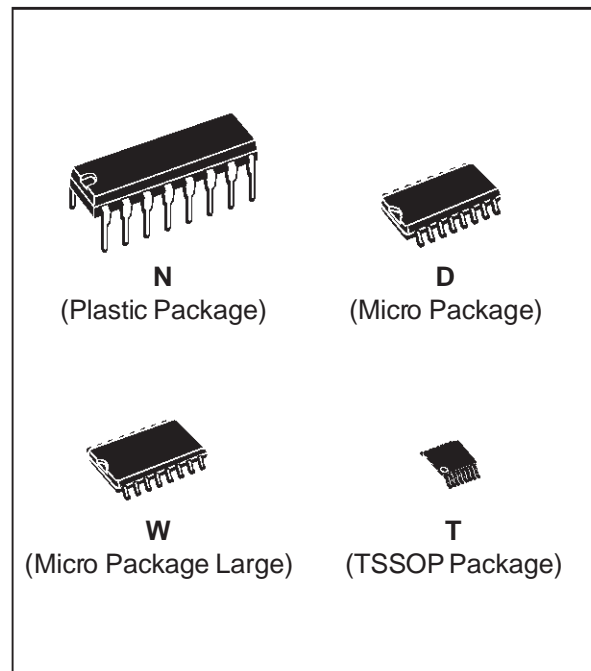
ST232

5V POWERED MULTI-CHANNEL RS-232 DRIVERS AND RECEIVERS

- SUPPLY VOLTAGE RANGE: 4.5 TO 5.5V
- SUPPLY CURRENT NO LOAD (TYP): 5mA
- TRANSMITTER OUTPUT VOLTAGE SWING (TYP): $\pm 7.8V$
- CONTROLLED OUTPUT SLEW RATE
- RECEIVER INPUT VOLTAGE RANGE: $\pm 30V$
- DATA RATE (TYP): 220Kbps
- OPERATING TEMPERATURE RANGE:
-40 TO 85 °C, 0 TO 70 °C
- COMPATIBLE WITH MAX232 AND MAX202

DESCRIPTION

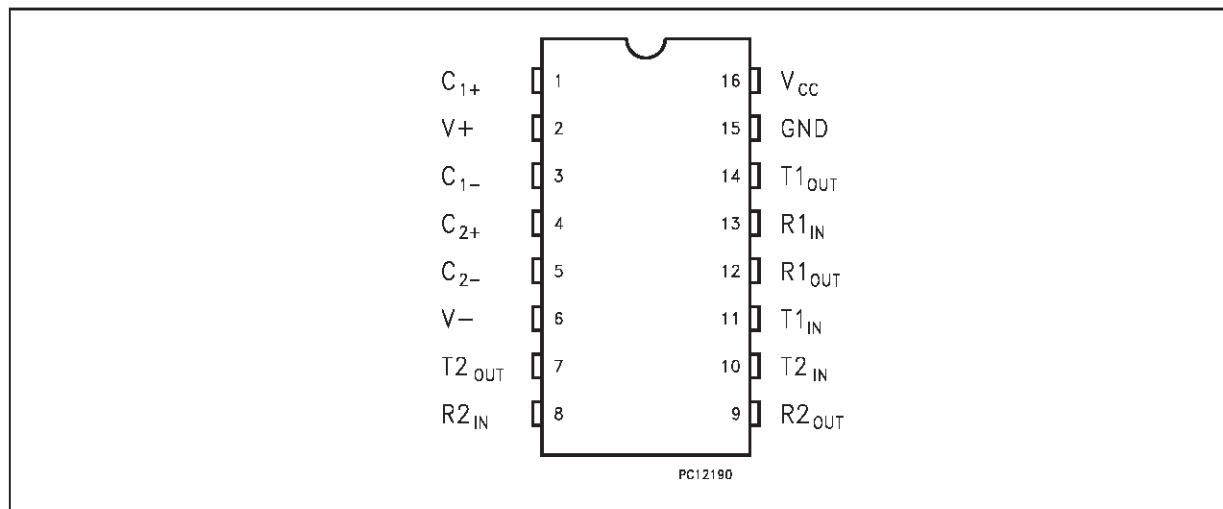
The ST232 is a 2 driver, 2 receiver device following EIA/TIA-232 and V.28 communication standard. It is particularly suitable for applications where $\pm 12V$ is not available. The ST232 uses a single 5V power supply and only four external capacitors (0.1 μF). Typical applications are in: Portable Computers, Low Power Modems, Interfaces Translation, Battery Powered RS-232 System, Multi-Drop RS-232 Networks.



