



Description

The SDN135 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.

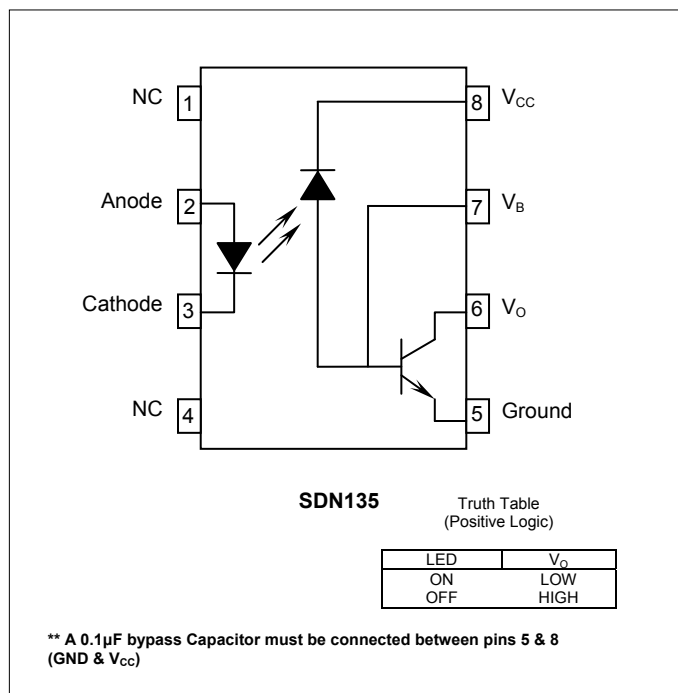
Separate access to the photodiode and transistor allow users to reduce base-collector capacitance, enabling much higher switching speeds. Signals with frequencies of up to 2.0MHz can be switched, giving the SDN135 a much broader application range than traditional optocouplers.

The SDN135 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



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 Current40mA
Transient Input Current400mA
Reverse Input Control Voltage5V
Input Power Dissipation40mW
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 Dissipation100mW

Ordering Information

Part Number	Description
SDN135	8 pin DIP, (50/Tube)
SDN135-H	0.40" (10.16mm) Lead Spacing (VDE0884)
SDN135-S	8 pin SMD, (50/Tube)
SDN135-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, $T_A = 25^\circ\text{C}$ (unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Input Specifications						
LED Forward Voltage	V_F	-	1.4	1.7	V	$I_F = 16\text{mA}$
LED Reverse Voltage	BV_R	5	-	-	V	$I_R = 10\mu\text{A}$
Detector Specifications						
Current Transfer Ratio ¹	CTR	7	18	50	%	$I_F=16\text{mA}$, $V_{CC}=4.5\text{V}$, $V_O=0.4\text{V}$
Logic Low Output Voltage	V_{OL}	-	0.18	0.4	V	$I_F=0\text{mA}$, $V_O=V_{CC}=4.5\text{V}$, $I_O=3\text{mA}$
Logic High Output Current	I_{OH}	-	-	0.5	μA	$I_F=0\text{mA}$, $V_O=V_{CC}=5.5\text{V}$
Logic Low Supply Current ²	I_{CCL}	-	400	-	μA	$I_F=16\text{mA}$, $V_O=\text{OPEN}$ ($V_{CC}=15\text{V}$)
Logic High Supply Current ²	I_{CCH}	-	-	1	μA	$I_F=0\text{mA}$, $V_O=\text{OPEN}$ ($V_{CC}=15\text{V}$)
Offset Voltage						
Switching Specifications, $T_A = 0\sim 70^\circ\text{C}$, $V_{CC} = 5\text{V}$ (unless otherwise specified)						
Propagation Delay Time to Low Output Level ³	t_{PHL}	-	0.09	1.5	μS	$T_A=25^\circ\text{C}$ ($R_L=4.1\text{K}\Omega$, $I_F=16\text{mA}$)
Propagation Delay Time to High Output Level ³	t_{PLH}	-	0.8	1.5	μS	$T_A=25^\circ\text{C}$ ($R_L=4.1\text{K}\Omega$, $I_F=16\text{mA}$)
Logic High Common Mode Transient Immunity ³	$ CM_H $	1	-	-	KV/ μS	$I_F=0\text{mA}$, $V_{CM}=10\text{V}_{P-P}$, $R_L=4.1\text{K}\Omega$
Logic High Common Mode Transient Immunity ³	$ CM_L $	1	-	-	KV/ μS	$I_F=16\text{mA}$, $V_{CM}=10\text{V}_{P-P}$, $R_L=4.1\text{K}\Omega$
Coupled Capacitance					μS	
Contact Transient Ratio					μS	
Isolation Specifications						
Input-Output Insulation Leakage Current	I_{I-O}	-	-	1.0	μA	45% RH, $t=5\text{s}$, $V_{I-O}=3\text{kV}$
Withstand Insulation Test Voltage	V_{ISO}	5000	-	-	V_{RMS}	RH $\leq 50\%$, $t=1\text{min}$
Input-Output Resistance	R_{I-O}	-	10^{12}	-	Ω	$V_{I-O} = 500\text{V}_{DC}$

