SOLID STATE OPTRONICS



# SDT460

DC Input
70V
Wide Body Photo-Transistor Optocoupler

## Description

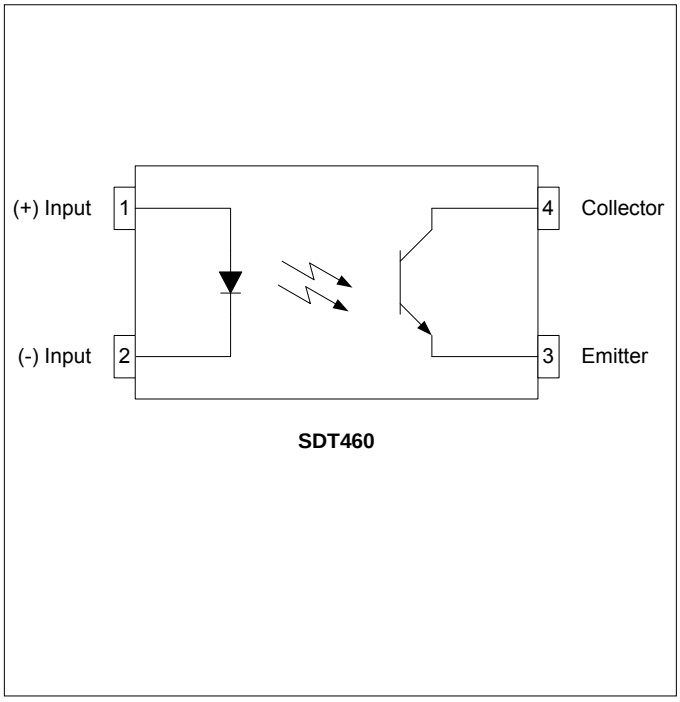
The SDT460 consists of a phototransistor optically coupled to a light emitting diode. Optical coupling between the input IR LED and output phototransistor allows for high isolation levels while maintaining low-level DC signal control capability. The SDT460 circuitry is contained in a wide body (7.5mm) body, giving the device creepage distances over 8mm. The SDT460 provides an exceptionally isolated method of controlling many interface applications such as telecommunications, industrial control and instrumentation circuitry.

The SDT460 comes standard in a 4 pin SOP, wide body package.

## Applications

- Home Appliances
- Office Automation Equipment
- Vending Machines
- Digital Logic Inputs
- Power Supplies

## Schematic Diagram




**SDT460**

## Features

- 7.5mm Width 4-Pin Small Outline Package
- Creepage > 8mm
- High Input-to-Output Isolation (5kV$_{RMS}$ MIN)
- CTR Range: 50% - 600%
- High Collector-Emitter Voltage ($V_{CE}$ = 70V MIN)
- Long Life / High Reliability
- RoHS / Pb-Free / REACH Compliant

## Agency Approvals

| | |
|---|---|
| UL / C-UL: | File # E201932 |
| VDE: | File # 40035191 (EN 60747-5-2) |

## Absolute Maximum Ratings

The values indicated are absolute stress ratings. Functional operation of the device is not implied at these or any conditions in excess of those defined in electrical characteristics section of this document. Exposure to absolute Maximum Ratings may cause permanent damage to the device and may adversely affect reliability.

| | |
|---|---|
| Storage Temperature | -55 to +110°C |
| Operating Temperature | -55 to +150°C |
| Continuous Input Current | 50mA |
| Transient Input Current | 500mA |
| Reverse Input Control Voltage | 6V |
| Input Power Dissipation | 70mW |
| Total Power Dissipation | 250mW |
| Solder Temperature – Wave (10sec) | 260°C |
| Solder Temperature – IR Reflow (10sec) | 260°C |

## Ordering Information

| Part Number | Description |
|---|---|
| SDT460 | 4 pin SOP, (100/Tube) |
| SDT460-TR | 4 pin SOP, Tape and Reel (3000/Reel) |