ORDER CODES

| Type | Temperature Range | Package | Comments |
|----------|-------------------|---------------------------|-------------------------------------|
| ST232CN | 0 to 70 °C | DIP-16 | 25 parts per tube / 40 tube per box |
| ST232BN | -40 to 85 °C | DIP-16 | 25 parts per tube / 40 tube per box |
| ST232CD | 0 to 70 °C | SO-16 (Tube) | 50 parts per tube / 20 tube per box |
| ST232BD | -40 to 85 °C | SO-16 (Tube) | 50 parts per tube / 20 tube per box |
| ST232CDR | 0 to 70 °C | SO-16 (Tape & Reel) | 2500 parts per reel |
| ST232BDR | -40 to 85 °C | SO-16 (Tape & Reel) | 2500 parts per reel |
| ST232CW | 0 to 70 °C | SO-16 Large (Tube) | 50 parts per tube / 20 tube per box |
| ST232BW | -40 to 85 °C | SO-16 Large (Tube) | 50 parts per tube / 20 tube per box |
| ST232CWR | 0 to 70 °C | SO-16 Large (Tape & Reel) | 1000 parts per reel |
| ST232BWR | -40 to 85 °C | SO-16 Large (Tape & Reel) | 1000 parts per reel |
| ST232CT | 0 to 70 °C | TSSOP16 (Tube) | only for samples |
| ST232BT | -40 to 85 °C | TSSOP16 (Tube) | only for samples |
| ST232CTR | 0 to 70 °C | TSSOP16 (Tape & Reel) | 2500 parts per reel |
| ST232BTR | -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 | T _{2OUT} | Second Transmitter Output Voltage |
| 8 | R _{2IN} | Second Receiver Input Voltage |
| 9 | R _{2OUT} | Second Receiver Output Voltage |
| 10 | T _{2IN} | Second Transmitter Input Voltage |
| 11 | T _{1IN} | First Transmitter Input Voltage |
| 12 | R _{1OUT} | First Receiver Output Voltage |
| 13 | R _{1IN} | First Receiver Input Voltage |
| 14 | T _{1OUT} | 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 |
| 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 _{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.
 Note1: No external supply can be applied to V₊ terminal and V₋ terminal.

ELECTRICAL CHARACTERISTICS(C₁ -C₄ = 0.1μF, V_{CC} = 5V ± 10%, T_A = -40 to 85 °C, unless otherwise specified.Typical Values 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(C₁ -C₄ = 0.1μF, V_{CC} = 5V ± 10%, T_A = -40 to 85 °C, unless otherwise specified.Typical Values 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 | ±7.8 | | V |
| I _{TIL} | Logic Pull-Up Current | T _{IN} = 0 V | | 15 | 200 | 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 2500 pF (Note 1) | | 7 | 30 | V/μs |
| D _R | Data Rate | (Note 2) | 120 | 220 | | 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 | one T _{XOUT} to GND | | ±10 | ±60 | mA |

