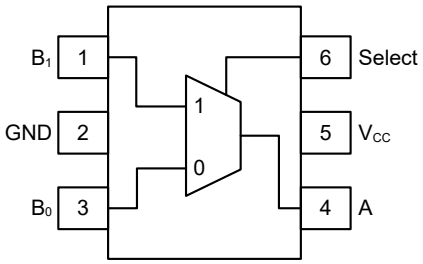
## 1.Description

ET3157 is an analog switch based on CMOS technology.It has low power consumption, low transmission delay and low output impedance. The voltage output range of analog signal and digital signal can be from $V_{CC}$ or GND.The select input terminal has over-voltage protection, which allows the input voltage to be higher than $V_{CC}$, up to 7V, and the pin will not be burned.

## 2.Features

- low power consumption
- High transmission speed
- Flip standard CMOS logic level
- High bandwidth, high linearity
- Switch for NTSC / PAL video, audio, SPDIF and HDTV
- Package form SC70-6 (3157)
- It can be used for clock switch and data selection switch
- Low output impedance
- First break and then open protection to prevent short circuit
- Working temperature - 55°C ~ + 125°C

## 3.Pinning Information




**SC70-6**

Pin description

| Pin | I/O | Function |
|---|---|---|
| A, $B_0$, $B_1$ | I/O | Data Port |
| Select | I | Control Selection |
| $V_{CC}$ | - | Power Supply Terminal |
| GND | - | Land |

Function Description

| Select Input | Function |
|---|---|
| L | $B_0$ to A |
| H | $B_1$ to A |

## 4.Thermal Resistance Data

| Parameter | Symbol | Numerical Value | Company |
|---|---|---|---|
| Thermal Resistance | $\theta_{JA}$ | 270 | °C/W |

## 5.Limit Parameter

| Parameter | Symbol | Range | Units |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | -0.5~+7.0 | V |
| Switching voltage (Note 1) | $V_S$ | -0.5~$V_{CC}$+0.5 | V |
| Input voltage (Note 1) | $V_{IN}$ | -0.5~+7.0 | V |
| Vin @ 0V input current clamp diode | $I_{IK}$ | -50 | mA |
| Output current | $I_{OUT}$ | 128 | mA |
| Power to ground current | $I_{CC}/I_{GND}$ | 100 | mA |
| Storage temperature range | $T_{STG}$ | -65~+150 | °C |
| Maximum junction temperature | $T_J$ | 150 | °C |
| Wire temperature (welding, 10 seconds) | $T_L$ | 260 | °C |
| Total power consumption (85°C) | $P_D$ | 180 | mW |

Exceeding the maximum value of DC limit parameters may cause irreparable damage to the circuit.If there is no special case, ensure that the power supply voltage, operating temperature and load characteristics of input / output of the whole working system are within the above range.

Note 1: the negative voltage of I/O can be exceeded according to the clamping diode current range of input / output.

## 6.Working Environment (Note 2)

| Parameter | | Symbol | Mid | Max | Units |
|---|---|---|---|---|---|
| Supply voltage | | $V_{CC}$ | 1.65 | 5.5 | V |
| Select terminal input voltage | | $V_{IN}$ | 0 | $V_{CC}$ | V |
| Switch input voltage | | $V_{IN}$ | 0 | $V_{CC}$ | V |
| Output voltage | | $V_{OUT}$ | 0 | $V_{CC}$ | V |
| Working temperature | | $T_A$ | -55 | +125 | °C |
| Enter the rising and falling time | Input voltage $V_{CC}$=2.3V - 3.6V | $t_r$, $t_f$ | 0 | 10 | ns/V |
| | Input voltage $V_{CC}$=4.5V - 5.5V | | 0 | 5 | ns/V |

Note: The input voltage of 2:Select terminal must be set to a high level or a low level, and cannot be left floating.

