

SINGLE BILATERAL SWITCH

- HIGH SPEED: $t_{PD} = 4ns$ (TYP.) at $V_{CC} = 4.5V$
- LOW POWER DISSIPATION:
 $I_{CC} = 1\mu A$ (MAX.) at $T_A=25^\circ C$
- HIGH NOISE IMMUNITY:
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (MIN.)
- LOW "ON" RESISTANCE:
 $R_{ON} = 50\Omega$ (TYP.) AT $V_{CC} = 9V$ $I_{I/O} = 100\mu A$
- SINE WAVE DISTORTION:
0.042% AT $V_{CC} = 4V$ $f = 1KHz$
- WIDE OPERATING RANGE:
 V_{CC} (OPR) = 2V TO 12V

DESCRIPTION

The 74H1G66 is a CMOS SINGLE BILATERAL SWITCH fabricated in silicon gate C²MOS technology. It achieves high speed performance combined with true CMOS low power consumption.

The C input is provided to control the switch and it's compatible with standard CMOS output; the switch is ON (port I/O is connected to Port O/I) when the C input is held high and OFF (high



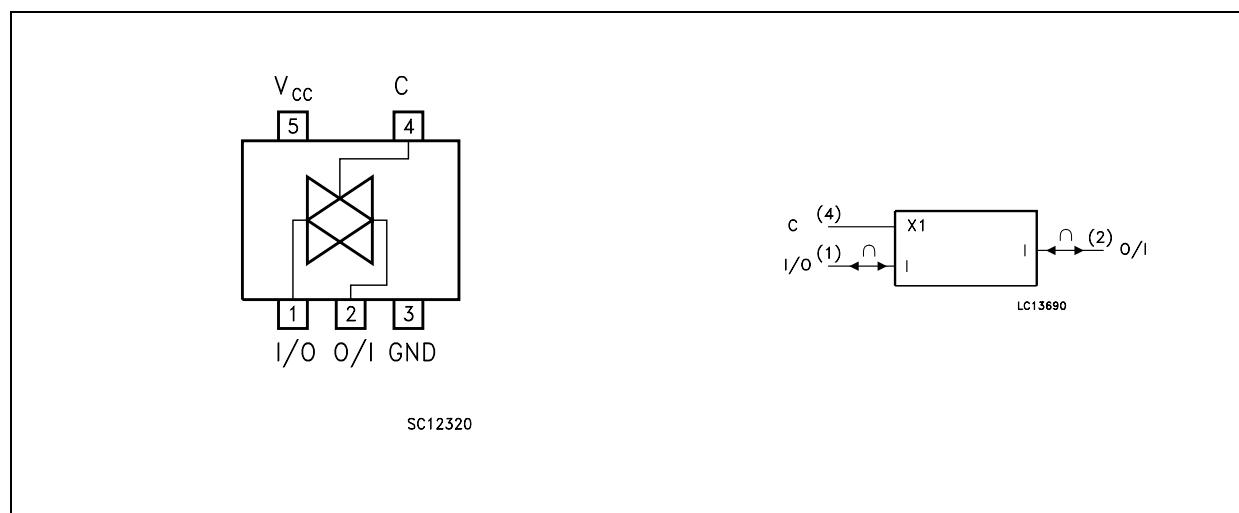
ORDER CODES

| PACKAGE | T & R |
|----------|------------|
| SOT23-5L | 74H1G66STR |

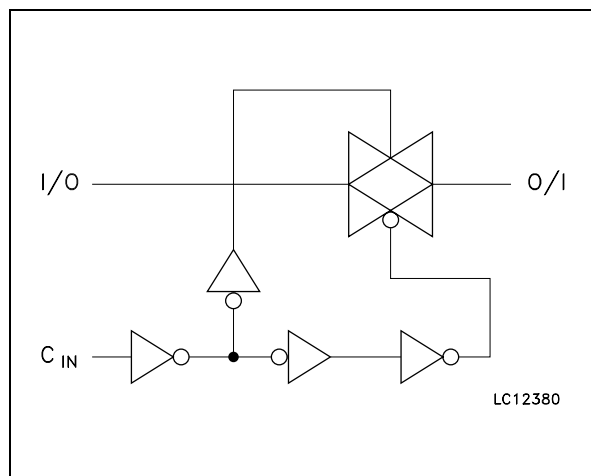
impedance state exists between the two ports) when C is held low.