**NOTES: Suffixes listed above are not included in marking on device for part number identification**

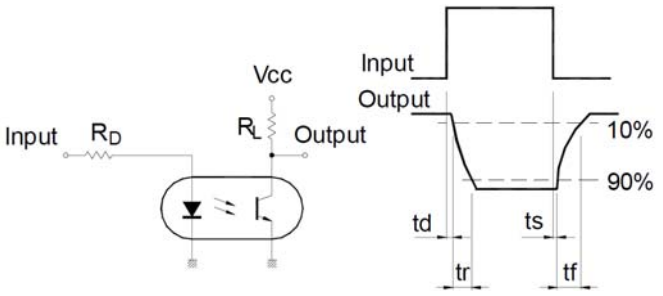
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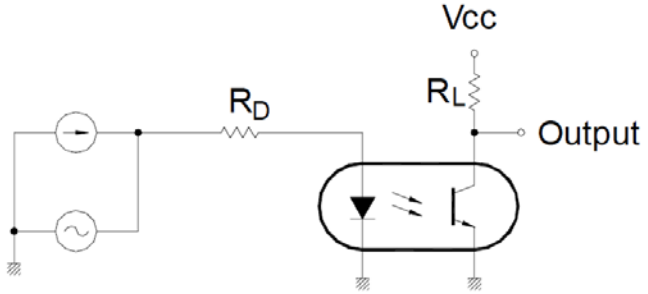
## Electrical Characteristics, $T_A$ = 25°C (unless otherwise specified)

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| **Input Specifications** | | | | | | |
| LED Forward Voltage | $V_F$ | - | 1.25 | 1.6 | V | $I_F$ = 50mA |
| Terminal Capacitance | $C_t$ | - | 50 | - | pF | V=0, f=1MHz |
| Reverse Current | $I_R$ | - | - | 10 | μA | $V_R$=4V |
| **Output Specifications** | | | | | | |
| Collector-Emitter Voltage | $V_{CEO}$ | 70 | - | - | V | $I_C$=100μA |
| Emitter-Collector Voltage | $V_{COE}$ | 7 | - | - | V | $I_E$=10μA |
| Collector Dark Current | $I_{CEO}$ | - | 10 | 100 | nA | $V_{CE}$=20V, $I_F$=0mA |
| Floating Capacitance | $C_f$ | - | 0.3 | - | pF | V=0, f=1MHz |
| Cut-Off Frequency | $f_C$ | - | 80 | - | kHz | $V_{CE}$=5V, $I_C$=2mA, $R_L$=100Ω, -3dB |
| Saturation Voltage | $V_{CE(sat)}$ | - | - | 0.3 | V | $I_F$=10mA, $I_C$=1mA |
| **Coupled Specifications** | | | | | | |
| Rise Time | $T_R$ | - | 3 | 18 | μS | $I_C$=2mA, $V_{CC}$=5V, $R_L$=100Ω |
| Fall Time | $T_F$ | - | 4 | 18 | μS | $I_C$=2mA, $V_{CC}$=5V, $R_L$=100Ω |
| Current Transfer Ratio (Open Bin / No Suffix) | CTR | 50 | - | 600 | % | $I_F$=5mA, $V_{CE}$=5V |
| (-A Binning) | CTR | 63 | - | 125 | % | $I_F$=10mA, $V_{CE}$=5V |
| (-B Binning) | CTR | 100 | - | 200 | % | $I_F$=10mA, $V_{CE}$=5V |
| (-C Binning) | CTR | 50 | - | 150 | % | $I_F$=5mA, $V_{CE}$=5V |
| (-D Binning) | CTR | 100 | - | 300 | % | $I_F$=5mA, $V_{CE}$=5V |
| (-E Binning) | CTR | 80 | - | 160 | % | $I_F$=5mA, $V_{CE}$=5V |
| (-F Binning) | CTR | 130 | - | 260 | % | $I_F$=5mA, $V_{CE}$=5V |
| (-G Binning) | CTR | 200 | - | 400 | % | $I_F$=5mA, $V_{CE}$=5V |
| **Isolation Specifications** | | | | | | |
| Isolation Voltage | $V_{ISO}$ | 5000 | - | - | $V_{RMS}$ | RH ≤ 50%, t=1min |
| Input-Output Resistance | $R_{I-O}$ | - | $10^{12}$ | - | Ω | $V_{I-O}$ = 500$V_{DC}$ |

**Test Circuit:** *Response Time*




**Test Circuit:** *Frequency Response*




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## SDT460 Performance & Characteristics Plots, $T_A$ = 25°C (unless otherwise specified)