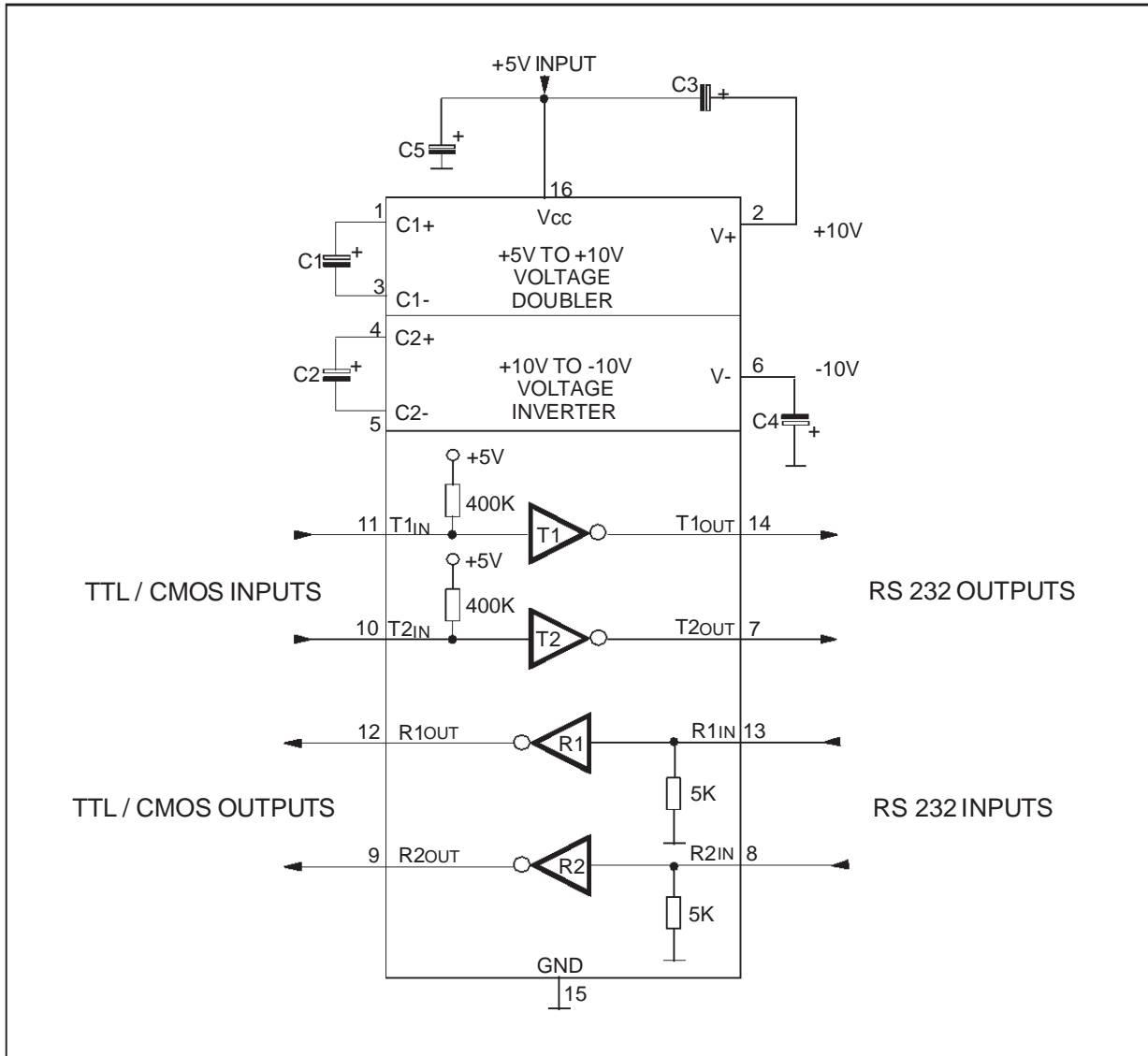
Note 1: Measured from 3V to -3V or from -3V to 3V.

Note 2: One transmitter output is loaded with R_L = 3KΩ to 7KΩ, C_L = 50 to 1000pF**RECEIVER ELECTRICAL CHARACTERISTICS**(C₁ -C₄ = 0.1μF, V_{CC} = 5V ± 10%, T_A = -40 to 85 °C, unless otherwise specified.Typical Values 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, V _{RIN} = 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 (to V _{CC}) | | | 0.4 | V |
| V _{ROH} | TTL/CMOS Output Voltage High | I _{OUT} = 1mA (to GND) | 3.5 | V _{CC} -0.4 | | V |
| t _{dR} | Propagation Delay Time | C _L = 150pF (Note 1) | | 0.3 | 1 | μs |
| I _{SCR} | Receiver Output Short Circuit Current | | | ±10 | | mA |

Note 1: RS-232 IN to TTL-CMOS OUT (from 50% to 50%)

APPLICATION CIRCUITS (note 1, note 2)

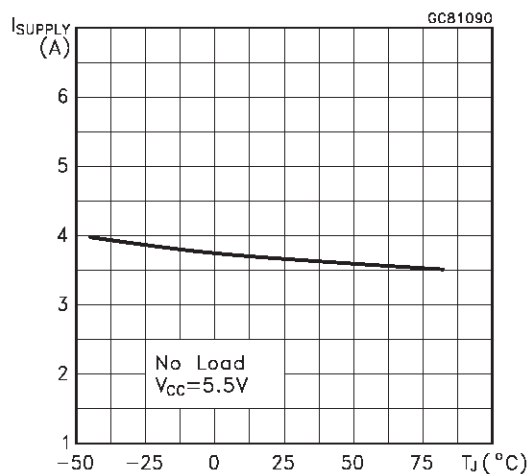


Note 1: C₁₋₄ capacitors can even be 1 μF ones.
 Note 2: C₁₋₄ can be common or biased capacitors.