## 7.1 Electrical Characteristics (DC Characteristic)

| Parameter | Symbol | Condition | $V_{CC}$ | $T_A$=25°C | | | $T_A$=-40°C~85°C | | Units |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | |
| High level input | $V_{IH}$ | | 1.65-1.95 | 0.75$V_{CC}$ | | | 0.75$V_{CC}$ | | V |
| | | | 2.3-2.8 | 1.5 | | | 1.5 | | V |
| | | | 3-4.2 | 2.4 | | | 2.4 | | V |
| | | | 4.5-5.5 | 0.7$V_{CC}$ | | | 0.6$V_{CC}$ | | V |
| Input low level | $V_{IL}$ | | 1.65-1.95 | 0.25$V_{CC}$ | | | | 0.25$V_{CC}$ | V |
| | | | 2.3-2.8 | 0.4 | | | | 0.4 | V |
| | | | 3-5.5 | 0.3$V_{CC}$ | | | | 0.3$V_{CC}$ | V |
| Leakage current input | $I_{IN}$ | 0<$V_{IN}$<5.5V | 0-5.5 | | ±0.05 | ±0.1 | | ±1 | μA |
| Closed state leakage electric current | $I_{OFF}$ | 0<A, B<$V_{CC}$ | 1.65-5.5 | | ±0.05 | ±0.1 | | ±1 | μA |
| Quiescent current | $I_{CC}$ | $V_{IN}$=$V_{CC}$ or GND, $I_{OUT}$=0 | 5.5 | | | 1 | | 10 | μA |
| Analog level input Into the scope | | | $V_{CC}$ | 0 | | $V_{CC}$ | 0 | $V_{CC}$ | V |
| Switch on resistance (Note 3) | $R_{ON}$ | $V_{IN}$=0V, $I_O$=30mA | 4.5 | | 3 | | | 7 | Ω |
| | | $V_{IN}$=2.4V, $I_O$=-30mA | | | 5 | | | 12 | Ω |
| | | $V_{IN}$=4.5V, $I_O$=-30mA | | | 7 | | | 15 | Ω |
| | | $V_{IN}$=0V, $I_O$=24mA | 3 | | 4 | | | 9 | Ω |
| | | $V_{IN}$=3V, $I_O$=-24mA | | | 10 | | | 20 | Ω |
| | | $V_{IN}$=0V, $I_O$=8mA | 2.3 | | 5 | | | 12 | Ω |
| | | $V_{IN}$=2.3V, $I_O$=-8mA | | | 13 | | | 30 | Ω |
| | | $V_{IN}$=0V, $I_O$=4mA | 1.65 | | 6.5 | | | 20 | Ω |
| | | $V_{IN}$=1.65V, $I_O$=-4mA | | | 17 | | | 50 | Ω |

| Parameter | Symbol | Condition | $V_{CC}$ | $T_A$=25°C | | | $T_A$=-40°C~85°C | | Units |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | |
| On resistance matching between channels (Note 3) (Note 4) (Note 5) | $\Delta R_{ON}$ | $I_A$=-30mA, $V_{Bn}$=3.15 | 4.5 | | 0.15 | | | | Ω |
| | | $I_A$=-24mA, $V_{Bn}$=2.1 | 3 | | 0.2 | | | | Ω |
| | | $I_A$=-8mA, $V_{Bn}$=1.6 | 2.3 | | 0.5 | | | | Ω |
| | | $I_A$=-4mA, $V_{Bn}$=1.15 | 1.65 | | 0.5 | | | | Ω |
| On-resistance flatness (Note 3) (Note 4) (Note 6) | $R_{FLAT}$ | $I_A$=-30mA, 0≤$V_{Bn}$≤$V_{CC}$ | 5 | | 6 | | | | Ω |
| | | $I_A$=-24mA, 0≤$V_{Bn}$≤$V_{CC}$ | 3.3 | | 12 | | | | Ω |
| | | $I_A$=-8mA, 0≤$V_{Bn}$≤$V_{CC}$ | 2.5 | | 28 | | | | Ω |
| | | $I_A$=-4mA, 0≤$V_{Bn}$≤$V_{CC}$ | 1.8 | | 125 | | | | Ω |

