SOLID STATE OPTRONICS

SDN136

Analog High Speed Optocoupler
1MBd, Photodiode with Transistor Output

Description

The SDN136 is a high speed optocoupler consisting of an infrared GaAs LED optically coupled through a high isolation barrier to an integrated high speed transistor and photodiode.

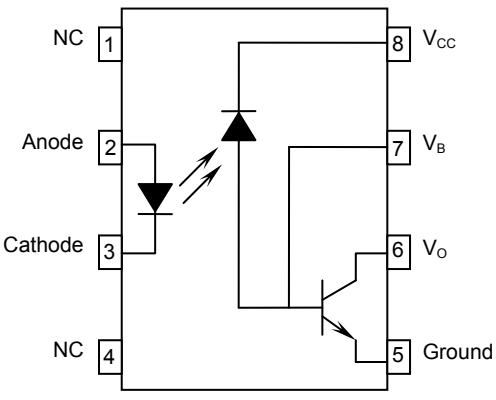
Separate access to the photodiode and transistor allow users to reduce base-collector capacitance, enabling much higher switching speeds. Signals with frequencies of up to 2.0MHz can be switched, giving the SDN136 a much broader application range than traditional optocouplers.

The SDN136 comes standard in an 8 pin DIP package.

Applications

- High Speed Logic Ground Isolation
- Replace Slower Speed Optocouplers
- Line Receivers
- Power Transistor Isolation
- Pulse Transformer Replacement
- Switch Mode Power Supplies
- High Voltage Insulation
- Ground Isolation – Analog Signals

Schematic Diagram



SDN136

Truth Table
(Positive Logic)

LED	V_O
ON	LOW
OFF	HIGH

**** A 0.1µF bypass Capacitor must be connected between pins 5 & 8 (GND & V_{CC})**

Features

- TTL Compatible
- High Bit Rate: 1Mb/s
- Bandwidth: 2.0MHz
- Open Collector Output
- High Isolation Voltage (5000V_{RMS})
- High Common Mode Interference Immunity
- 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 +85°C
Continuous Input Current.....40mA
Transient Input Current.....400mA
Reverse Input Control Voltage 5V
Input Power Dissipation.....40mW
Peak Output Current (Pin 6).....16mA
Max Emitter-Base Reverse Voltage (Pin 5-7).....5V
Max Supply Voltage (Pin 8-5).....15V
Max Output Voltage (Pin 6-5).....15V
Max Base Current (Pin 7).....5mA
Output Power Dissipation.....100mW

Ordering Information

Part Number	Description
SDN136	8 pin DIP, (50/Tube)
SDN136-H	0.40" (10.16mm) Lead Spacing (VDE0884)
SDN136-S	8 pin SMD, (50/Tube)
SDN136-STR	8 pin SMD, Tape and Reel (1000/Reel)