**Figure 1:** *Forward Current ($I_F$) vs. Temperature (°C)*

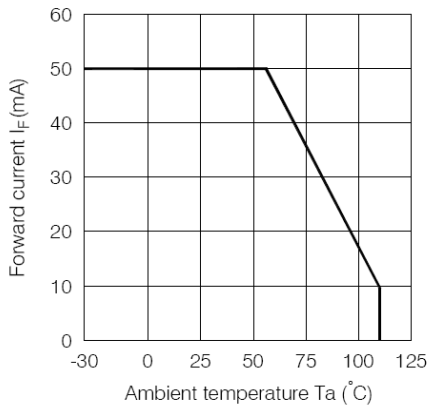



**Figure 2:** *Collector Power Dissipation ($P_C$) vs. Temperature (°C)*

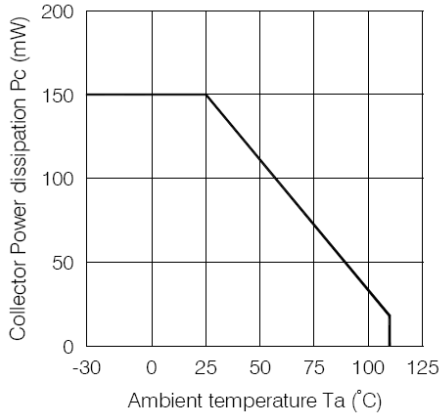



**Figure 3:** *Collector-Emitter Saturation Voltage ($V_{CE(SAT)}$) vs. Forward Current ($I_F$)*

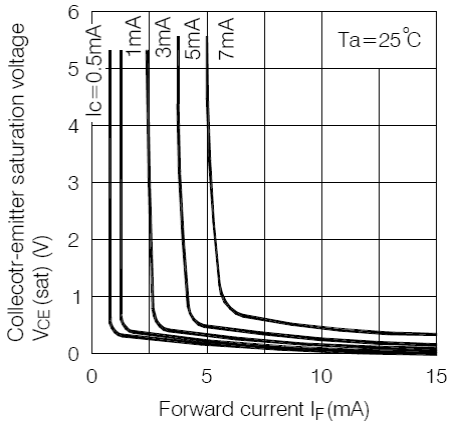



**Figure 4:** *Forward Current ($I_F$) vs. Forward Voltage ($V_F$)*

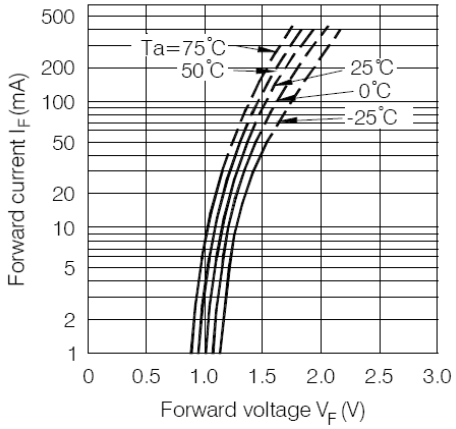



**Figure 5:** *Collector Current ($I_C$) vs. Collector-Emitter Voltage ($V_{CE}$)*

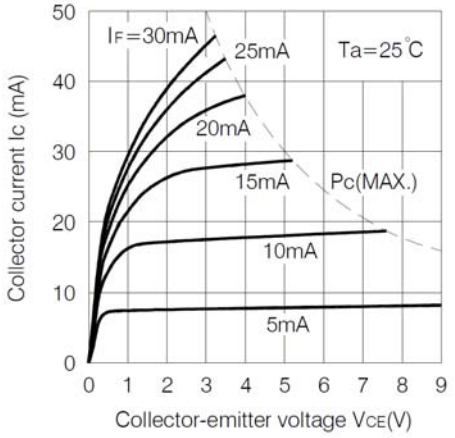
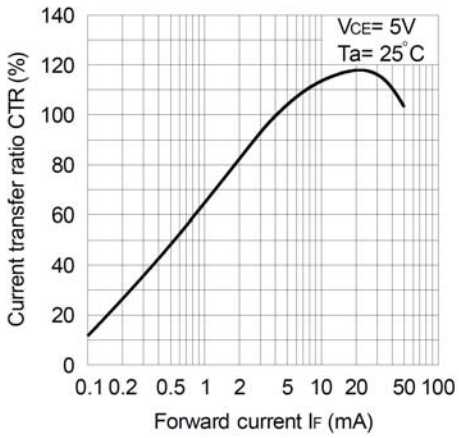



