SOLID STATE OPTRONICS



SAT400

AC Input
60V
Photo-Transistor Optocoupler

Description

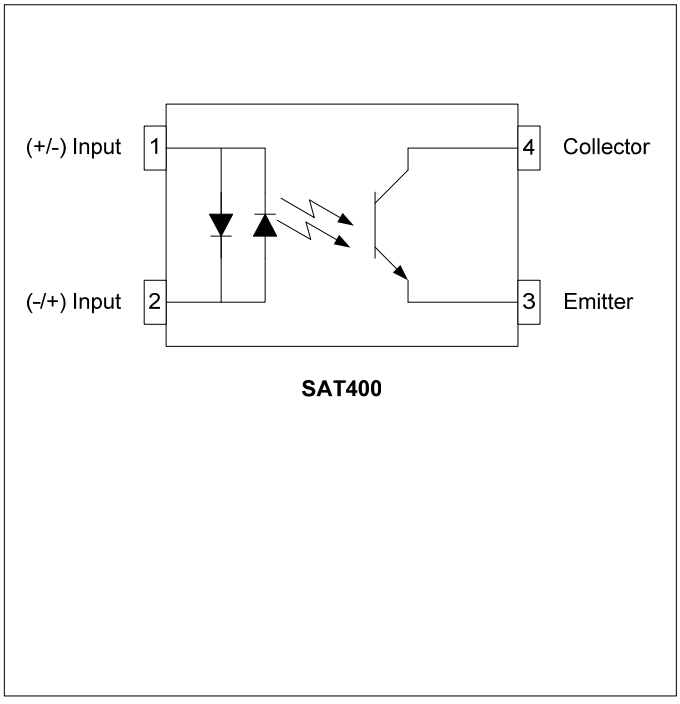
The SAT400 consists of a phototransistor optically coupled to two light emitting diodes. Optical coupling between the two input IR LEDs and output phototransistor allows for high isolation levels while maintaining low-level AC signal control capability. The SAT400 provides an optically isolated method of controlling many interface applications such as telecommunications, industrial control and instrumentation circuitry.

The SAT400 comes standard in a miniature 4 pin DIP package.

Applications

- Registers, Copiers, Automatic Vending Machines
- System Appliances, Measuring Instruments
- Computer Terminals, PLCs
- Telecommunication Equipment, Telephones
- Home Appliances
- Digital Logic Inputs
- Microprocessor Inputs
- Switching Power Supplies

Schematic Diagram



SAT400

Features

- V_{CEO} = 60V
- Small 4 pin DIP/SMD package
- Low input power consumption
- High stability
- High Isolation Voltage (5000V_{RMS})
- Long Life / High Reliability
- VDE/EN60747-5-2 Approval
- 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 +125°C
Operating Temperature	-40 to +100°C
Continuous Input Current	50mA
Transient Input Current	500mA
Reverse Input Control Voltage	6V
Input Power Dissipation	40mW
Total Power Dissipation	200mW
Solder Temperature – Wave (10sec)	260°C
Solder Temperature – IR Reflow (10sec)	260°C

Ordering Information

Part Number	Description
SAT400	4 pin DIP, (100/Tube)
SAT400-H	0.40" (10.16mm) Lead Spacing (VDE0884)
SAT400-S	4 pin SMD, (100/Tube)
SAT400-STR	4 pin SMD, Tape and Reel (1000/Reel)

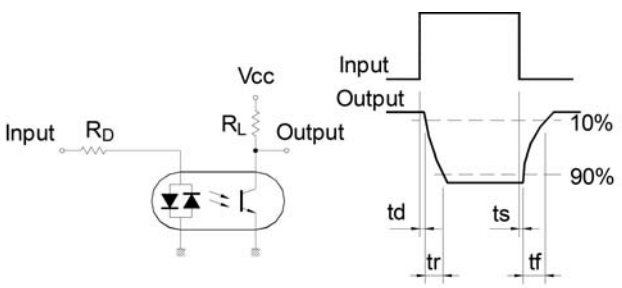
NOTE: Suffixes listed above are not included in marking on device for part number identification