All inputs and output are equipped with protection circuits against static discharge, giving them ESD immunity and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS



INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

| PIN No | SYMBOL | NAME AND FUNCTION |
|--------|-----------------|----------------------------|
| 1 | I/O | Independent Input/Output |
| 2 | O/I | Independent Output/Input |
| 3 | GND | Ground (0V) |
| 4 | C | Enable Input (Active HIGH) |
| 5 | V _{CC} | Positive Supply Voltage |

TRUTH TABLE

| C | SWITCH FUNCTION |
|---|-----------------|
| H | ON |
| L | OFF * |

* High Impedance State

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-------------------------------------|--|-------------------------------|------|
| V _{CC} | Supply Voltage | -0.5 to +13.0 | V |
| V _{I/O} | DC Input/Output Voltage | -0.5 to V _{CC} + 0.5 | V |
| V _{IC} | DC Control Input Voltage | -0.5 to V _{CC} + 0.5 | V |
| I _{I/O} | DC Input/Output Diode Current | ± 20 | mA |
| I _{IK} | DC Control Input Diode Current | ± 20 | mA |
| I _O | DC Output Source Sink Current per Output Pin | ± 25 | mA |
| I _{CC} or I _{GND} | DC V _{CC} or Ground Current | ± 50 | mA |
| P _D | Power Dissipation | 500 (*) | mW |
| T _{stg} | Storage Temperature | -65 to +150 | °C |
| T _L | Lead Temperature (10 sec) | 300 | °C |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

(*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Value | Unit | |
|---------------------------------|---|-------------------------|-----------|----|
| V _{CC} | Supply Voltage | 2 to 12 | V | |
| V _I | Control Input Voltage | 0 to V _{CC} | V | |
| V _{I/O} | Input/Output Voltage | 0 to V _{CC} | V | |
| T _{op} | Operating Temperature | -55 to 125 | °C | |
| t _r , t _f | Input Rise and Fall Time on control pin | V _{CC} = 2.0V | 0 to 1000 | ns |
| | | V _{CC} = 4.5V | 0 to 500 | ns |
| | | V _{CC} = 6.0V | 0 to 400 | ns |
| | | V _{CC} = 10.0V | 0 to 250 | ns |

DC SPECIFICATIONS

| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|------------------|---|------------------------|---|-----------------------|------|-------|-------------|-------|--------------|-------|------|
| | | V _{CC} (V) | | T _A = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| V _{IH} | High Level Input Voltage | 2.0 | | 1.5 | | | 1.5 | | 1.5 | | V |
| | | 4.5 | | 3.15 | | | 3.15 | | 3.15 | | |
| | | 9.0 | | 6.3 | | | 6.3 | | 6.3 | | |
| | | 12.0 | | 8.4 | | | 8.4 | | 8.4 | | |
| V _{IL} | Low Level Input Voltage | 2.0 | | | | 0.5 | | 0.5 | | 0.5 | V |
| | | 4.5 | | | | 1.35 | | 1.35 | | 1.35 | |
| | | 9.0 | | | | 2.7 | | 2.7 | | 2.7 | |
| | | 12.0 | | | | 3.6 | | 3.6 | | 3.6 | |
| R _{ON} | ON Resistance | 4.5 | V _{IC} = V _{IH} V _{I/O} = V _{CC} to GND I _{I/O} ≤ 1mA | | 96 | 170 | | 200 | | 250 | Ω |
| | | 9.0 | | | 55 | 85 | | 100 | | 150 | |
| | | 12.0 | | | 45 | 80 | | 90 | | 120 | |
| R _{ON} | ON Resistance | 4.5 | V _{IC} = V _{IH} V _{I/O} = V _{CC} or GND I _{I/O} ≤ 1mA | | 70 | 100 | | 130 | | 160 | Ω |
| | | 9.0 | | | 50 | 75 | | 95 | | 115 | |
| | | 12.0 | | | 45 | 70 | | 90 | | 110 | |
| I _{OFF} | Input/Output Leakage Current (SWITCH OFF) | 12.0 | V _{OS} = V _{CC} to GND V _{IS} = V _{CC} to GND V _{IC} = V _{IL} | | | ±0.1 | | ± 1 | | ± 2 | μA |
| I _{Iz} | Switch Input Leakage Current (SWITCH ON, OUTPUT OPEN) | 12.0 | V _{OS} = V _{CC} to GND V _{IC} = V _{IH} | | | ±0.1 | | ± 1 | | ± 2 | μA |
| I _{IN} | Control Input Leakage Current | 6.0 | V _{IC} = 5.5V or GND | | | ± 0.1 | | ± 1.0 | | ± 1.0 | μA |
| I _{CC} | Quiescent Supply Current | 6.0 | V _I = V _{CC} or GND | | | 1 | | 10 | | 20 | μA |
| | | 9.0 | | | | 4 | | 40 | | 80 | |
| | | 12.0 | | | | 8 | | 80 | | 160 | |