**Figure 6:** *Current Transfer Ratio (CTR) vs. Forward Current ($I_F$)*




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## SDT460 Performance & Characteristics Plots, $T_A$ = 25°C (unless otherwise specified)

**Figure 7:** *Relative CTR (%) vs. Temperature (°C)*

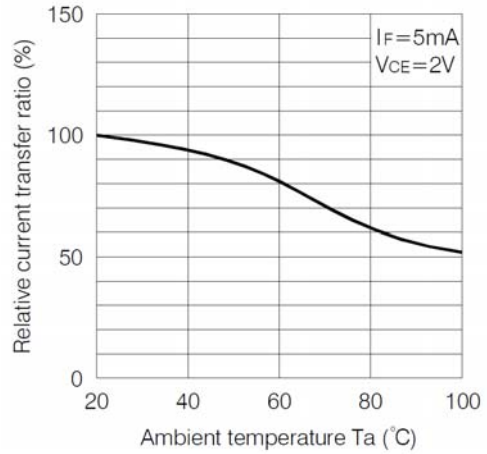



**Figure 8:** *Collector-Emitter Saturation Voltage ($V_{CE(SAT)}$) vs. Temperature (°C)*

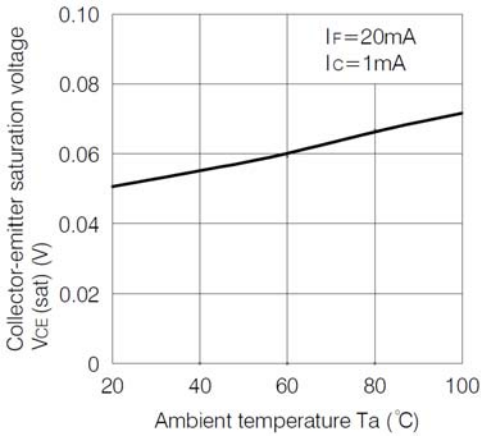



**Figure 9:** *Collector Dark Current ($I_{CEO}$) vs. Temperature (°C)*

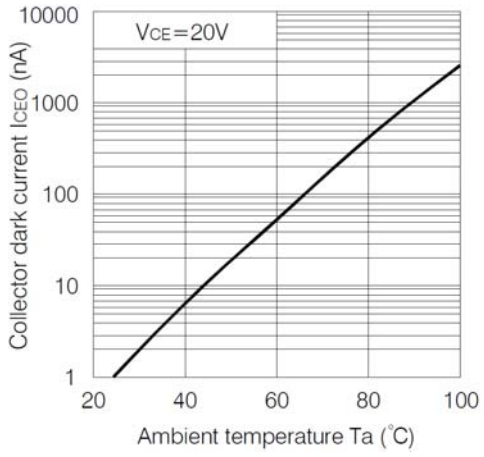



**Figure 10:** *Response Times vs. Load Resistance ($R_L$)*

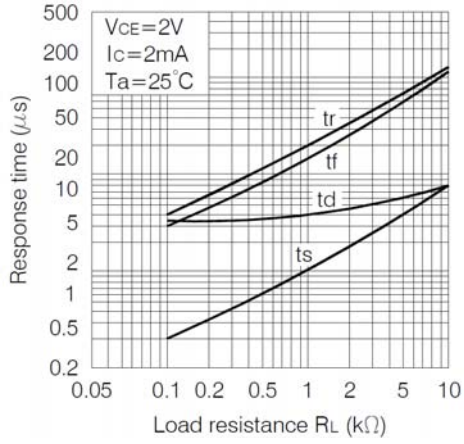
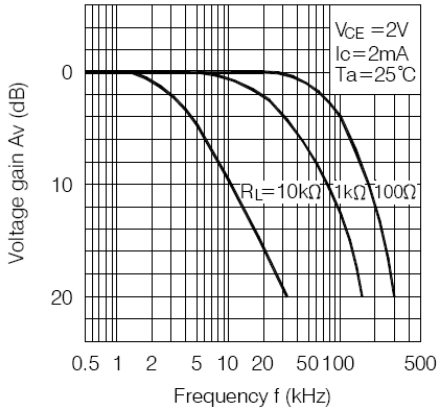