## 7.2 Electrical Characteristics (AC Characteristics)

| Parameter | Symbol | Condition | $V_{CC}$ | $T_A$=25°C | | | $T_A$=-40°C~85°C | | Units |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | |
| Transmission Delay (Note 8) | $t_{PHL}$ $t_{PLH}$ | Fig. 1, $V_I$=OPEN | 1.65-1.95 | | | | | 2 | nS |
| | | | 2.3-2.7 | | | | | 1.2 | nS |
| | | | 3.0-3.5 | | | | | 0.8 | nS |
| | | | 4.5-5.5 | | | | | 0.3 | nS |
| Open time (a to Bn) | $t_{PZL}$ $t_{PZH}$ | Fig. 1 $V_I$=2*$V_{CC}$ for $t_{PZL}$, $V_I$=0V for $t_{PZH}$ | 1.65-1.95 | | | 23 | 7 | 24 | nS |
| | | | 2.3-2.7 | | | 13 | 3.5 | 14 | nS |
| | | | 3.0-3.5 | | | 6.9 | 2.5 | 7.6 | nS |
| | | | 4.5-5.5 | | | 5.2 | 1.7 | 5.7 | nS |
| turn - off time (port a to port b) | $t_{PLZ}$ $t_{PHZ}$ | Fig. 1 $V_I$=2*$V_{CC}$ for $t_{PLZ}$, $V_I$=0V for $t_{PZH}$ | 1.65-1.95 | | | 12.5 | 3 | 13 | nS |
| | | | 2.3-2.7 | | | 7 | 2 | 7.5 | nS |
| | | | 3.0-3.5 | | | 5 | 1.5 | 5.3 | nS |
| | | | 4.5-5.5 | | | 3.5 | 0.8 | 3.8 | nS |
| Break before connect time (Note 7) | $t_{B-M}$ | Fig. 2, $C_L$=50pF, $R_L$=600Ω | 1.65-1.95 | | | | 0.5 | | nS |
| | | | 2.3-2.7 | | | | 0.5 | | nS |
| | | | 3.0-3.5 | | | | 0.5 | | nS |
| | | | 4.5-5.5 | | | | 0.5 | | nS |
| Charge injection (Note 7) | Q | Fig. 3, $C_L$=0.1nF, $V_{GEN}$=0V, $R_{GEN}$=0Ω | 5 | | 7 | | | | pC |
| | | | 3.3 | | 3 | | | | pC |
| Close(note 9) Release | OIRR | Fig.4,$R_L$=50Ω,f=10MHz | 1.65-5.5 | | -57 | | | | dB |
| Cross talk | Xtalk | Fig.5,$R_L$=50Ω,f=10MHz | 1.65-5.5 | | -54 | | | | dB |
| -3dB bandwidth | BW | Fig. 8, $R_L$=50Ω | 1.65-5.5 | | 350M | | | | Hz |
| total harmonic distortion (Note 7) | THD | $R_L$=600Ω, 0.5$V_{P-P}$ f=600Hz - 20kHz | 5 | | 0.011 | | | | % |
| Input terminal capacitance (Note 10) | $C_{IN}$ | | 0 | | 2.3 | | | | pF |

| Parameter | Symbol | Condition | $V_{CC}$ | $T_A$=25°C | | | $T_A$=-40°C~85°C | | Units |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | |
| B disconnection capacitance when the port is turned off (Note 10) | $C_{IO-B}$ | Figure 6 | 5 | | 5 | | | | pF |
| A conduction capacitance when the port is open (Note 10) | $C_{IOA-ON}$ | Figure 7 | 5 | | 15.5 | | | | pF |

Note3: It is obtained by measuring the ratio of the voltage difference between the two ports A and B to the current flowing through the two ports. On-resistance is determined by the lower voltage port of port A and B

Note4: The load characteristics introduced by encapsulation are not included.

Note5: ΔRON=RON max- RON min in the given $V_{CC}$, temperature and level range.

Note6: On-resistance flatness refers to the difference between the maximum value and the minimum value of on-resistance under specified conditions.

Note 7: Design simulation value.

Note 8: This parameter is the design simulation value rather than the measured value. In the case of an ideal voltage source (zero output load), the transmission delay will be better than that of a 50pF load capacitor.

Note 9: Turn off isolation =20log10[VA/VBn].

Note 10: TA=+25°C, f=1MHz, excluding the load capacitance introduced by packaging.