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

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

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Input Specifications						
LED Forward Voltage	V_F	-	1.4	1.7	V	I_F = 16mA
LED Reverse Voltage	BV_R	5	-	-	V	I_R = 10µA
Detector Specifications						
Current Transfer Ratio [1]	CTR	19	24	50	%	I_F=16mA, V_{CC}=4.5V, V_O=0.4V
Logic Low Output Voltage	V_{OL}	-	0.25	0.4	V	I_F=0mA, V_O=V_{CC}=4.5V, I_O=3mA
Logic High Output Current	I_{OH}	-	-	1	µA	I_F=0mA, V_O=V_{CC}=5.5V
Logic Low Supply Current [2]	I_{CCL}	-	400	-	µA	I_F=16mA, V_O=OPEN (V_{CC}=15V)
Logic High Supply Current [2]	I_{CCH}	-	-	1	µA	I_F=0mA, V_O=OPEN (V_{CC}=15V)
Offset Voltage						
Switching Specifications, T_A = 0~70°C, V_{CC} = 5V (unless otherwise specified)						
Propagation Delay Time to Low Output Level [3]	t_{PHL}	-	0.1	0.8	µS	T_A=25°C (R_L=1.9KΩ, I_F=16mA)
Propagation Delay Time to High Output Level [3]	t_{PLH}	-	0.4	0.8	µS	T_A=25°C (R_L=1.9KΩ, I_F=16mA)
Logic High Common Mode Transient Immunity [3]	$\|CM_H\|$	1	-	-	KV/ µS	I_F=0mA, V_{CM}=10V_{P-P}, R_L=1.9KΩ
Logic High Common Mode Transient Immunity [3]	$\|CM_L\|$	1	-	-	KV/ µS	I_F=16mA, V_{CM}=10V_{P-P}, R_L=1.9KΩ
Coupled Capacitance					µS	
Contact Transient Ratio					µS	
Isolation Specifications						
Input-Output Insulation Leakage Current	I_{I-O}	-	-	1.0	µA	45% RH, t=5s, V_{I-O}=3kV
Withstand Insulation Test Voltage	V_{ISO}	5000	-	-	V_{RMS}	RH ≤ 50%, t=1min
Input-Output Resistance	R_{I-O}	-	10^{12}	-	Ω	V_{I-O} = 500V_{DC}

Notes

1. Current Transfer Ratio (CTR) as a percentage is defined as the ratio of output collector current (I_O) to the forward LED input current (I_F) times 100
2. A 0.1µF or bigger bypass capacitor for V_{CC} is needed as shown in Figure 1 on following page
3. The 1.9KΩ load represents 1TTL unit load of 1.6mA and the 5.6KΩ pull-up resistor.