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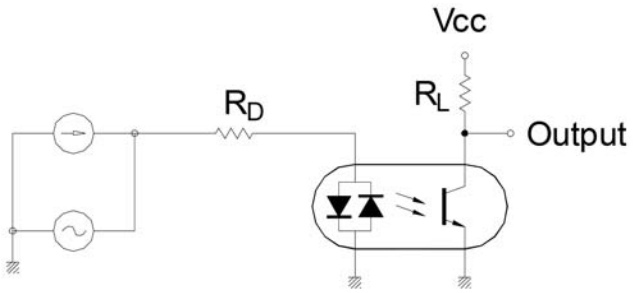
Electrical Characteristics, T_A = 25°C (unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Input Specifications						
LED Forward Voltage	V_F	-	1.2	1.4	V	I_F = ±20mA
Terminal Capacitance	C_t	-	30	250	pF	V=0, f=1KHz
Output Specifications						
Collector-Emitter Voltage	V_{CEO}	60	-	-	V	I_C=10μA
Emitter-Collector Voltage	V_{COE}	6	-	-	V	I_E=10μA
Collector Dark Current	I_{CEO}	-	-	100	nA	V_{CE}=20V
Floating Capacitance	C_f	-	0.6	1.0	pF	V_{CE}=0, f=1MHz
Cut-Off Frequency	f_C	-	80	-	kHz	V_{CE}=5V, I_C=2mA, R_L=100Ω, -3dB
Saturation Voltage	$V_{CE(sat)}$	-	0.1	0.2	V	I_F=±20mA, I_C=1mA
Coupled Specifications						
Rise Time	T_R	-	4	18	μS	I_C=±2mA, V_{CC}=2V, R_L=100Ω
Fall Time	T_F	-	3	18	μS	I_C=±2mA, V_{CC}=2V, R_L=100Ω
Current Transfer Ratio	CTR	20	-	300	%	I_F=±1mA, V_{CE}=5V
- A CTR Binning	CTR	50	-	150	%	I_F=±1mA, 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} = 500V_{DC}

Test Circuit: *Response Time*



Test Circuit: *Frequency Response*



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SAT400 Performance & Characteristics Plots, T_A = 25°C (unless otherwise specified)

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

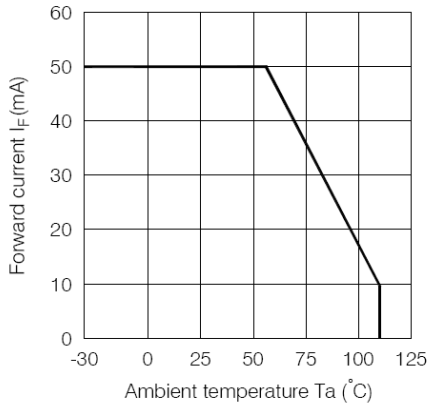


Figure 2: *Collector Power Dissipation (P_C) vs. Temperature (°C)*

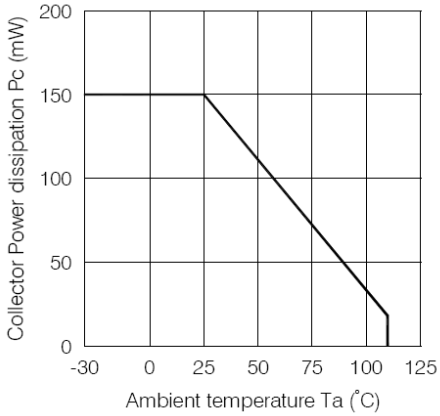


Figure 3: *Collector-Emitter Saturation Voltage ($V_{CE(SAT)}$) vs. Forward Current (I_F)*