Notes

- 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
- A 0.1 μF or bigger bypass capacitor for V_{CC} is needed as shown in Figure 1 on following page
- The 4.1K Ω load represents 1LSTTL unit load of 0.36mA and the 6.1K Ω pull-up resistor.

SDN135 Electrical Test Circuits

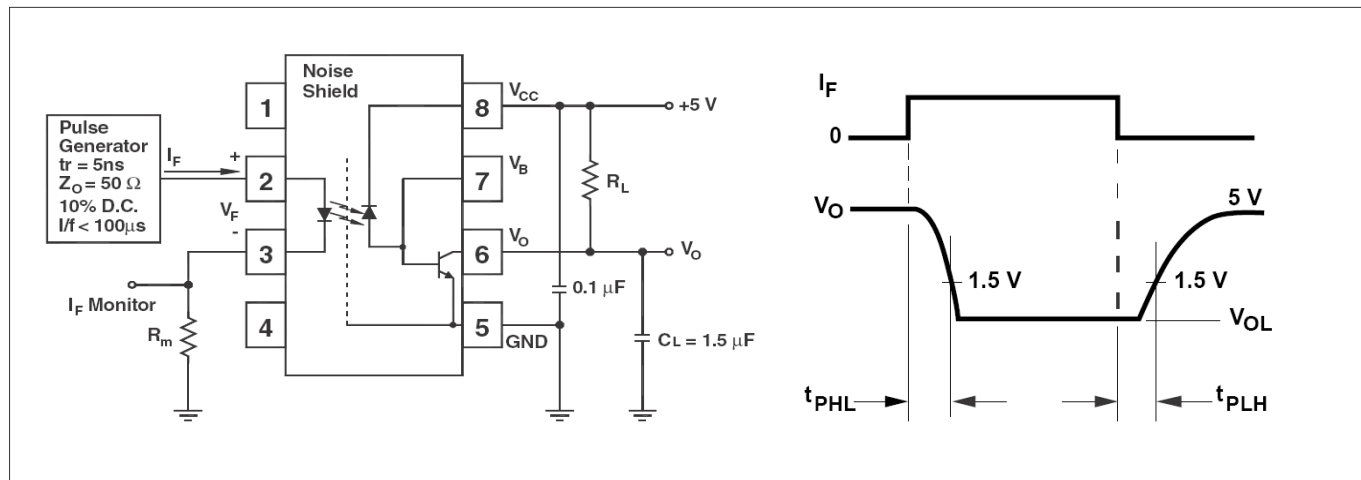


Figure 1: *Single Channel Test Circuit for t_{PHL} and t_{PLH}*

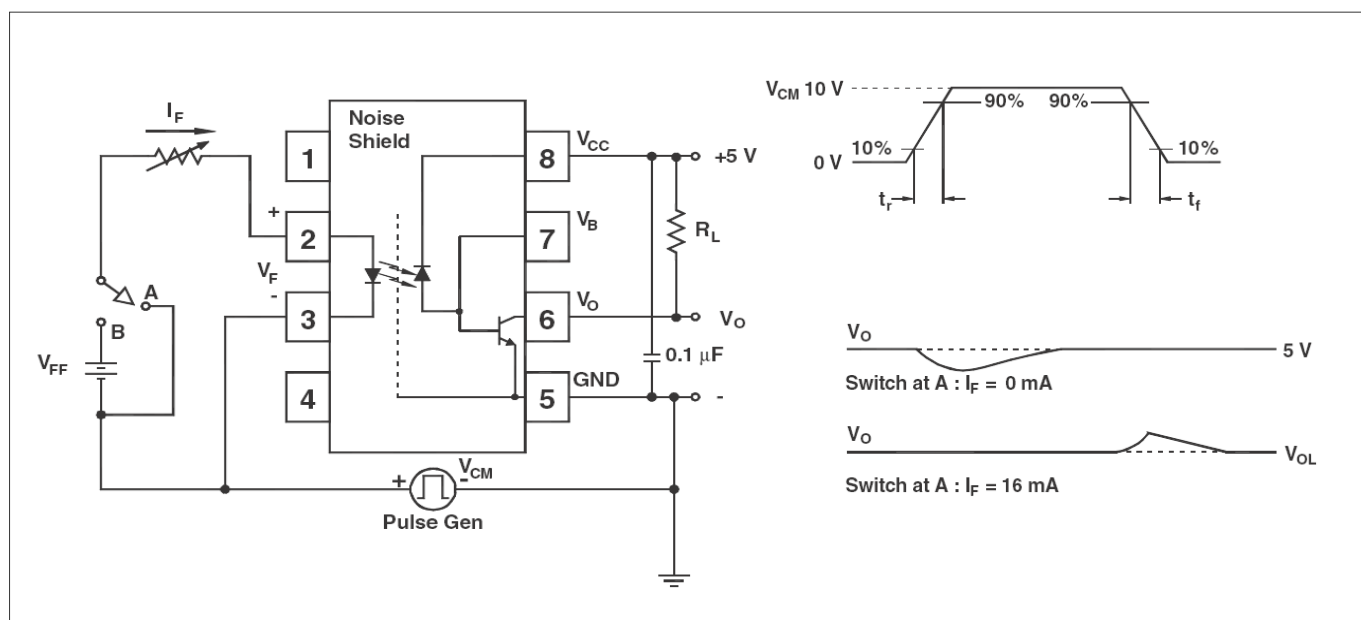
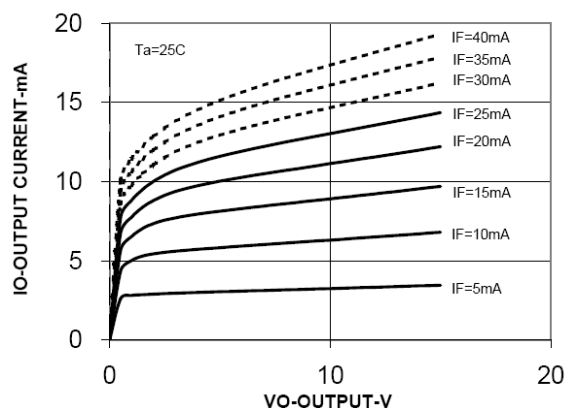
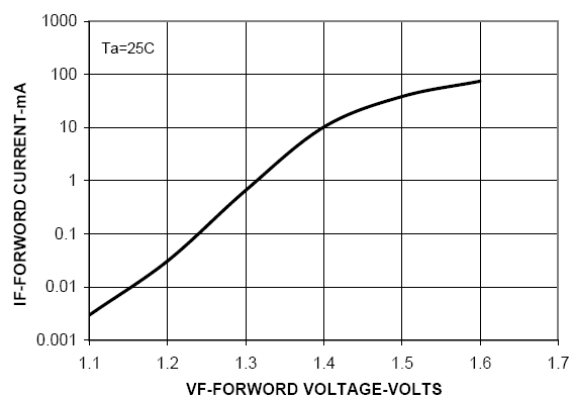