SDN136 Electrical Test Circuits

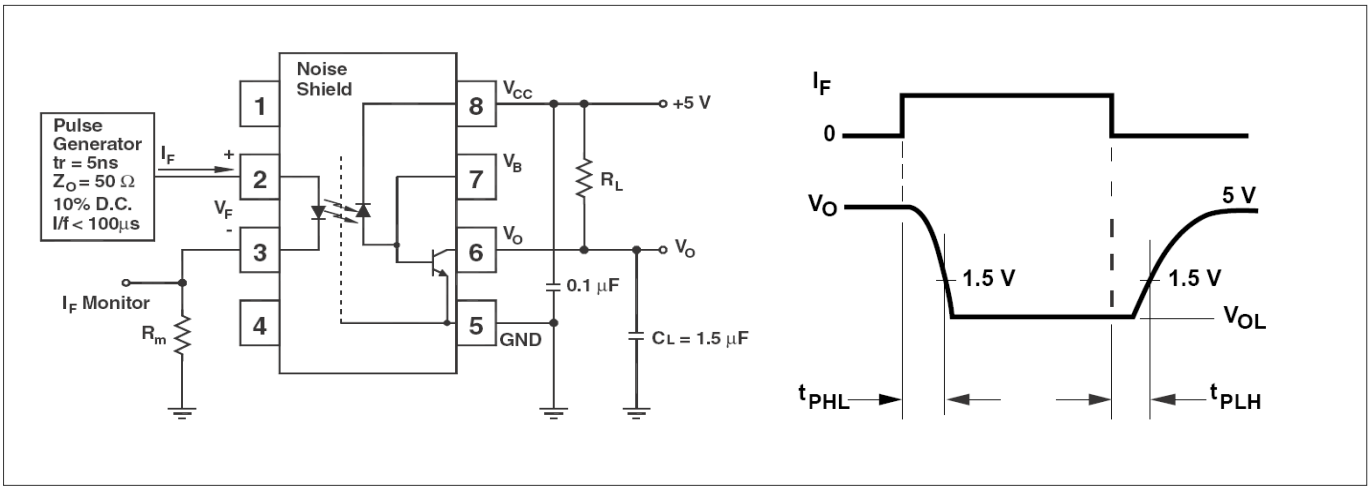


Figure 1: *Single Channel Test Circuit for t_{PHL} and t_{PLH}*

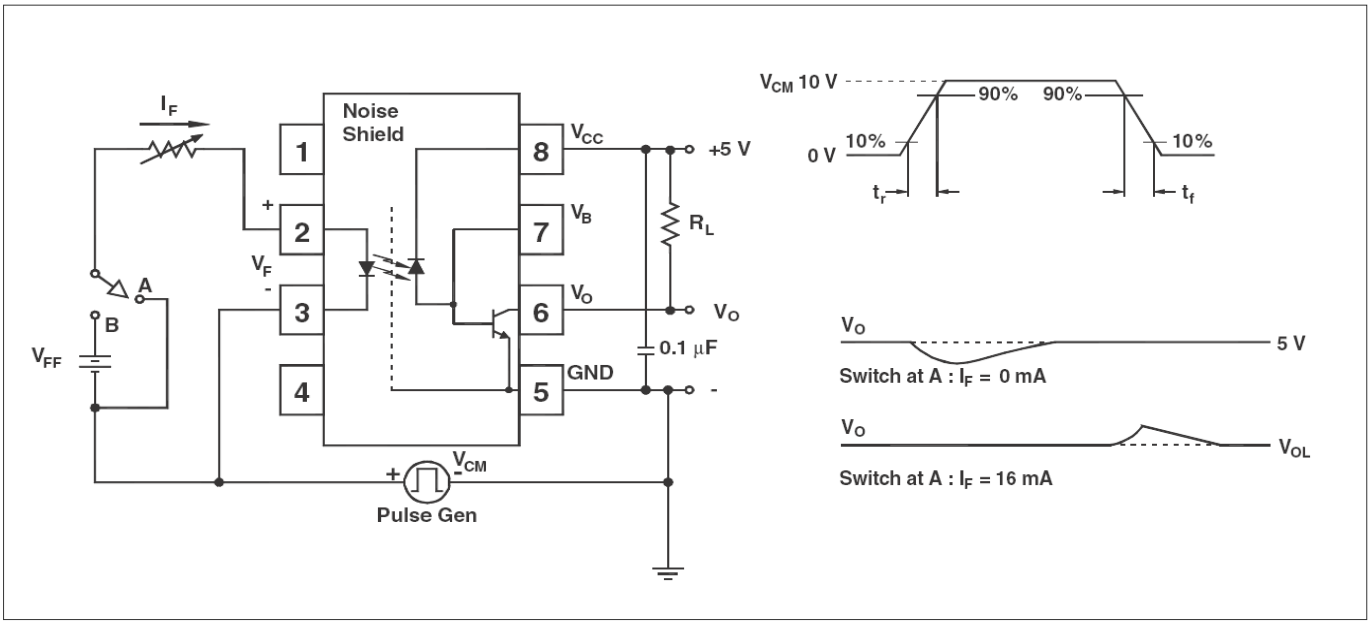


Figure 2: *Single Channel Test Circuit for Common Mode Transient Immunity*

SDN136 Performance & Characteristics Plots, T_A = 25°C, V_{CC}=5V (unless otherwise specified)