AC ELECTRICAL CHARACTERISTICS ($C_L = 50\text{pF}$, Input $t_r = t_f = 6\text{ns}$)

| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|------------------------|---|-----------------|---|--------------------------|------|------|-----------------------------|------|------------------------------|------|------|
| | | V_{CC} (V) | | $T_A = 25^\circ\text{C}$ | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| $\Phi_{I/O}$ | Phase Difference Between Input and Output | 2.0 | | | 10 | 50 | | 65 | | 75 | ns |
| | | 4.5 | | | 4 | 10 | | 15 | | 18 | |
| | | 9.0 | | | 3 | 8 | | 13 | | 16 | |
| | | 12.0 | | | 3 | 7 | | 10 | | 12 | |
| t_{PLZ} t_{PHZ} | Output Disable Time | 2.0 | $R_L = 500\ \Omega$ | | 18 | 100 | | 125 | | 150 | ns |
| | | 4.5 | | | 8 | 20 | | 25 | | 30 | |
| | | 9.0 | | | 6 | 12 | | 22 | | 27 | |
| | | 12.0 | | | 6 | 12 | | 18 | | 25 | |
| t_{PZL} t_{PZH} | Output Enable Time | 2.0 | $R_L = 1\ \text{K}\Omega$ | | 20 | 115 | | 145 | | 175 | ns |
| | | 4.5 | | | 10 | 23 | | 29 | | 35 | |
| | | 9.0 | | | 8 | 20 | | 25 | | 30 | |
| | | 12.0 | | | 8 | 18 | | 22 | | 27 | |
| | Maximum Control Input Frequency | 2.0 | $R_L = 1\ \text{K}\Omega$ $C_L = 15\text{pF}$ $V_O = 1/2V_{CC}$ | | 30 | | | | | | MHz |
| | | 4.5 | | | 30 | | | | | | |
| | | 9.0 | | | 30 | | | | | | |
| | | 12.0 | | | 30 | | | | | | |