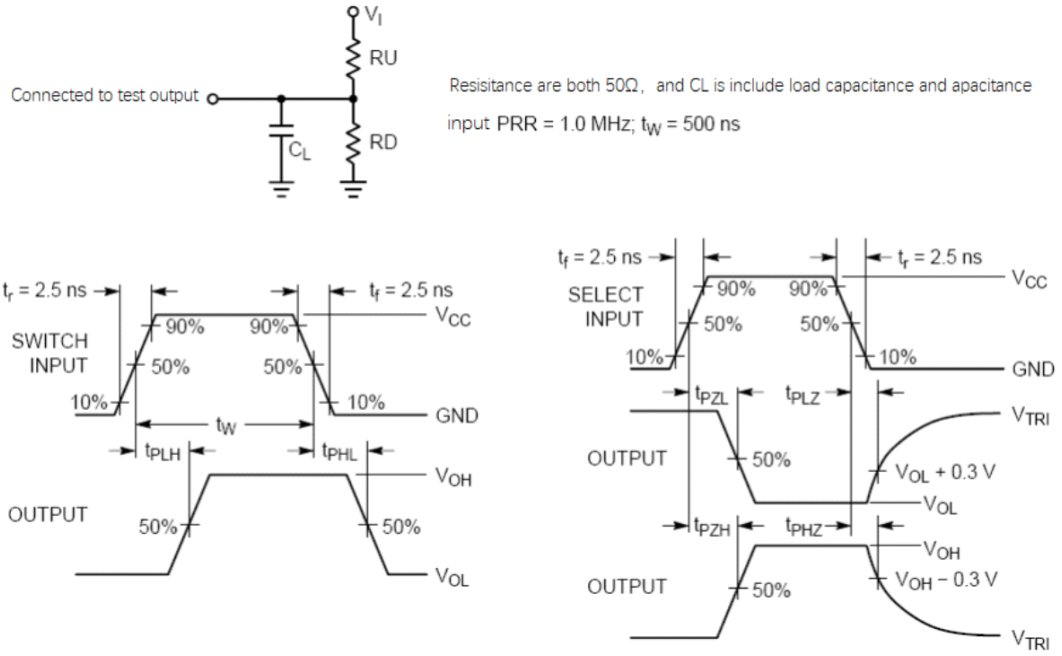



Figure 1 Transmission delay, opening time, closing time




Figure 2: Cut off before opening time

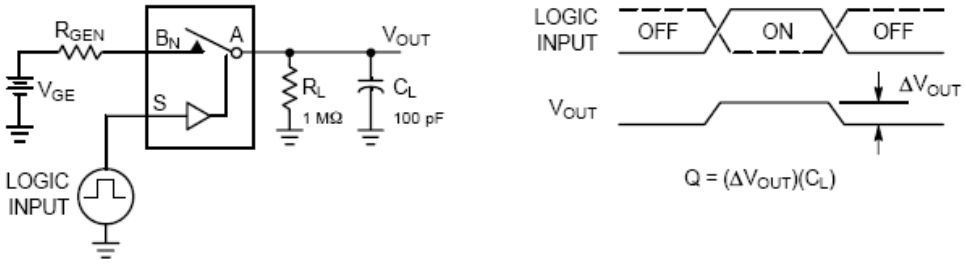



Figure 3 Charge injection test

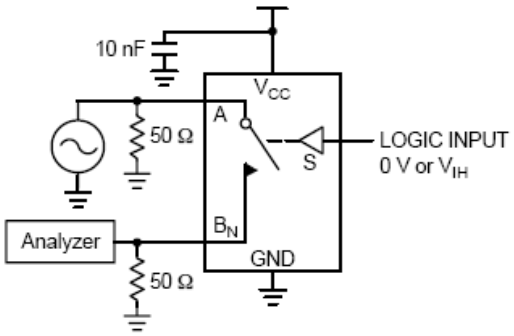



Figure 4 Close quarantine

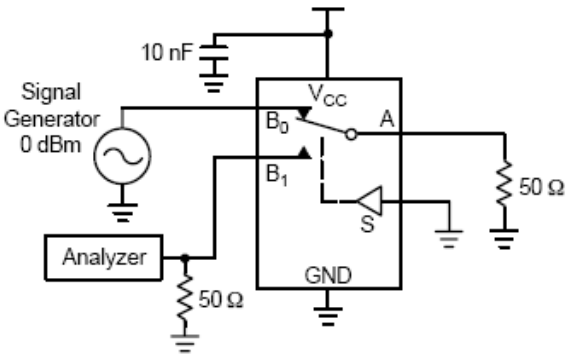



Figure 5 Crosstalk

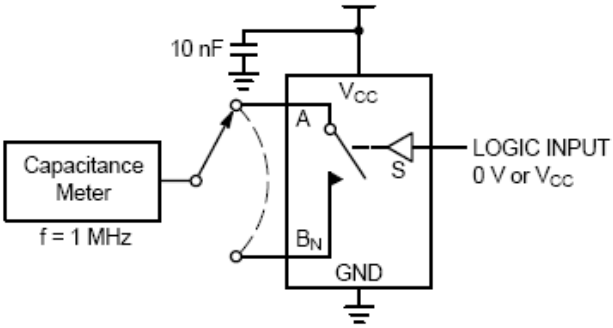



Figure 6 Output capacitance when channel is closed

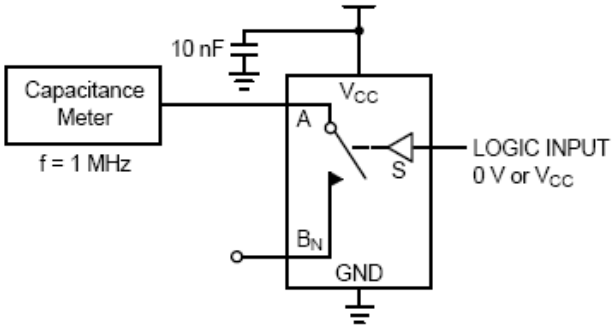



Figure 7 Output capacitance when channel is open