**Figure 11:** *Frequency Response Characteristics*

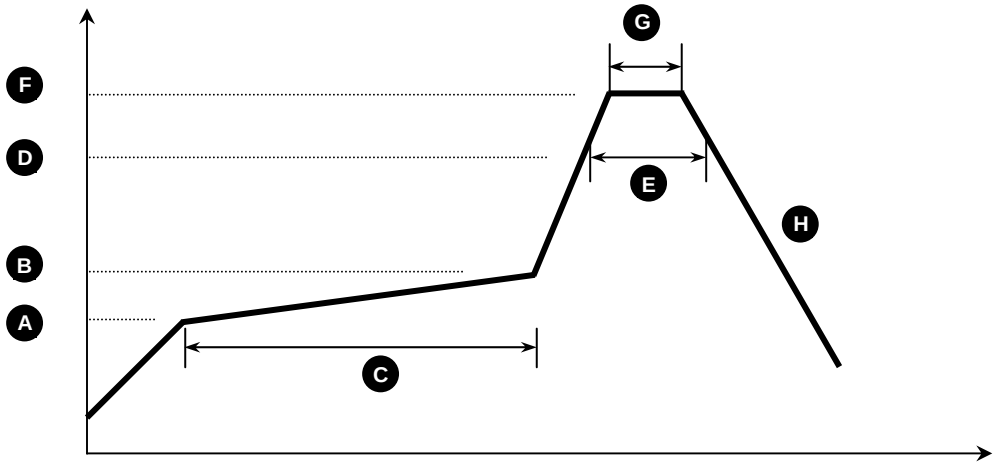



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## SDT460 Solder Reflow Temperature Profile Recommendations

### (1) *Infrared Reflow:*

Refer to the following figure as an example of an optimal temperature profile for single occurrence infrared reflow. Soldering process should not exceed temperature or time limits expressed herein. Surface temperature of device package should not exceed 250ºC:




| Process Step | Description | Parameter |
|---|---|---|
| A | Preheat Start Temperature (ºC) | 150ºC |
| B | Preheat Finish Temperature (ºC) | 180ºC |
| C | Preheat Time (s) | 90 - 120s |
| D | Melting Temperature (ºC) | 230ºC |
| E | Time above Melting Temperature (s) | 30s |
| F | Peak Temperature, at Terminal (ºC) | 260ºC |
| G | Dwell Time at Peak Temperature (s) | 10s |
| H | Cool-down (ºC/s) | <6ºC/s |

### (2) *Wave Solder:*

Maximum Temperature: 260ºC (at terminal)
Maximum Time: 10s
Pre-heating: 100 - 150ºC (30 - 90s)
Single Occurrence

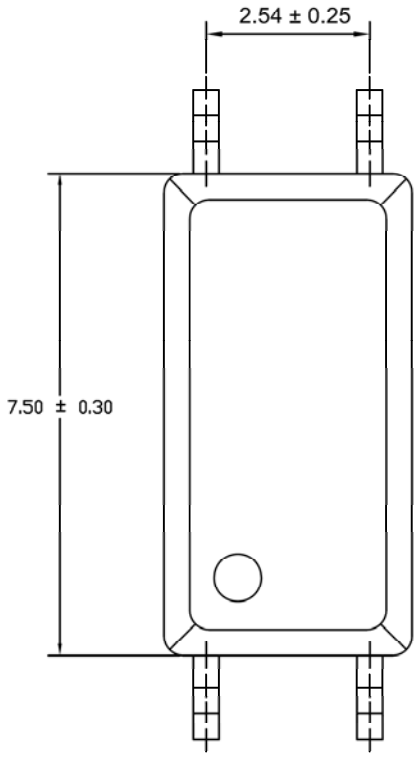
### (3) *Hand Solder:*

Maximum Temperature: 350ºC (at tip of soldering iron)
Maximum Time: 3s
Single Occurrence