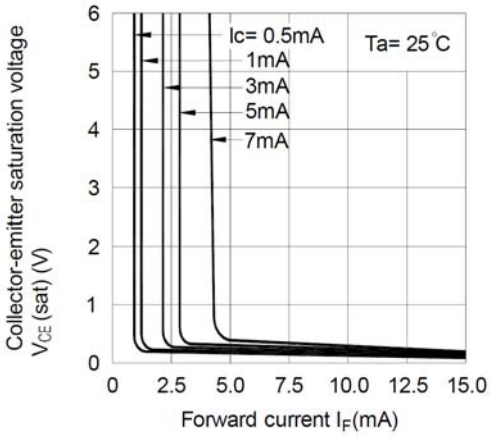


Figure 4: *Forward Current (I_F) vs. Forward Voltage (V_F)*

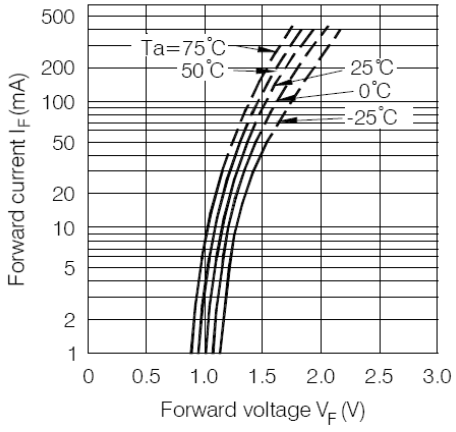


Figure 5: *Collector Current (I_C) vs. Collector-Emitter Voltage (V_{CE})*

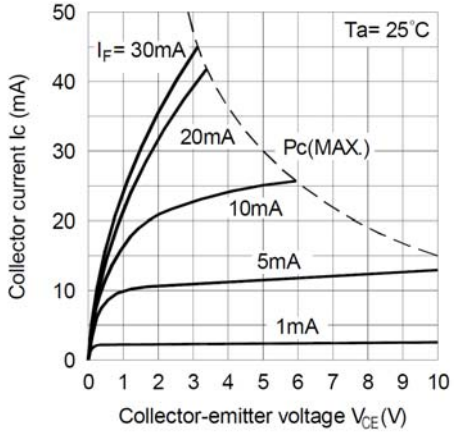
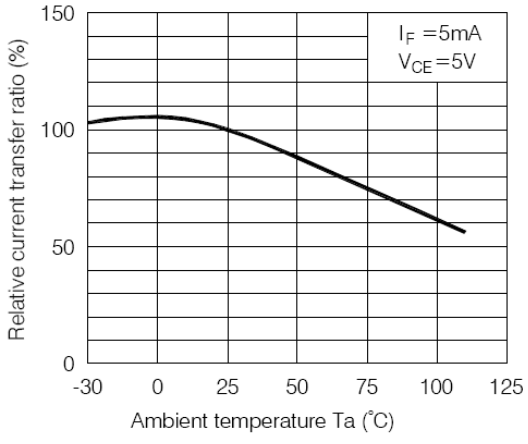


Figure 6: *Relative CTR (%) vs. Temperature (°C)*



SAT400 Performance & Characteristics Plots, T_A = 25°C (unless otherwise specified)

Figure 7: *Collector-Emitter Saturation Voltage ($V_{CE(SAT)}$) vs. Temperature (°C)*