CAPACITIVE CHARACTERISTICS

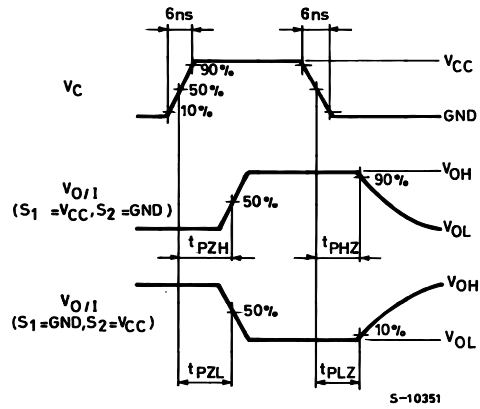
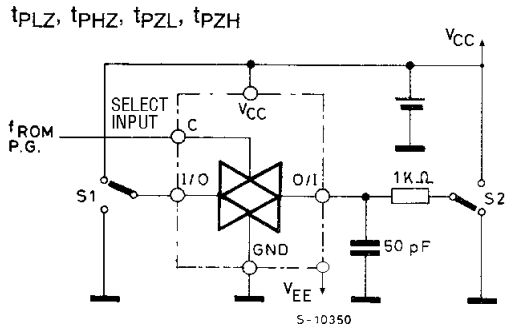
| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|-----------|--|----------------|--|--------------------------|------|------|-----------------------------|------|------------------------------|------|------|
| | | | | $T_A = 25^\circ\text{C}$ | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| C_{IN} | Input Capacitance | | | | 5 | 10 | | 10 | | 10 | pF |
| $C_{I/O}$ | Switch Terminal Capacitance | | | | 10 | | | | | | pF |
| C_{IOS} | Feed through Capacitance | | | | 0.5 | | | | | | pF |
| C_{PD} | Power Dissipation Capacitance (note 1) | | | | 15 | | | | | | pF |

1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(oper)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

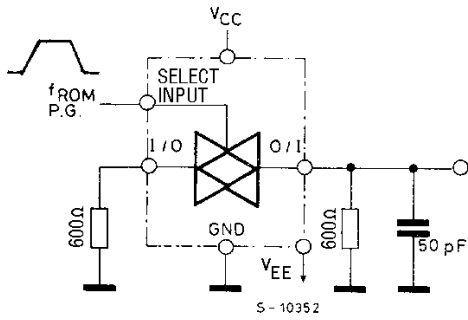
ANALOG SWITCH CHARACTERISTICS (GND = 0V; $T_A = 25^\circ\text{C}$)

| Symbol | Parameter | Test Condition | | Value | Unit | |
|-----------|--|-----------------|--|---|------|---|
| | | V_{CC} (V) | V_{IN} (V_{p-p}) | Typ. | | |
| | Sine Wave Distortion (THD) | 4.5 | 4 | $f_{IN} = 1 \text{ KHz}$, $R_L = 10 \text{ K}\Omega$, $C_L = 50 \text{ pF}$ | 0.04 | % |
| | | 9.0 | 8 | | 0.04 | |
| f_{MAX} | Frequency Response (Switch ON) | 4.5 | Adjust f_{IN} voltage to obtain 0 dBm at V_{OS} . Increase f_{IN} Frequency until dB meter reads -3dB $R_L = 50\Omega$, $C_L = 10 \text{ pF}$ | 150 | MHz | |
| | | 9.0 | | 180 | | |
| | Feed through Attenuation (Switch OFF) | 4.5 | V_{IN} is centered at $V_{CC}/2$ Adjust f_{IN} Voltage to obtained 0dBm at V_{IS} $R_L = 600\Omega$, $C_L = 50 \text{ pF}$, $f_{IN} = 1\text{KHz}$ sine wave | -60 | dB | |
| | | 9.0 | | -60 | | |
| | Crosstalk (Control Input to Signal Output) | 4.5 | $R_L = 600\Omega$, $C_L = 50 \text{ pF}$, $f_{IN} = 1\text{KHz}$ square wave $t_r = t_f = 6\text{ns}$ | 60 | mV | |
| | | 9.0 | | 60 | | |