Figure 3: *Output Current (I_O) vs. Output Voltage (V_O)*

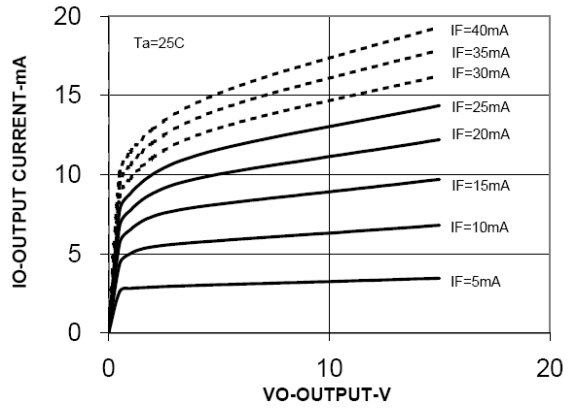


Figure 4: *Input Current (I_F) vs. Forward Voltage (V_F)*

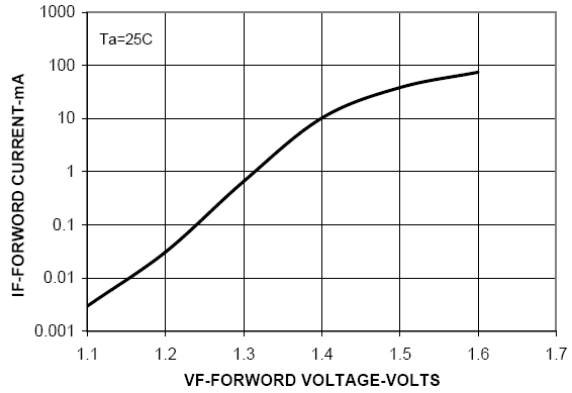


Figure 5: *Logic High Output Current (I_{OH}) vs. Temperature (°C)*

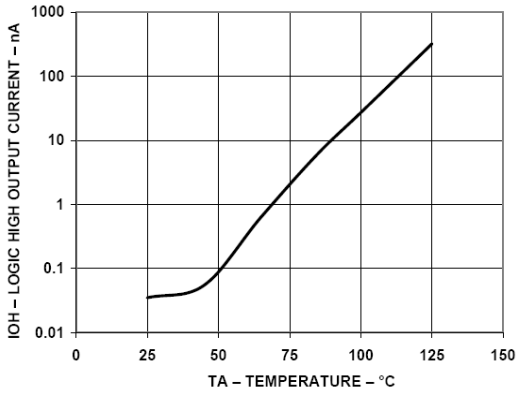


Figure 6: *Current Transfer Ratio (CTR) vs. Input Current (I_F)*

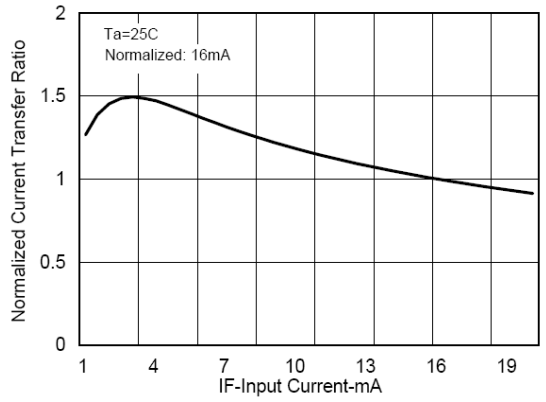


Figure 7: *Current Transfer Ratio (CTR) vs. Temperature (°C)*

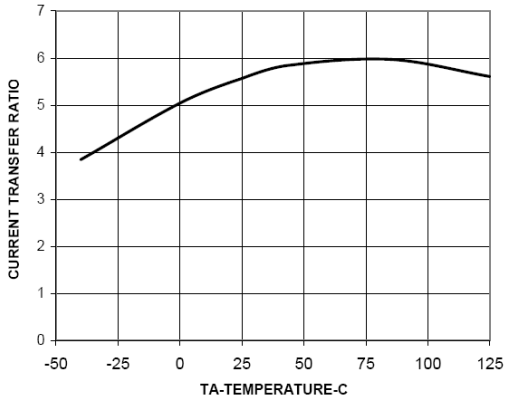
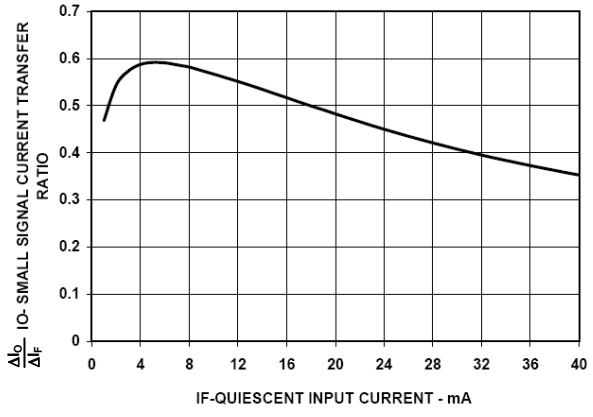