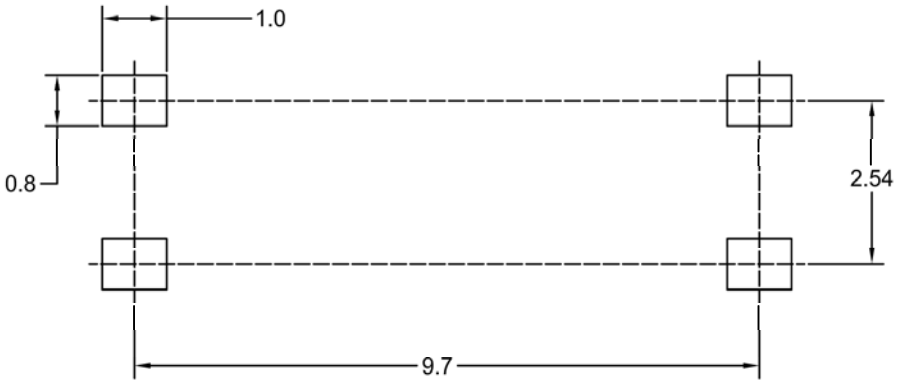
## SDT460 Package Dimensions

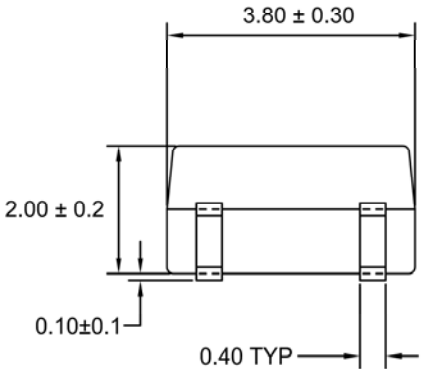
*4 PIN SOP (WIDE) Package*

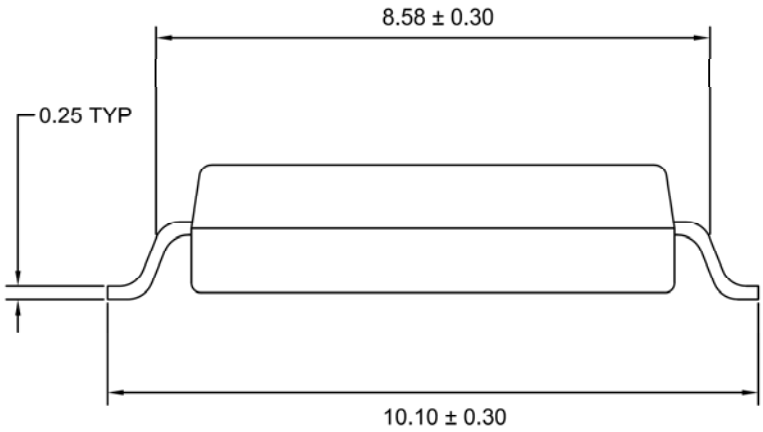
***Note:*** *All dimensions in millimeters [mm]*