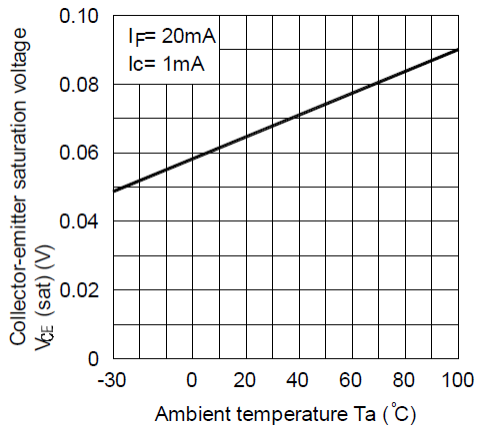


Figure 8: *Collector Dark Current (I_{CEO}) vs. Temperature (°C)*

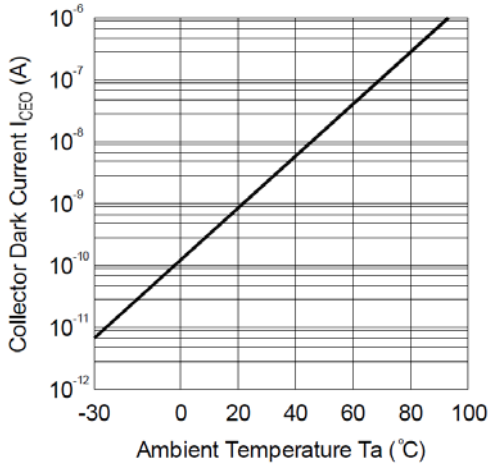


Figure 9: *Response Times vs. Load Resistance (R_L)*

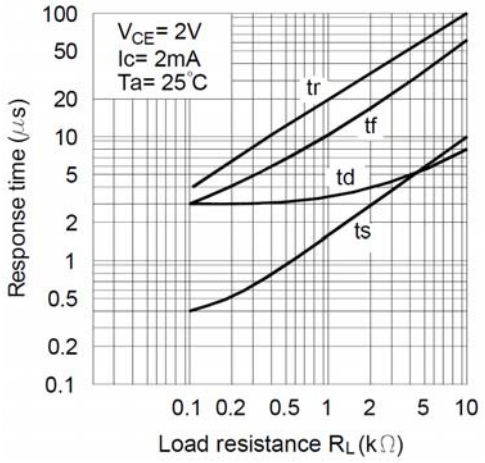
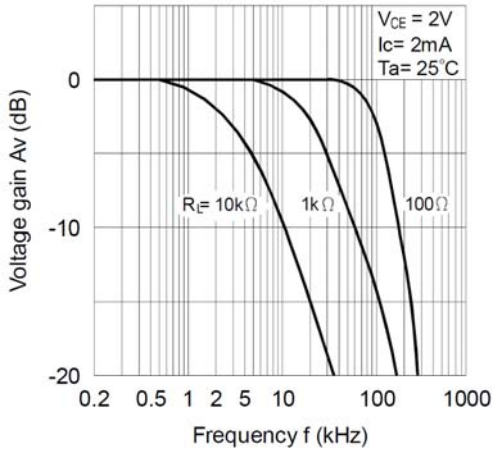


Figure 10: *Frequency Response Characteristics*

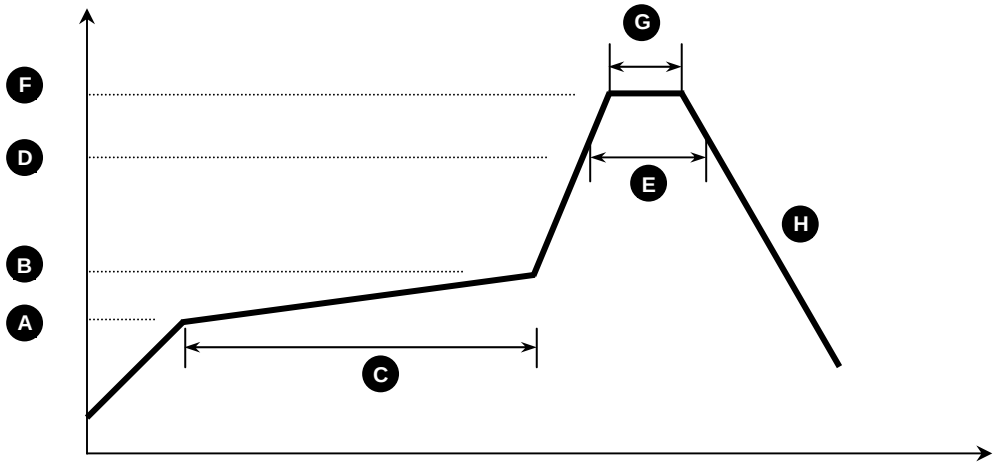


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SAT400 Solder Reflow Temperature Profile Recommendations

(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:*

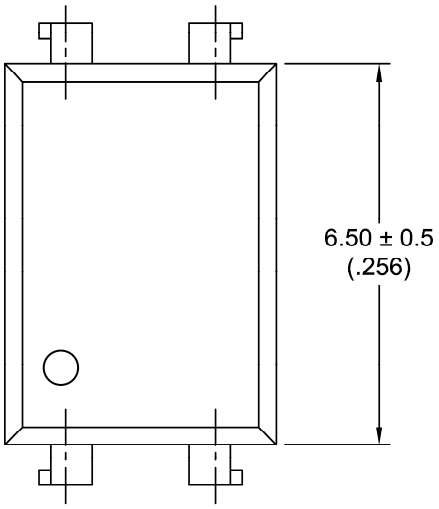
Maximum Temperature:	350ºC (at tip of soldering iron)
Maximum Time:	3s
Single Occurrence	