Figure 8: *Small Signal Current Transfer Ratio ($\frac{\Delta I_O}{\Delta I_F}$) vs. Quiescent Input Current (I_F) [R_L = 100Ω)*



SDN136 Performance & Characteristics Plots, T_A = 25°C, V_{CC}=5V (unless otherwise specified)

Figure 9: *Propagation Delay Time (t_p) vs. Temperature (°C)*

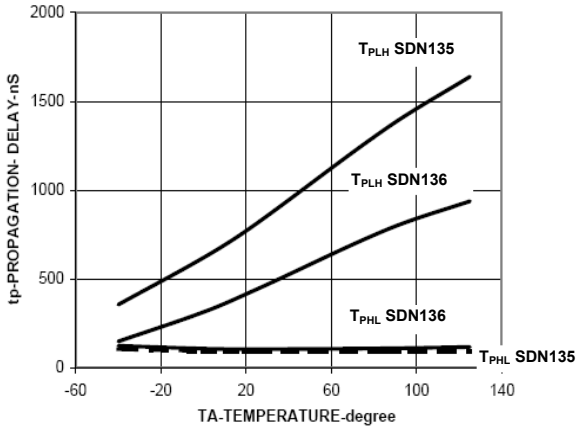
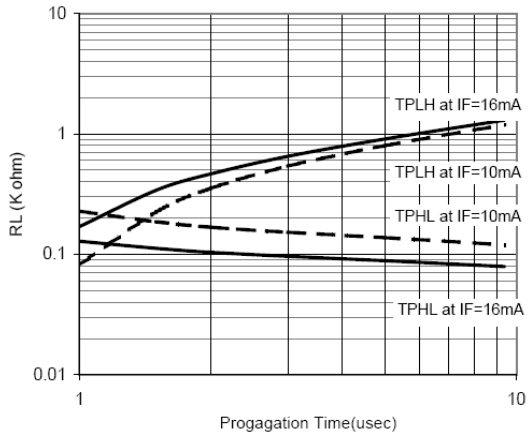


Figure 10: *Load Resistance (R_L) vs. Propagation Delay Time (t_p)*



SDN136 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:

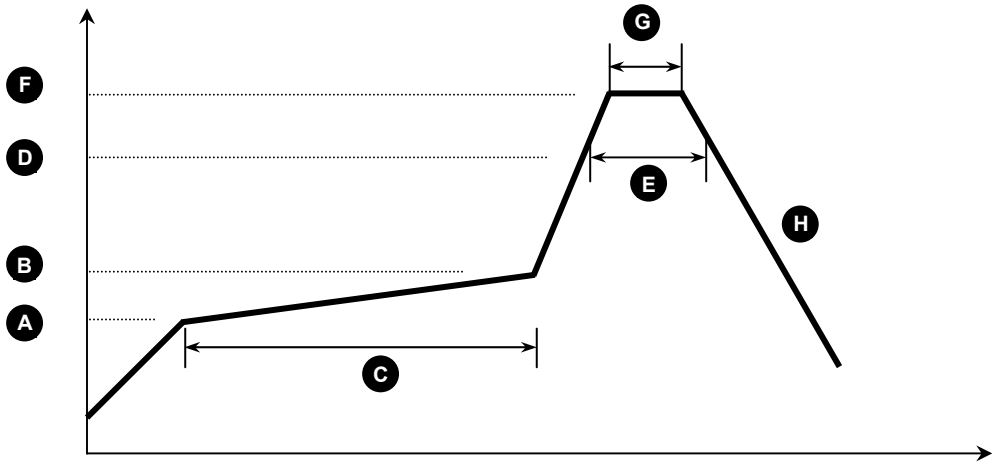


Figure 11

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

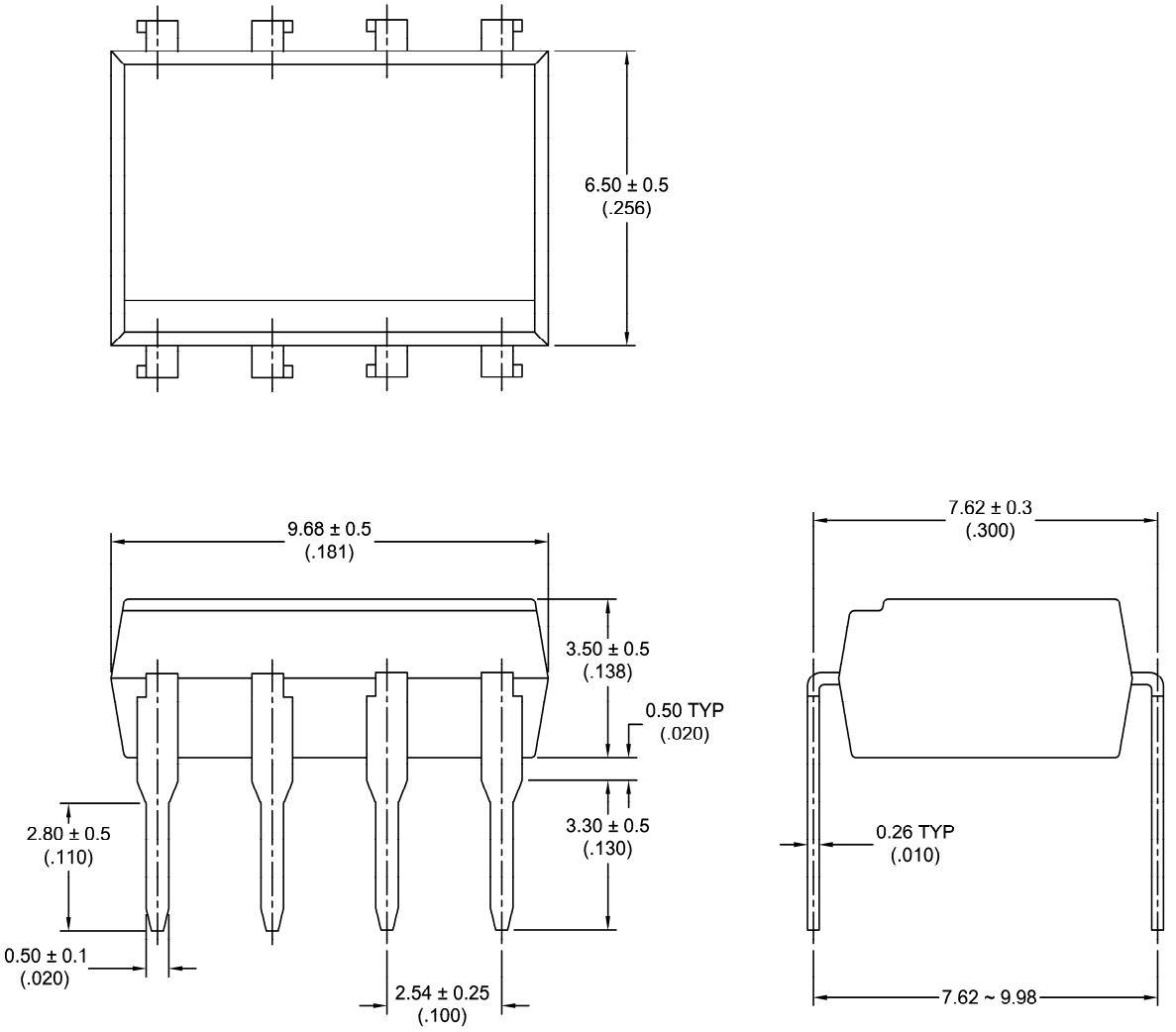
(3) *Hand Solder:*

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

SDN136 Package Dimensions

8 PIN DIP Package

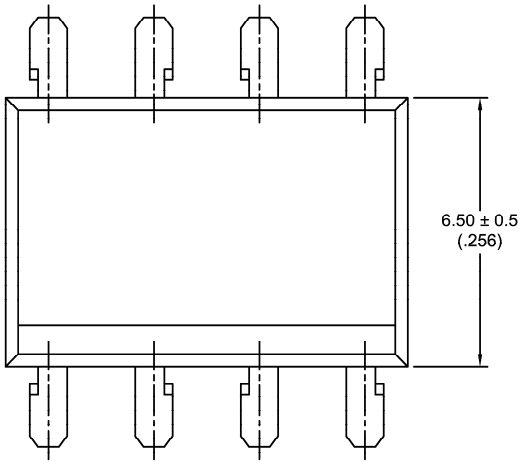
Note: *All dimensions in millimeters [mm] with inches in parenthesis ()*