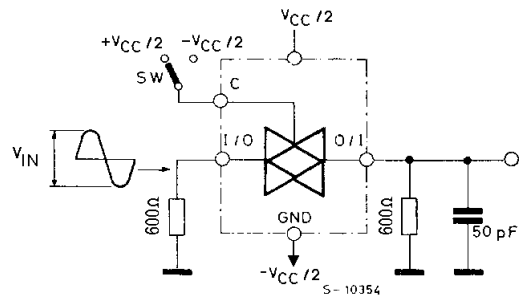
SWITCHING CHARACTERISTICS TEST CIRCUIT



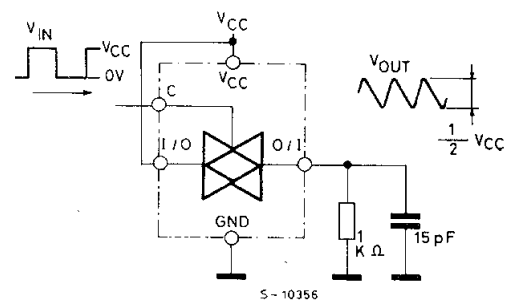
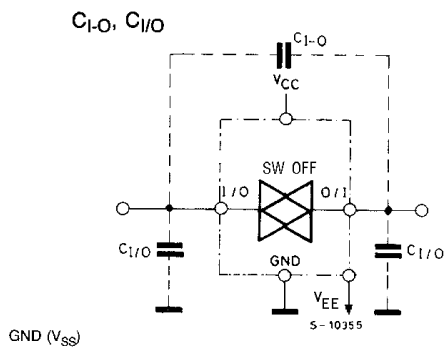
CROSSTALK (control to output)



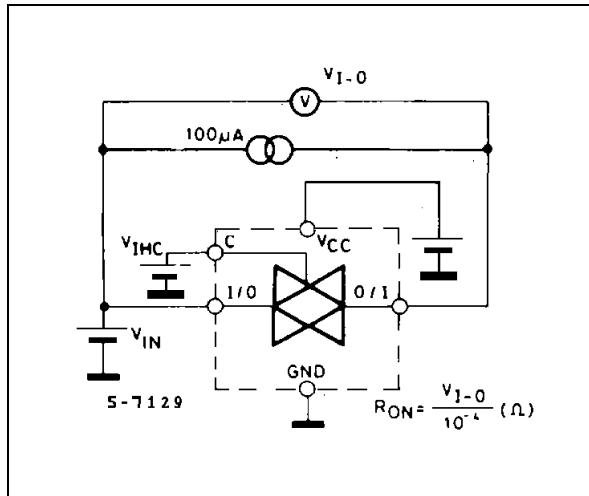
BANDWIDTH AND FEEDTHROUGH ATTENUATION



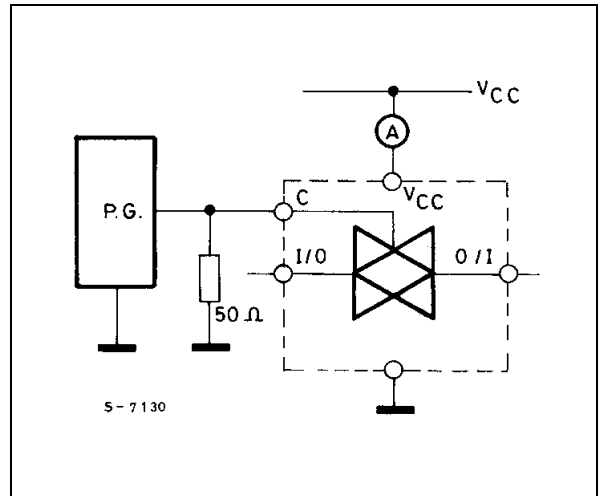
MAXIMUM CONTROL FREQUENCY



CHANNEL RESISTANCE (R_{ON})