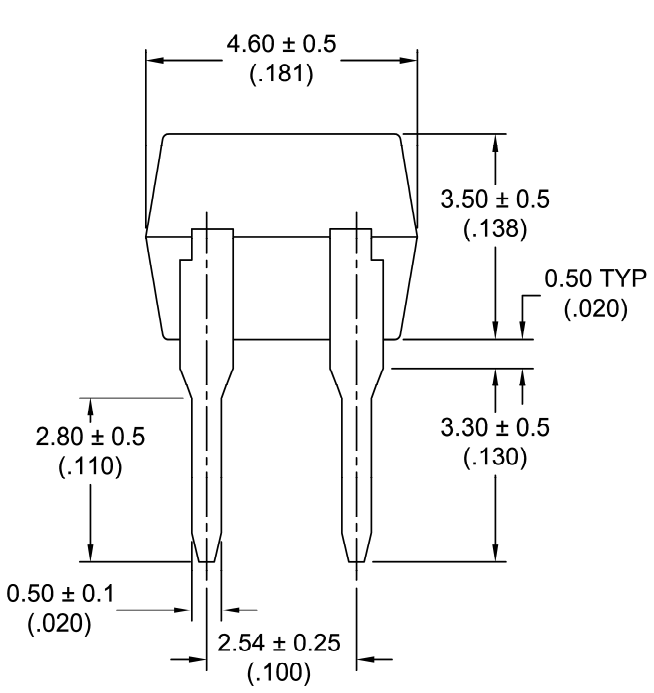
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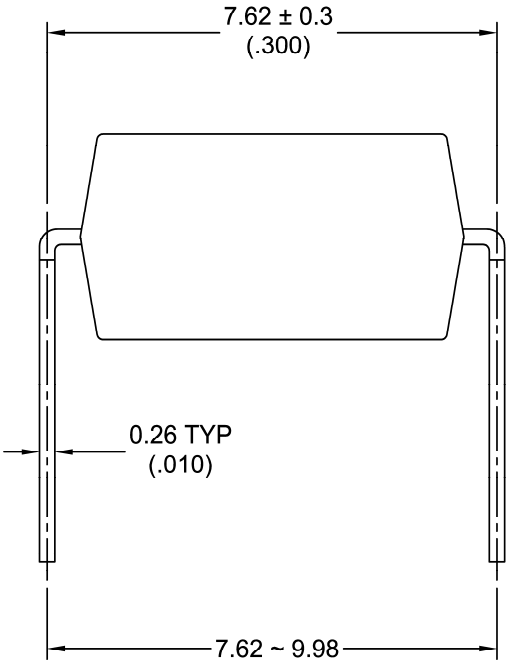
SAT400 Package Dimensions