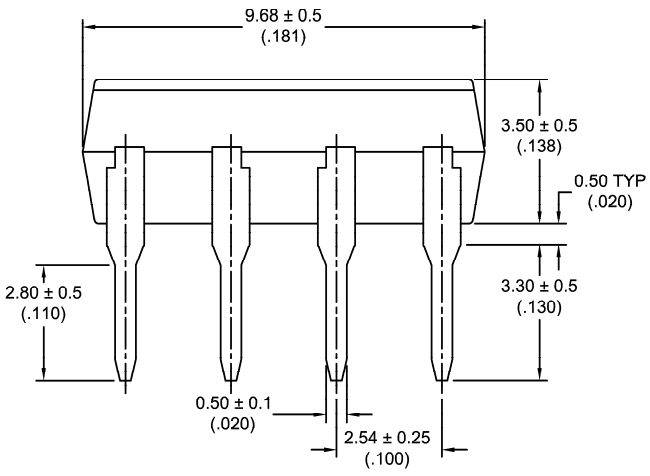


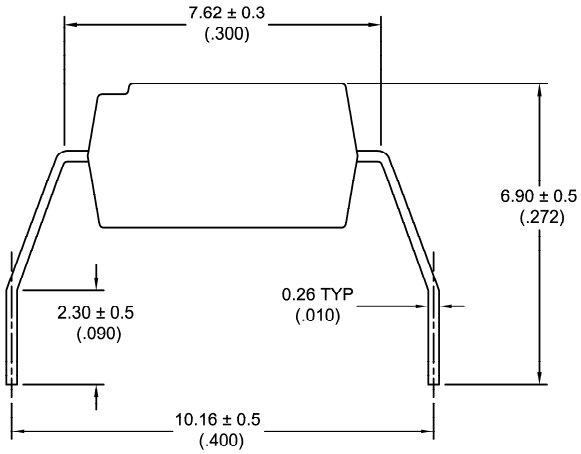
SDN136 Package Dimensions

8 PIN WIDE Lead Space Package (-H)

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



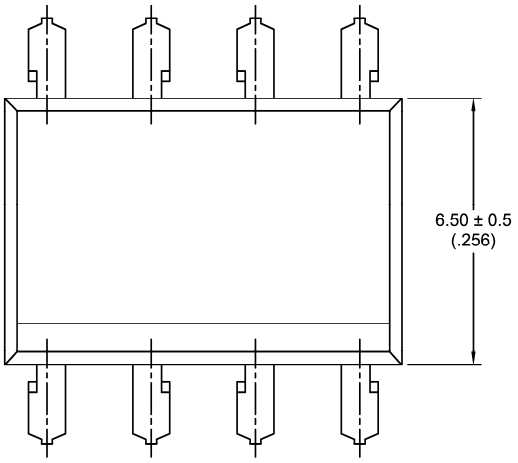


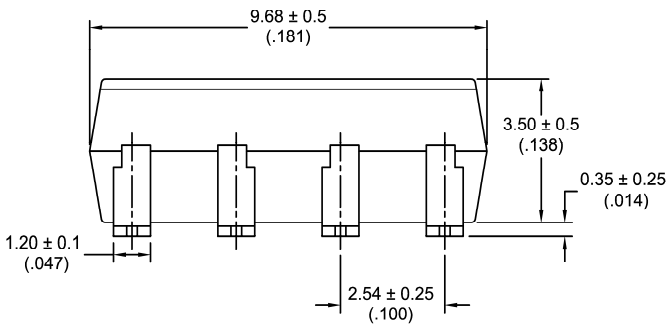


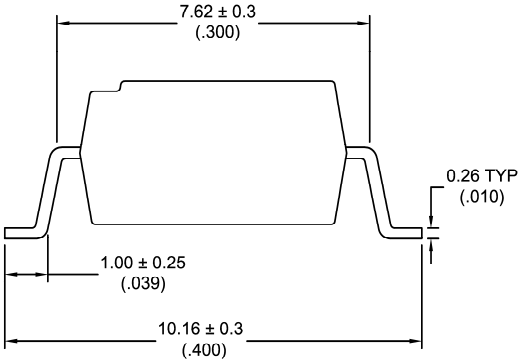
SDN136 Package Dimensions

8 PIN SMD Surface Mount Package (-S)

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



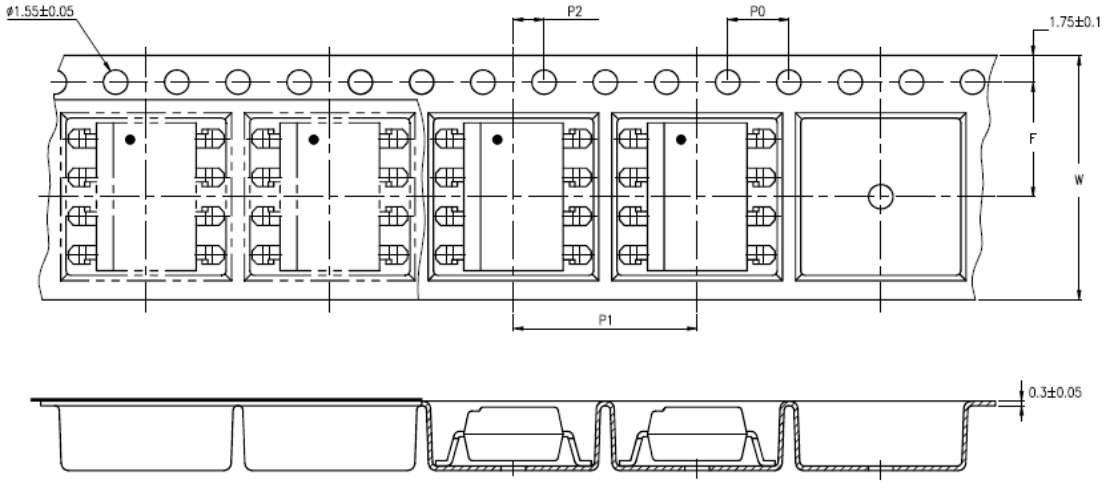




SDN136 Packaging Specifications

Tape & Reel Specifications (T&R)

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



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 P2	7.5 ± 0.1 (0.295) 2 ± 0.1 (0.079)
Compartment Pitch	P1	12 ± 0.1 (0.472)

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