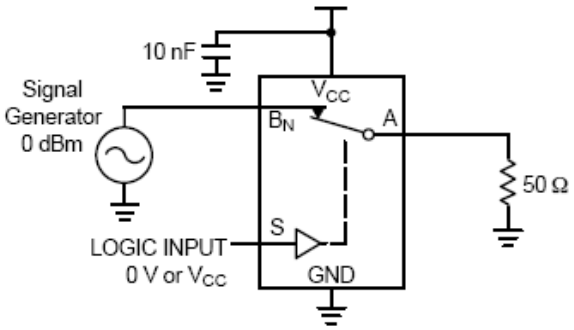



Figure 8 Bandwidth

## 8.Typical Characteristic

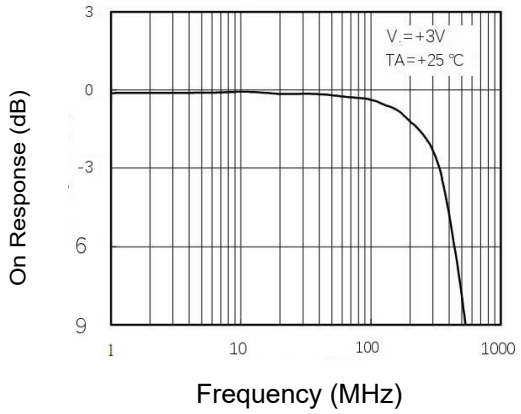



Figure 1: On Response vs. Frequency

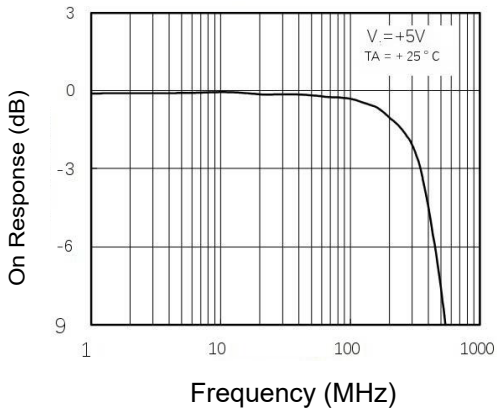



Figure 2: On Response vs. Frequency

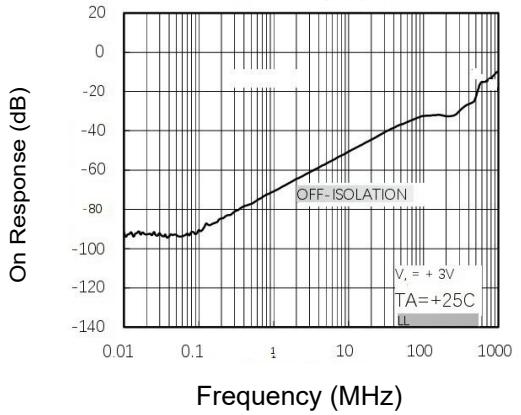



Figure 3: Response vs. Frequency

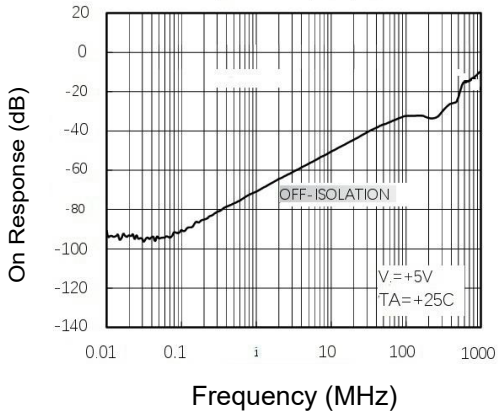
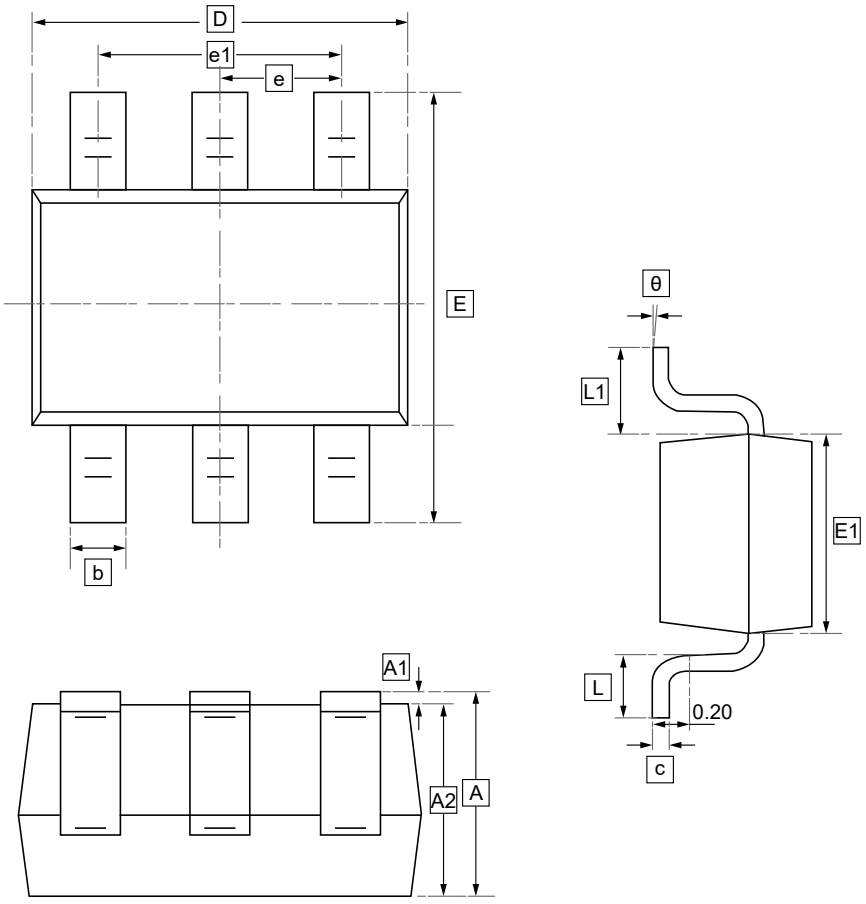



Figure 4: Response vs. Frequency

## 9.SC70-6 Package Outline Dimensions

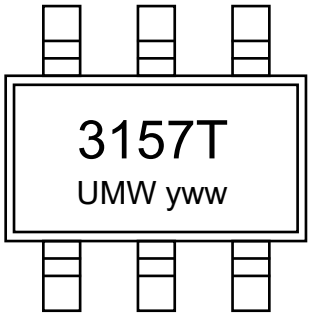



**DIMENSIONS (mm are the original dimensions)**

| Symbol | A | A1 | A2 | b | c | D | E | E1 | e | e1 | L | L1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Min | 0.90 | 0.00 | 0.90 | 0.15 | 0.08 | 2.05 | 2.15 | 1.15 | 0.65 | 1.2 | 0.26 | 0.525 |
| Max | 1.10 | 0.10 | 1.00 | 0.35 | 0.15 | 2.25 | 2.45 | 1.35 | TYP. | 1.4 | 0.46 | REF. |

| Symbol | θ |
|---|---|
| Min | 0° |
| Max | 8° |

## 15.Ordering Information




yww: Batch Code

| Order Code | Package | Base QTY | Delivery Mode |
|---|---|---|---|
| UMW ET3157 | SC-70-6 | 3000 | Tape and reel |

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