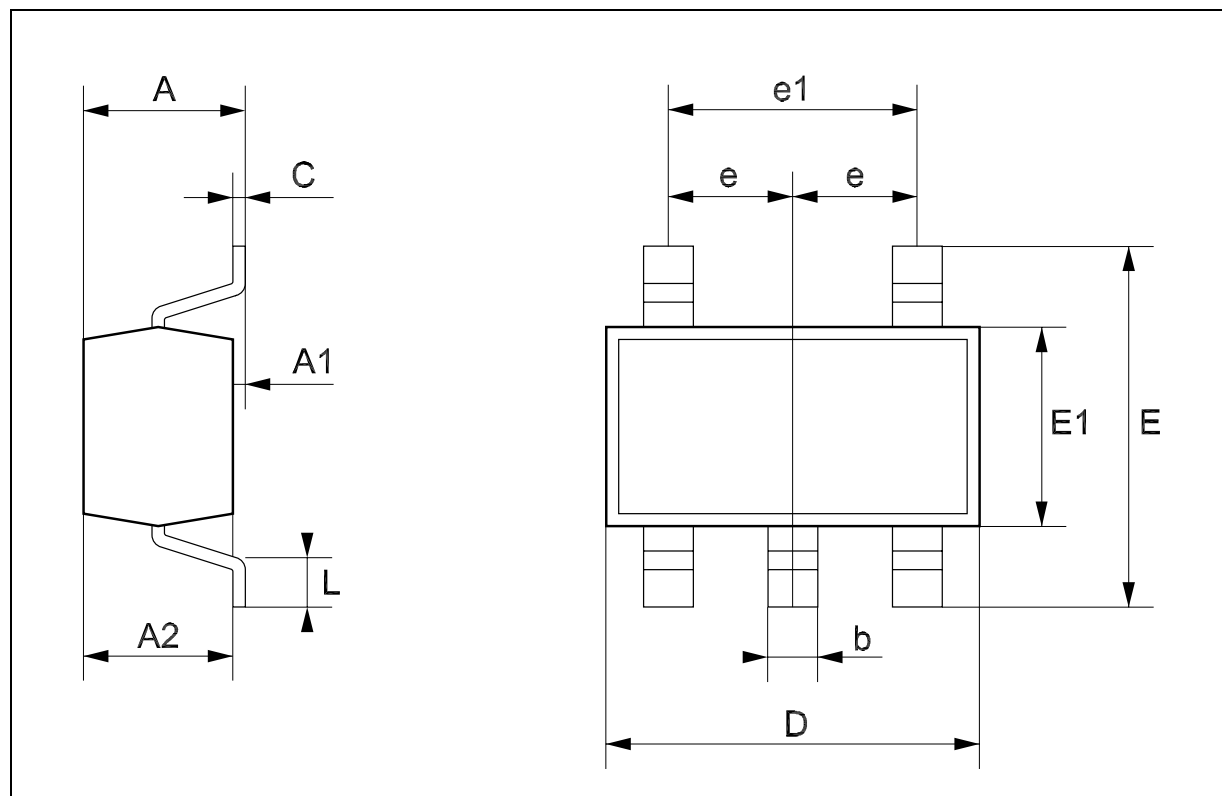


I_{CC} (Opr.)