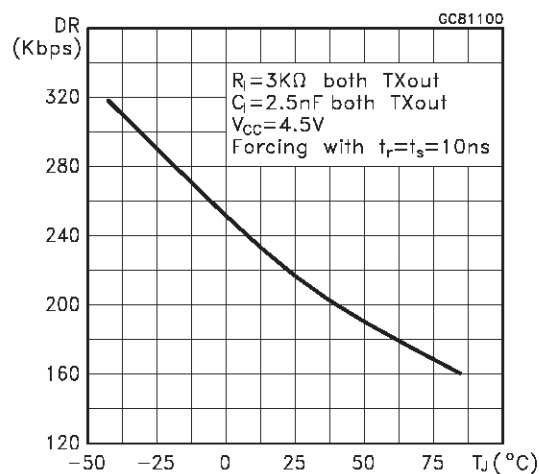
Capacitance Value (μF)

| C1 | C2 | C3 | C4 | C5 |
|-----|-----|-----|-----|-----|
| 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

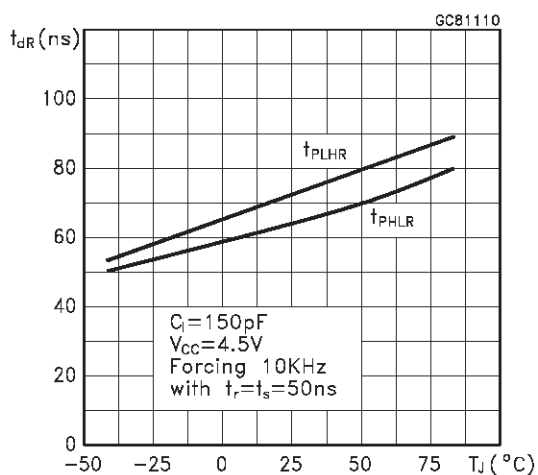
Supply Current vs Temperature



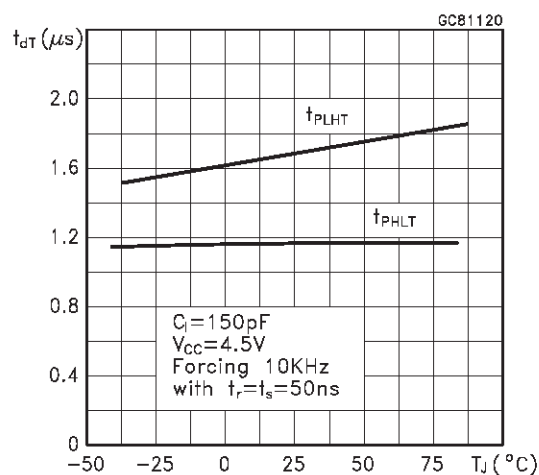
Data Rate vs Temperature



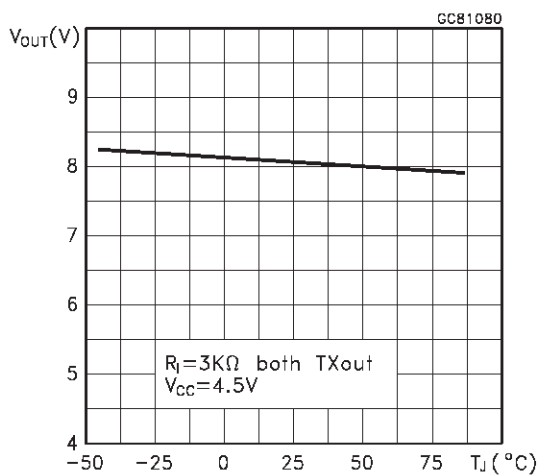
Receiver Propagation Delay



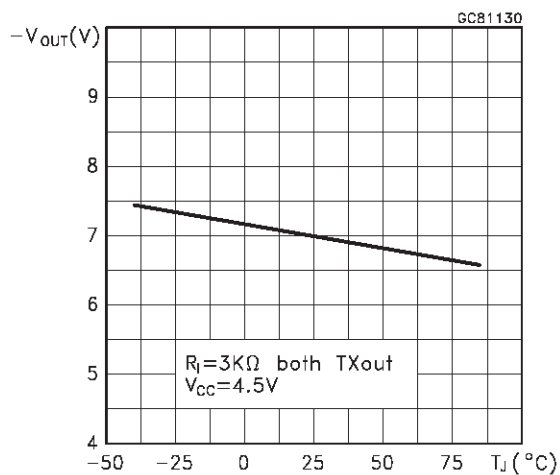