4 PIN DIP Package

Note: *All dimensions in millimeters [mm] with inches in parenthesis ()*



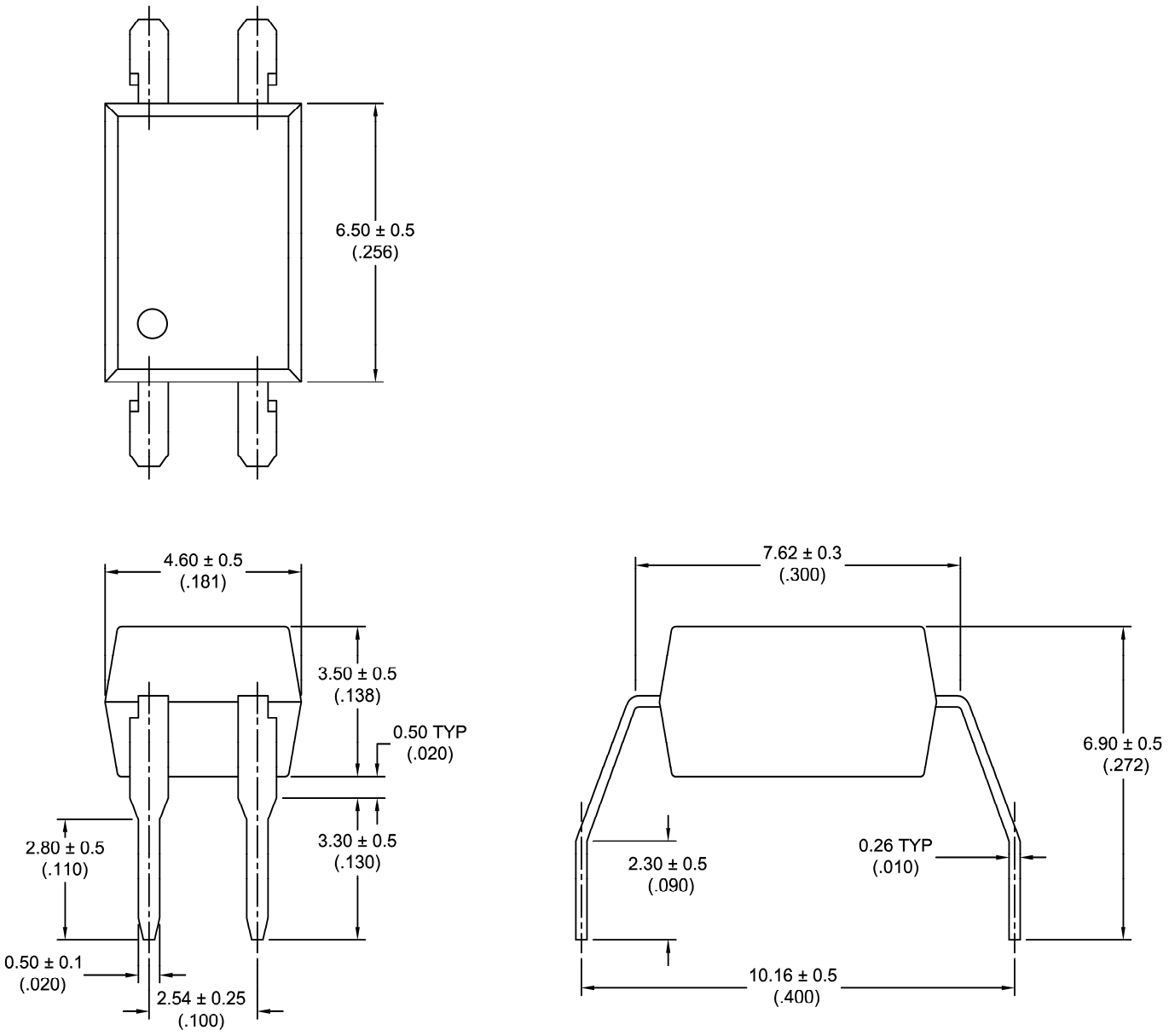




SAT400 Package Dimensions

4 PIN WIDE Lead Space Package (-H)

Note: *All dimensions in millimeters [mm] with inches in parenthesis ()*

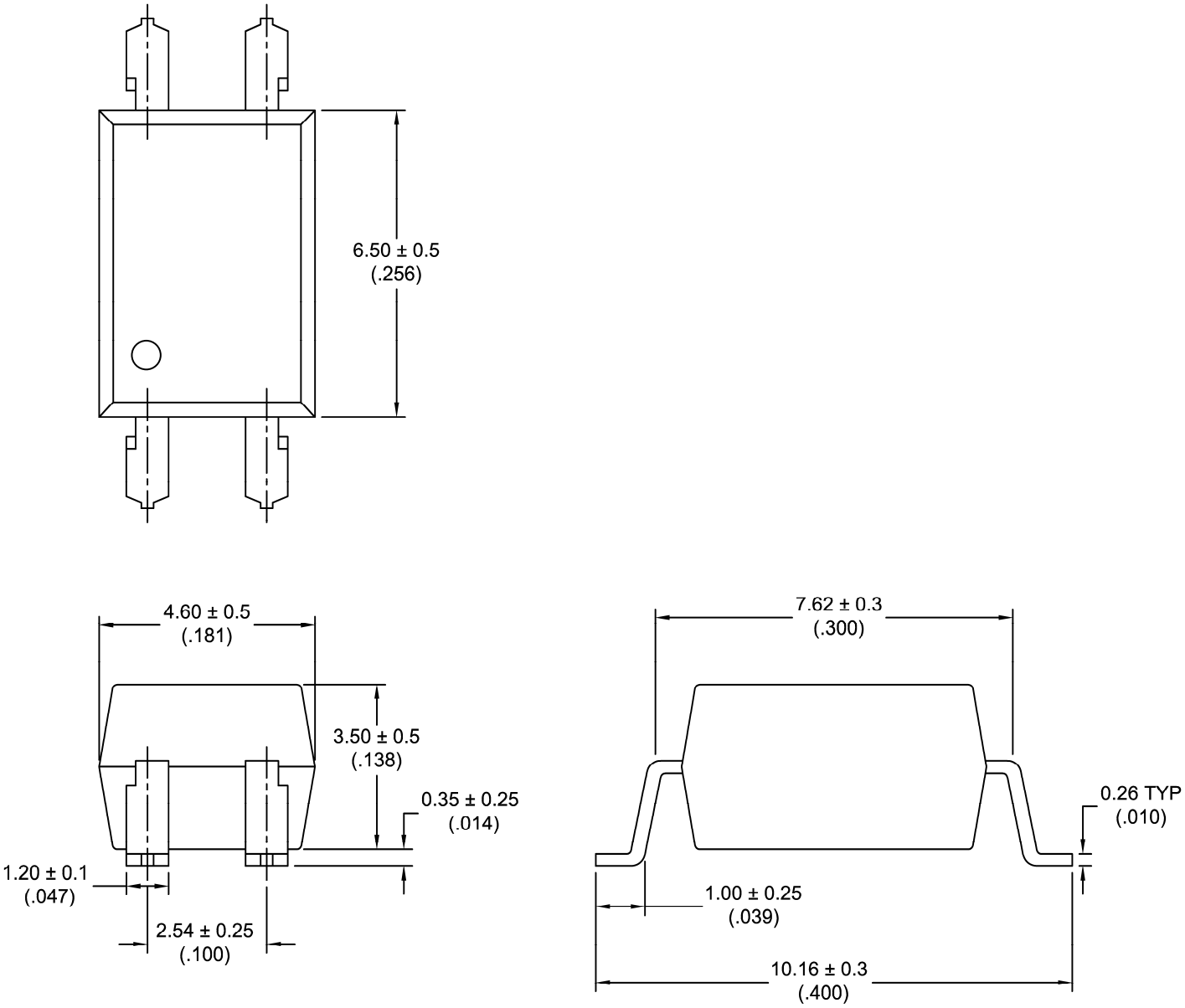