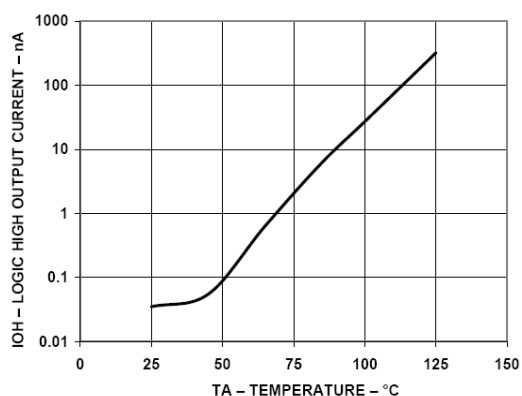
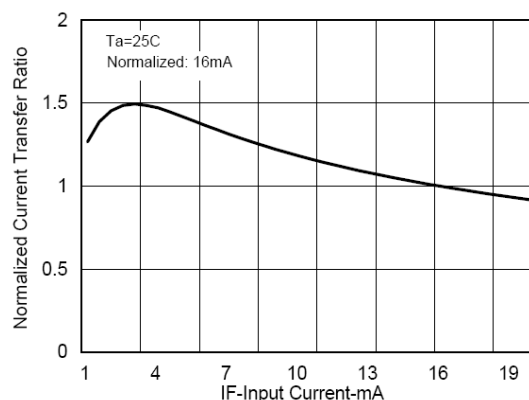
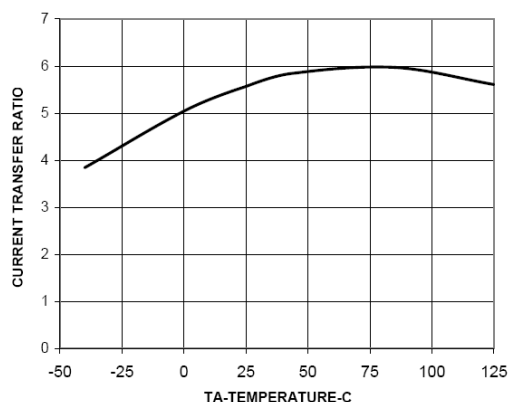
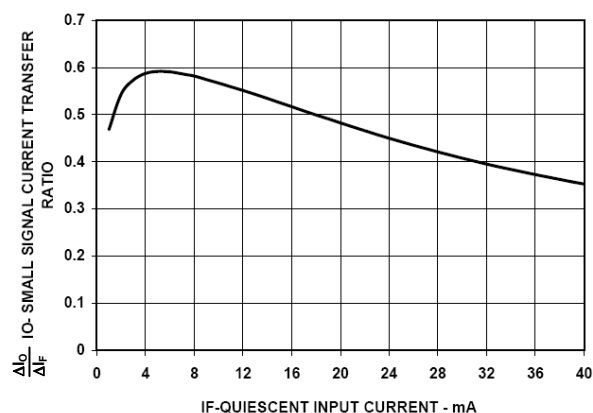
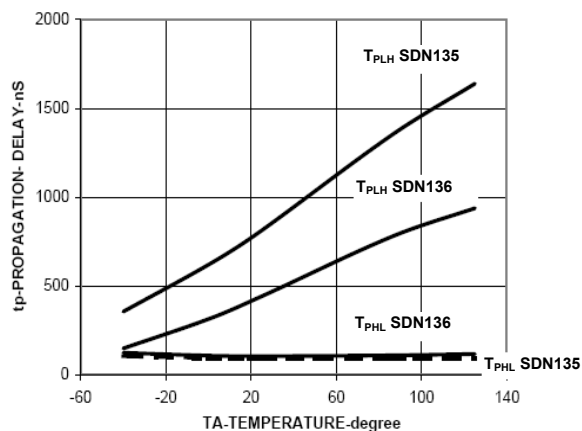
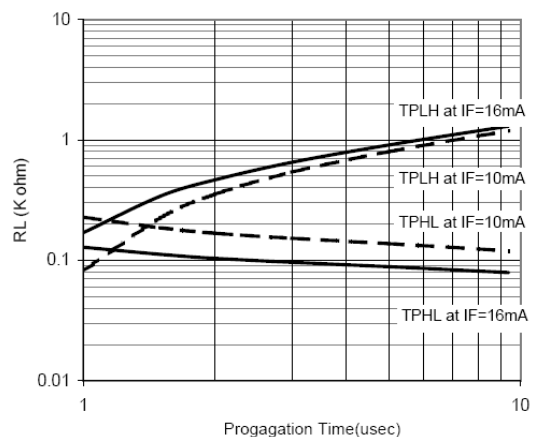