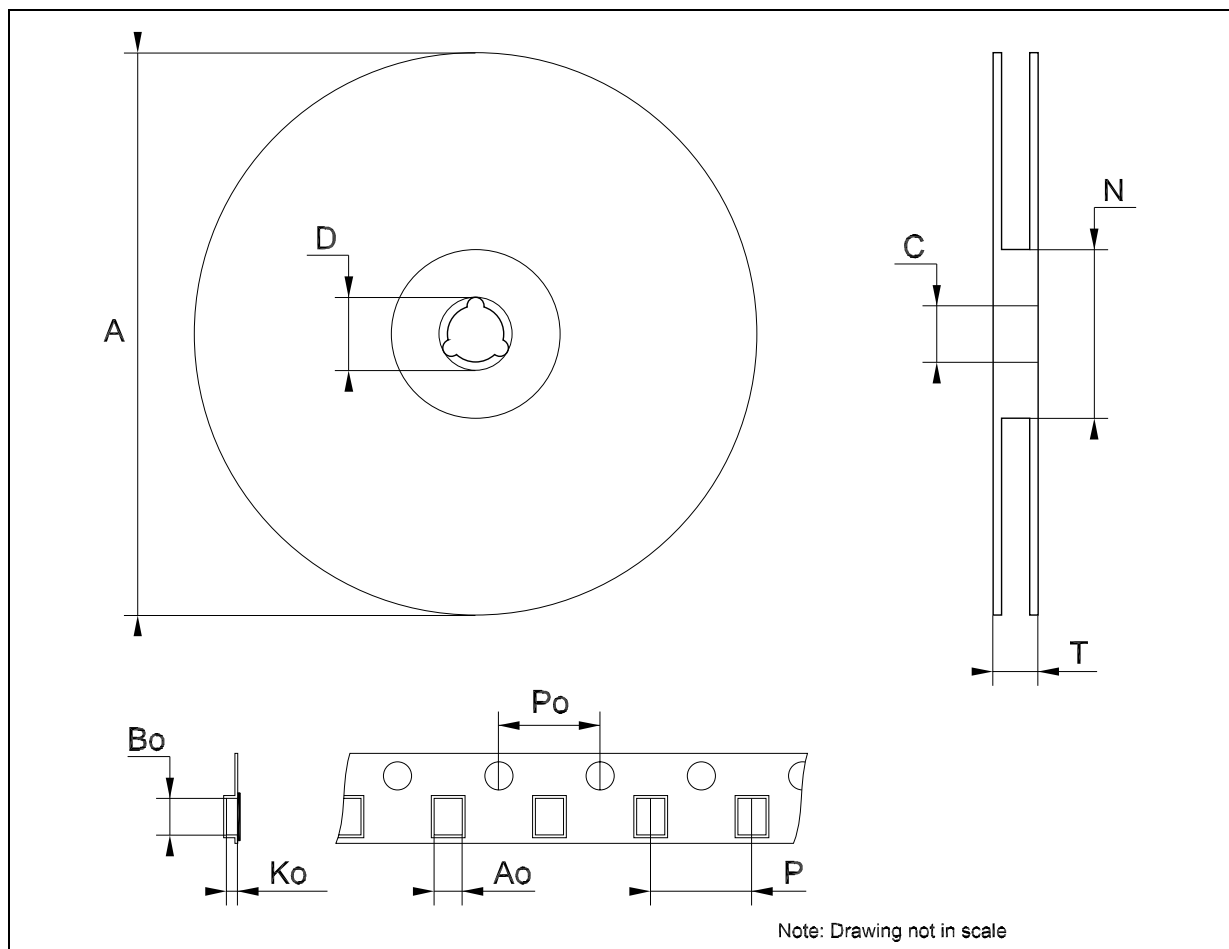
SOT23-5L MECHANICAL DATA

| DIM. | mm. | | | mils | | |
|------|------|------|------|-------|------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 0.90 | | 1.45 | 35.4 | | 57.1 |
| A1 | 0.00 | | 0.15 | 0.0 | | 5.9 |
| A2 | 0.90 | | 1.30 | 35.4 | | 51.2 |
| b | 0.35 | | 0.50 | 13.7 | | 19.7 |
| C | 0.09 | | 0.20 | 3.5 | | 7.8 |
| D | 2.80 | | 3.00 | 110.2 | | 118.1 |
| E | 2.60 | | 3.00 | 102.3 | | 118.1 |
| E1 | 1.50 | | 1.75 | 59.0 | | 68.8 |
| e | | 0.95 | | | 37.4 | |
| e1 | | 1.9 | | | 74.8 | |
| L | 0.35 | | 0.55 | 13.7 | | 21.6 |



Tape & Reel SOT23-xL MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 180 | | | 7.086 |
| C | 12.8 | 13.0 | 13.2 | 0.504 | 0.512 | 0.519 |
| D | 20.2 | | | 0.795 | | |
| N | 60 | | | 2.362 | | |
| T | | | 14.4 | | | 0.567 |
| Ao | 3.13 | 3.23 | 3.33 | 0.123 | 0.127 | 0.131 |
| Bo | 3.07 | 3.17 | 3.27 | 0.120 | 0.124 | 0.128 |
| Ko | 1.27 | 1.37 | 1.47 | 0.050 | 0.054 | 0.058 |
| Po | 3.9 | 4.0 | 4.1 | 0.153 | 0.157 | 0.161 |
| P | 3.9 | 4.0 | 4.1 | 0.153 | 0.157 | 0.161 |



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