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SAT400 Package Dimensions

4 PIN SMD Surface Mount Package (-S)

Note: *All dimensions in millimeters [mm] with inches in parenthesis ()*

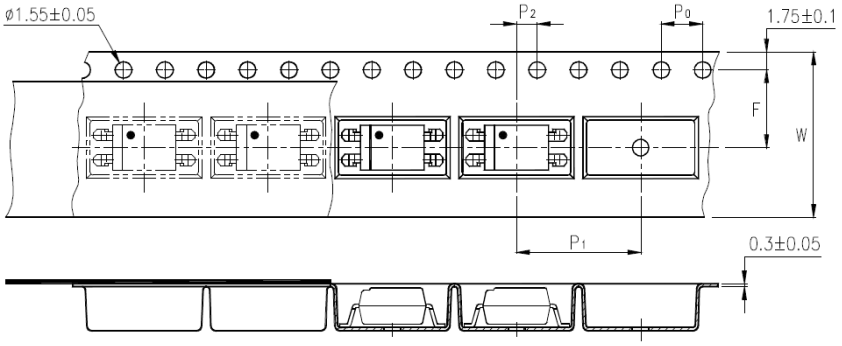


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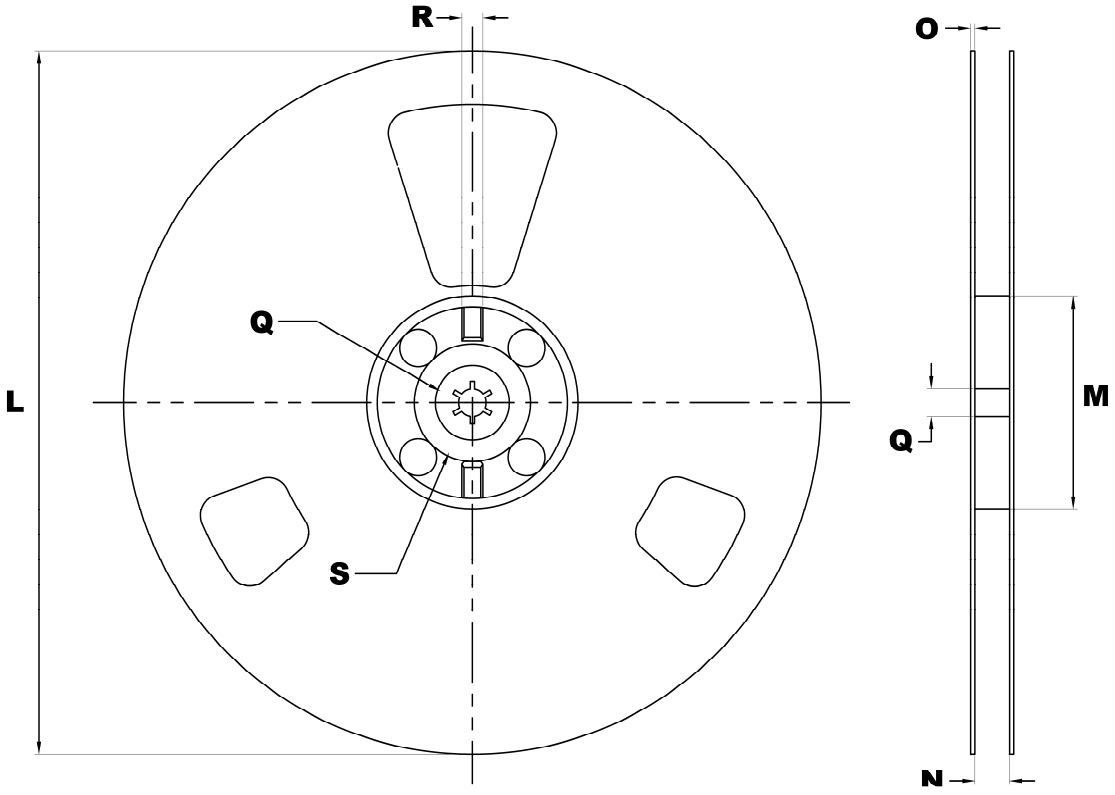
SAT400 Packaging Specifications