Driver Propagation Delay



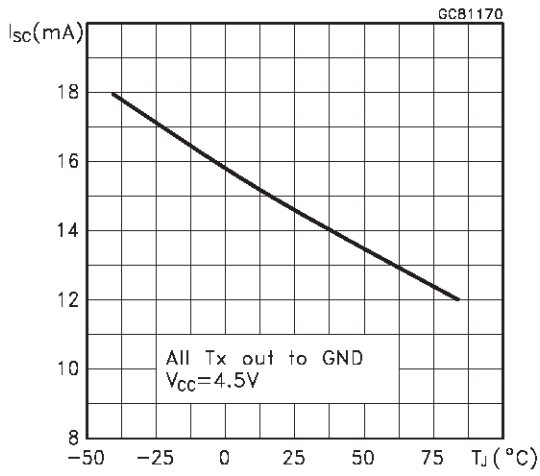
High Level Output Voltage Swing vs Temperature



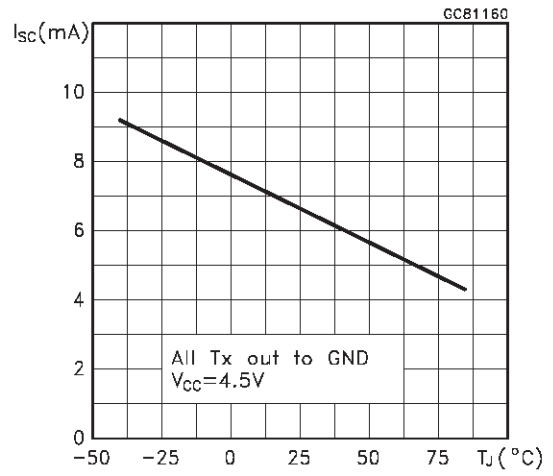
Low Level Output Voltage Swing vs Temperature



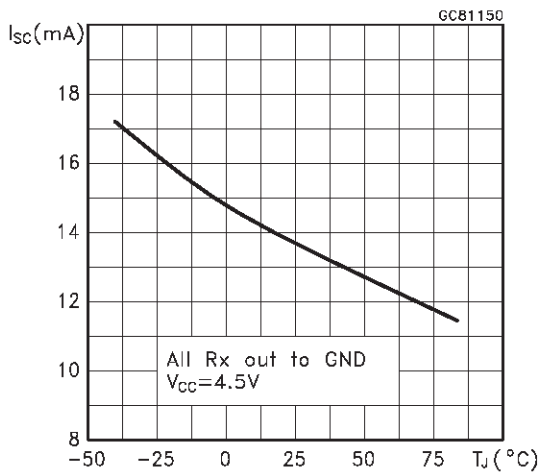
High Level Trasmmitter Output Short Circuit Current vs Temperature



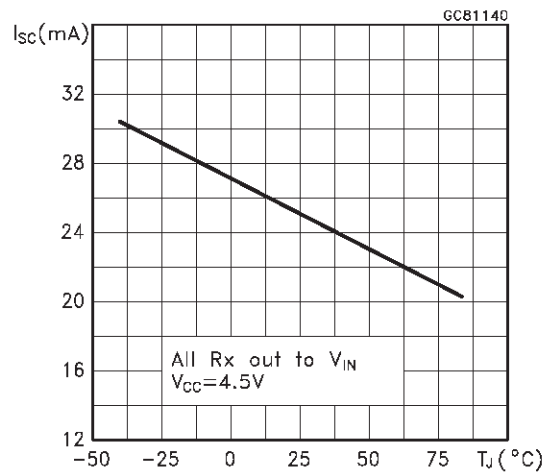
Low Level Trasmmitter Output Short Circuit Current vs Temperature