*4 PIN SOP (WIDE) Footprint*



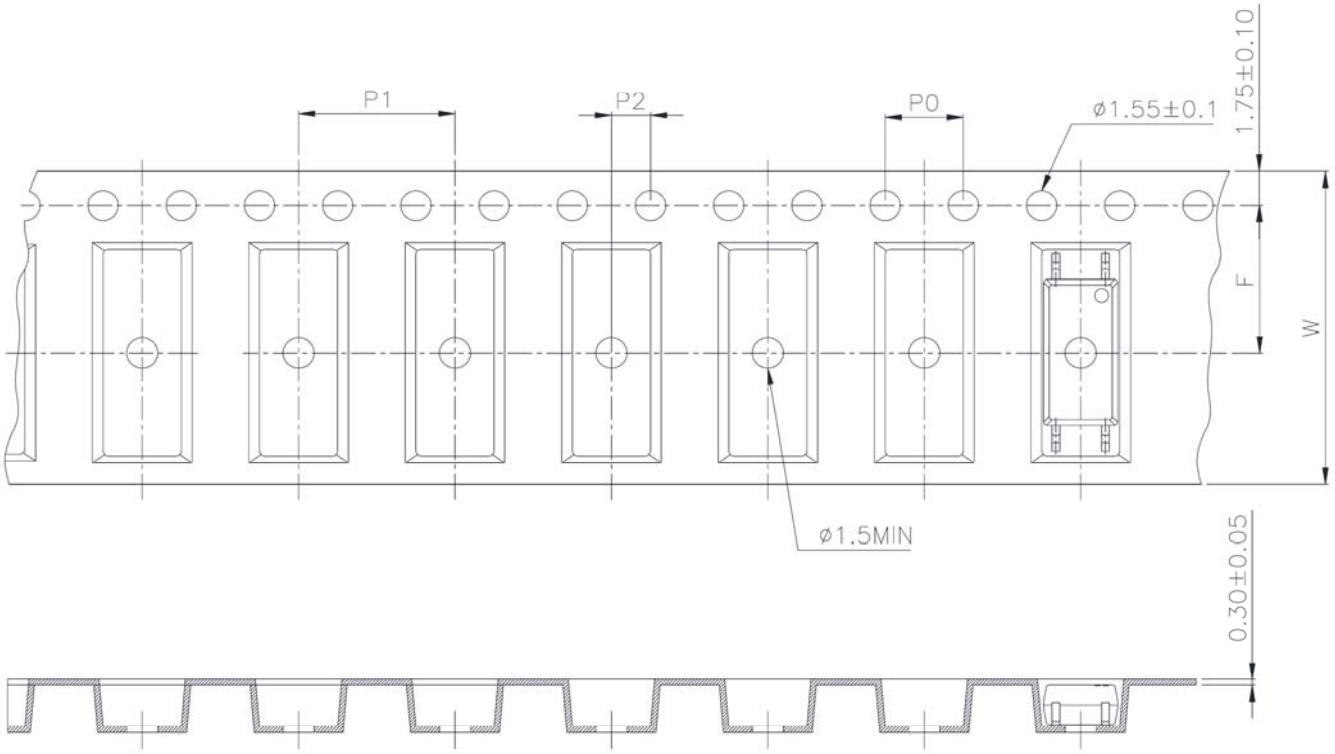




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## SDT460 Packaging Specifications

*Tape & Reel Specifications (T&R)*

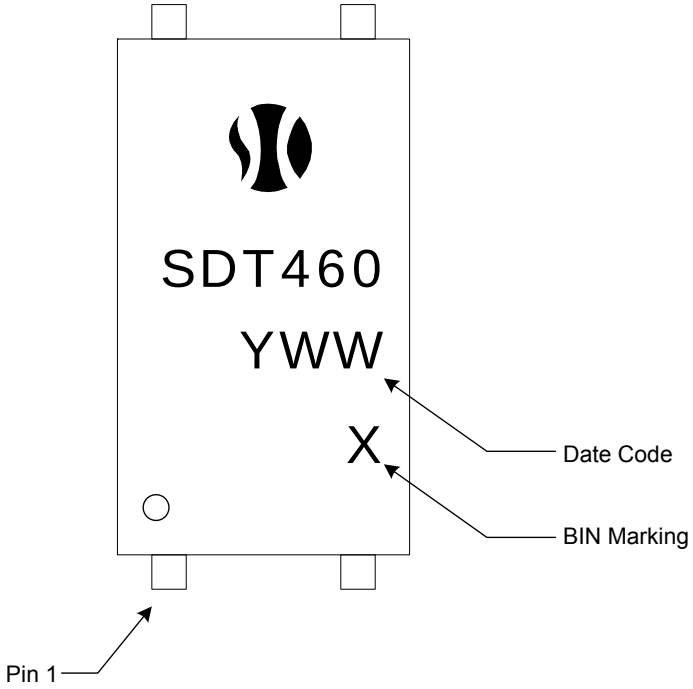
***Note:*** *All dimensions in millimeters [mm]*




| Specification | Symbol | Dimensions, mm ( inches ) |
|---|---|---|
| Tape Width | W | 16 ± 0.3 ( 0.63 ) |
| Sprocket Hole Pitch | P0 | 4 ± 0.1 ( 0.15 ) |
| Compartment Location | F<br>P2 | 7.5 ± 0.1 ( 0.295 )<br>2 ± 0.1 ( 0.079 ) |
| Compartment Pitch | P1 | 8 ± 0.1 ( 0.315 ) |

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**SDT460 Package Marking**




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