Tape & Reel Specifications (T&R)

Note: *All dimensions in millimeters [mm] with inches in parenthesis ()*

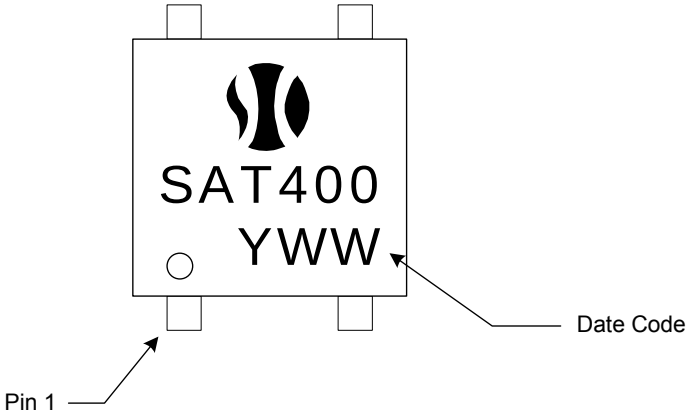


F	P0	P1	P2	W
7.5±0.1	4.0±0.1	12.0±0.1	2.0±0.1	16.0±0.3



L	M	N	O	Q	R	S
330±2	101.6±1	16.4+0.2	2.0±0.2	R13±0.5	1.50±0.5	R10±1

SAT400 Package Marking



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