High Level Receiver Output Short Circuit Current vs Temperature

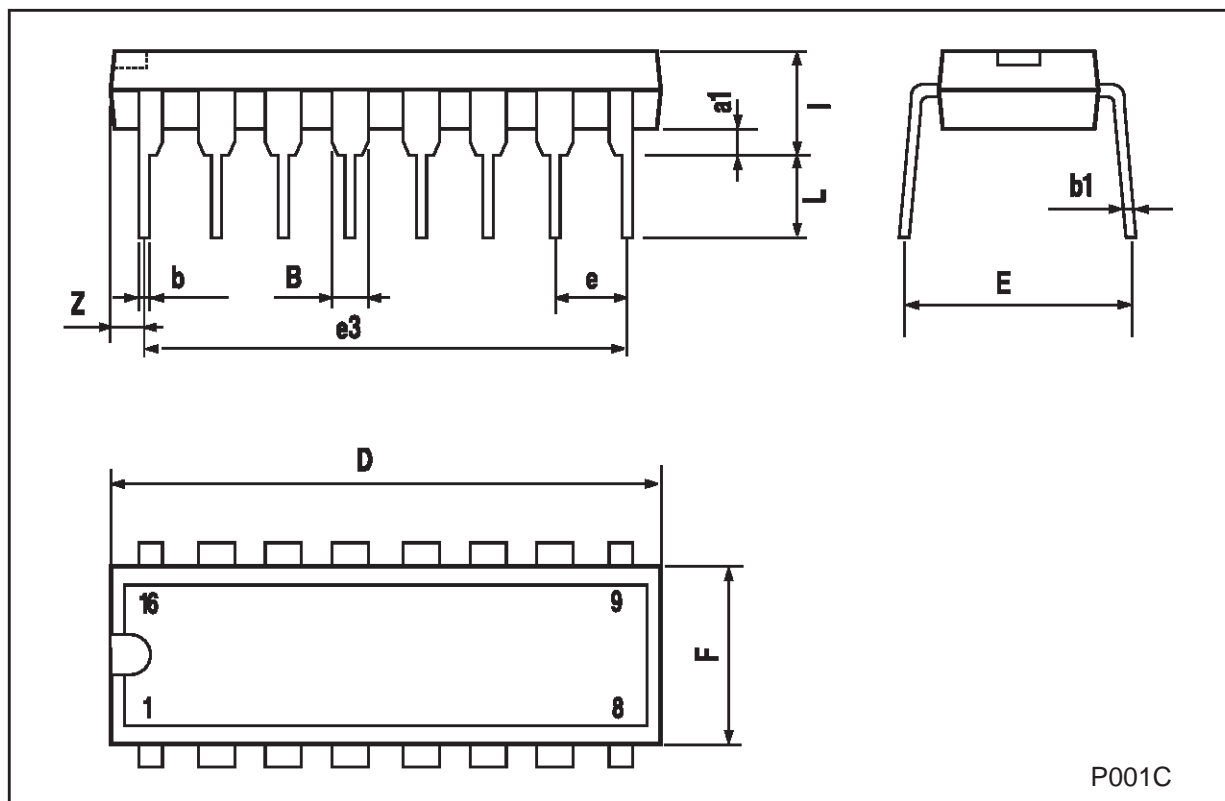


Low Level Receiver Output Short Circuit Current vs Temperature



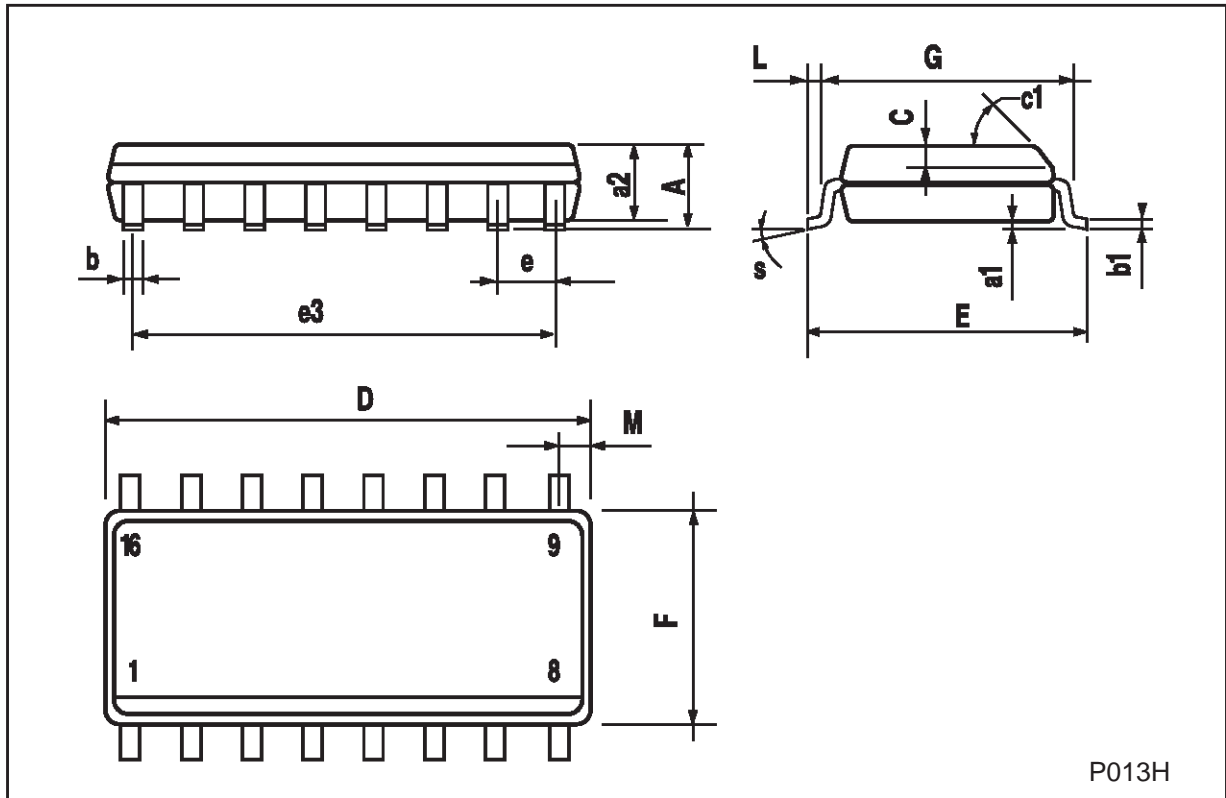
Plastic DIP-16 (0.25) MECHANICAL DATA

| 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 |
| l | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | | | 1.27 | | | 0.050 |



SO-16 MECHANICAL DATA

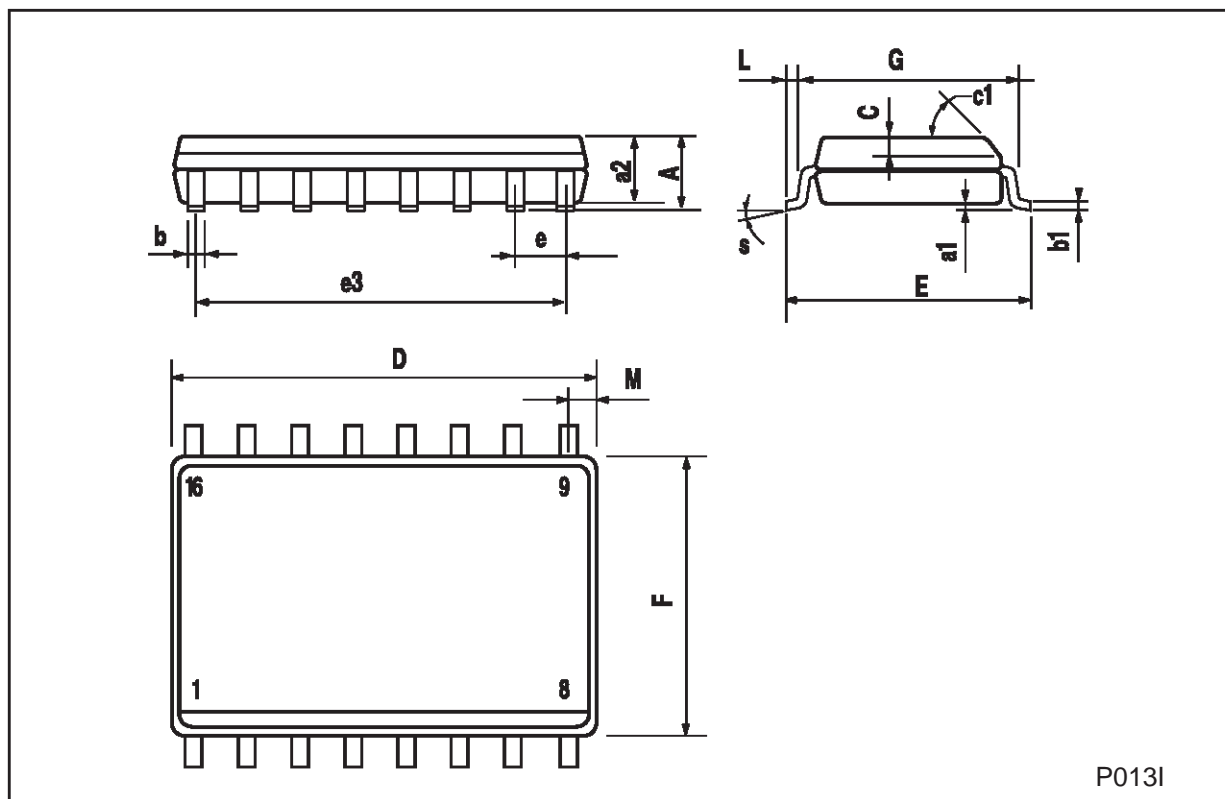
| DIM. | mm | | | inch | | |
|------|-----------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.2 | 0.004 | | 0.007 |
| a2 | | | 1.65 | | | 0.064 |
| b | 0.35 | | 0.46 | 0.013 | | 0.018 |
| b1 | 0.19 | | 0.25 | 0.007 | | 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

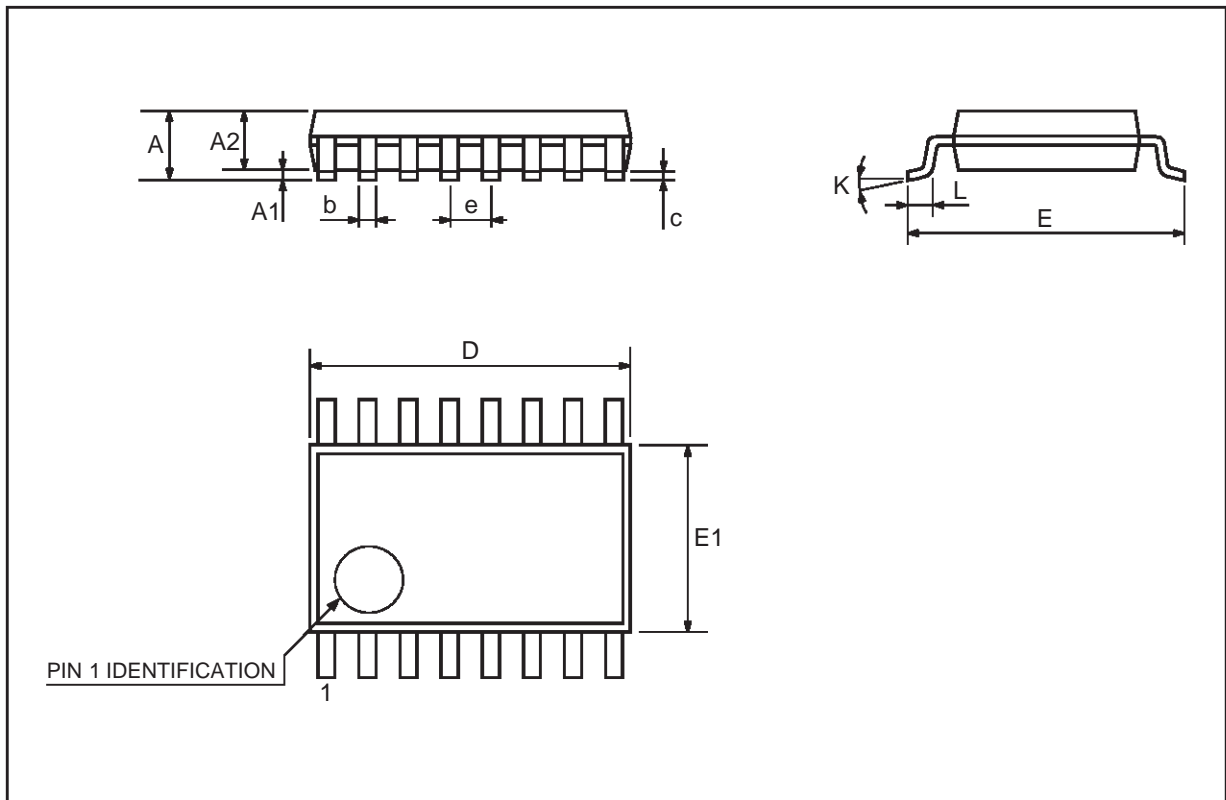
| DIM. | mm | | | inch | | |
|------|-----------|------|-------|--------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 2.65 | | | 0.104 |
| a1 | 0.1 | | 0.2 | 0.004 | | 0.008 |
| a2 | | | 2.45 | | | 0.096 |
| b | 0.35 | | 0.49 | 0.014 | | 0.019 |
| b1 | 0.23 | | 0.32 | 0.009 | | 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° | 4° | 8° | 0° | 4° | 8° |
| L | 0.50 | 0.60 | 0.70 | 0.020 | 0.024 | 0.028 |



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