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

SDN135 Performance & Characteristics Plots, $T_A = 25^\circ\text{C}$, $V_{CC}=5\text{V}$ (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 ($^\circ\text{C}$)

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

Figure 7: Current Transfer Ratio (CTR) vs. Temperature ($^\circ\text{C}$)

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


SDN135 Performance & Characteristics Plots, $T_A = 25^\circ\text{C}$, $V_{CC}=5\text{V}$ (unless otherwise specified)
Figure 9: Propagation Delay Time (t_p) vs. Temperature ($^\circ\text{C}$)

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


SDN135 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 250°C:

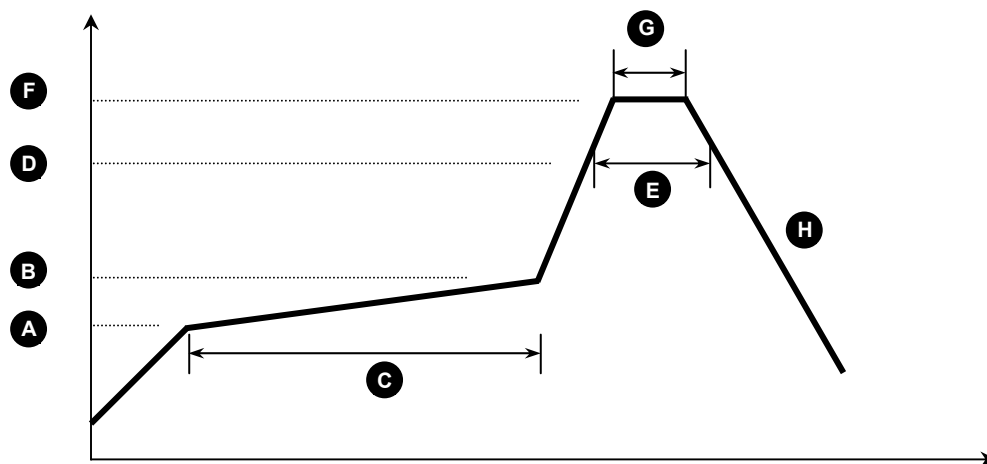


Figure 11

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

(2) Wave Solder:

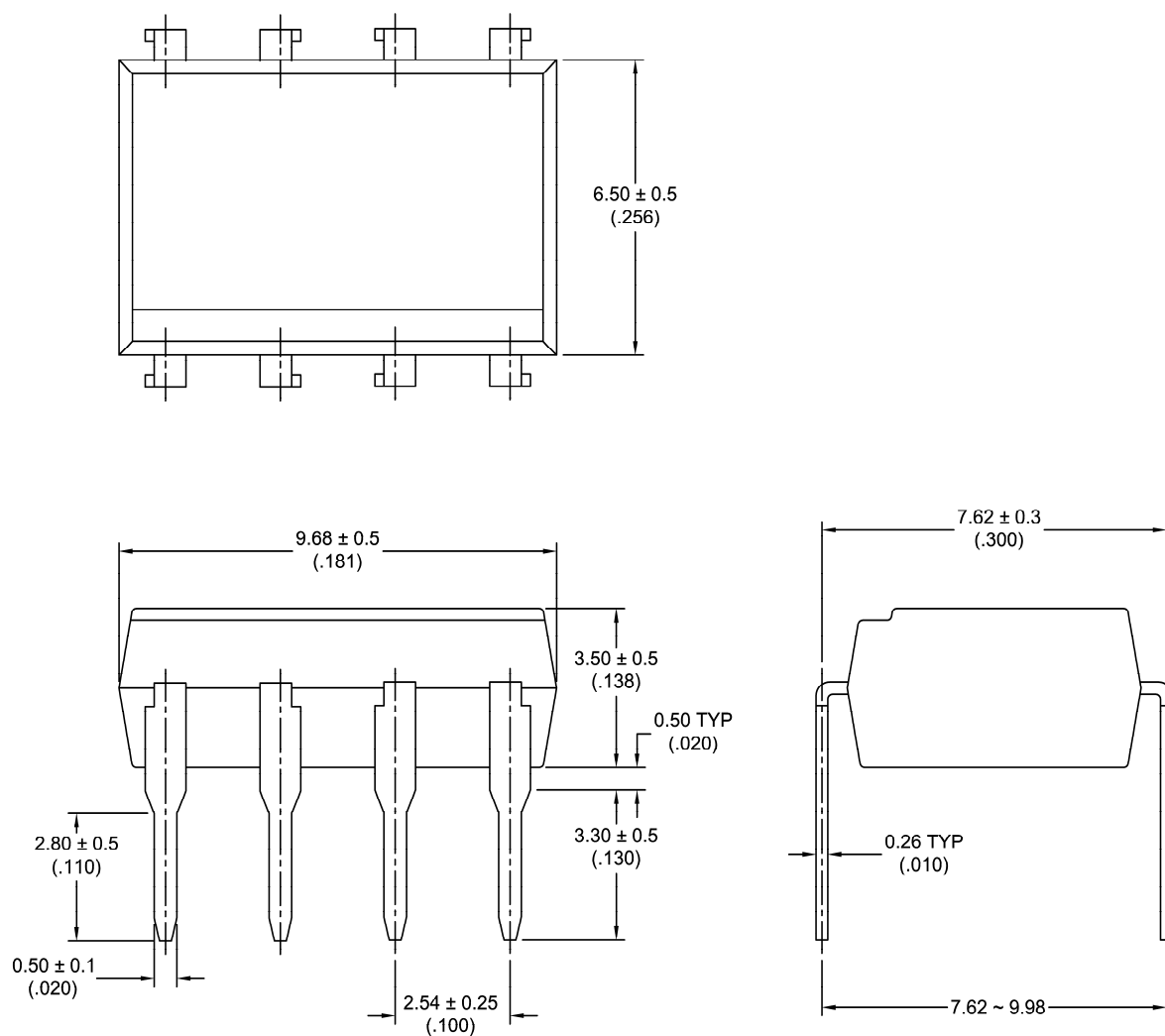
Maximum Temperature: 260°C (at terminal)
Maximum Time: 10s
Pre-heating: 100 - 150°C (30 - 90s)
Single Occurrence

(3) Hand Solder:

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

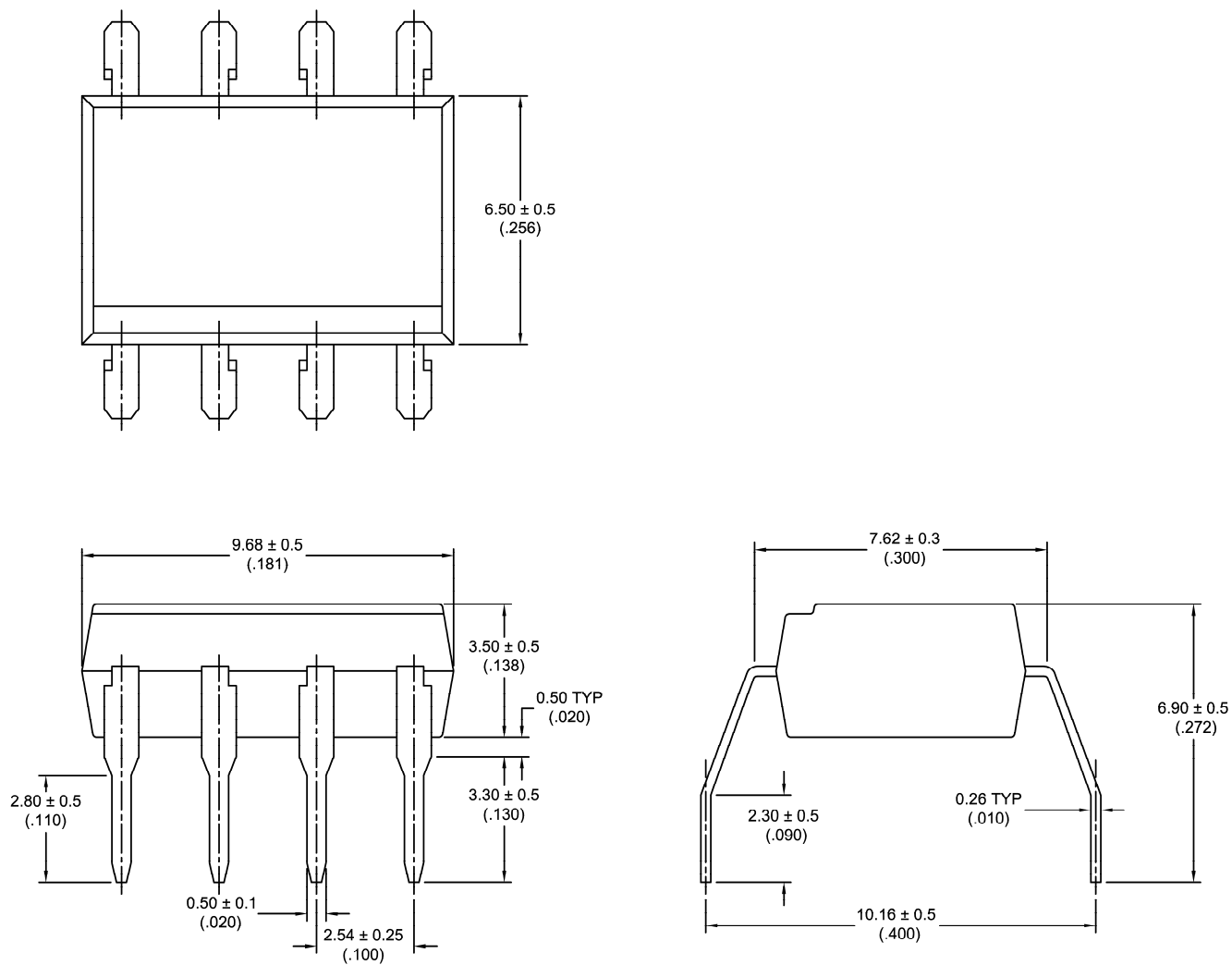
SDN135 Package Dimensions

8 PIN DIP Package

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


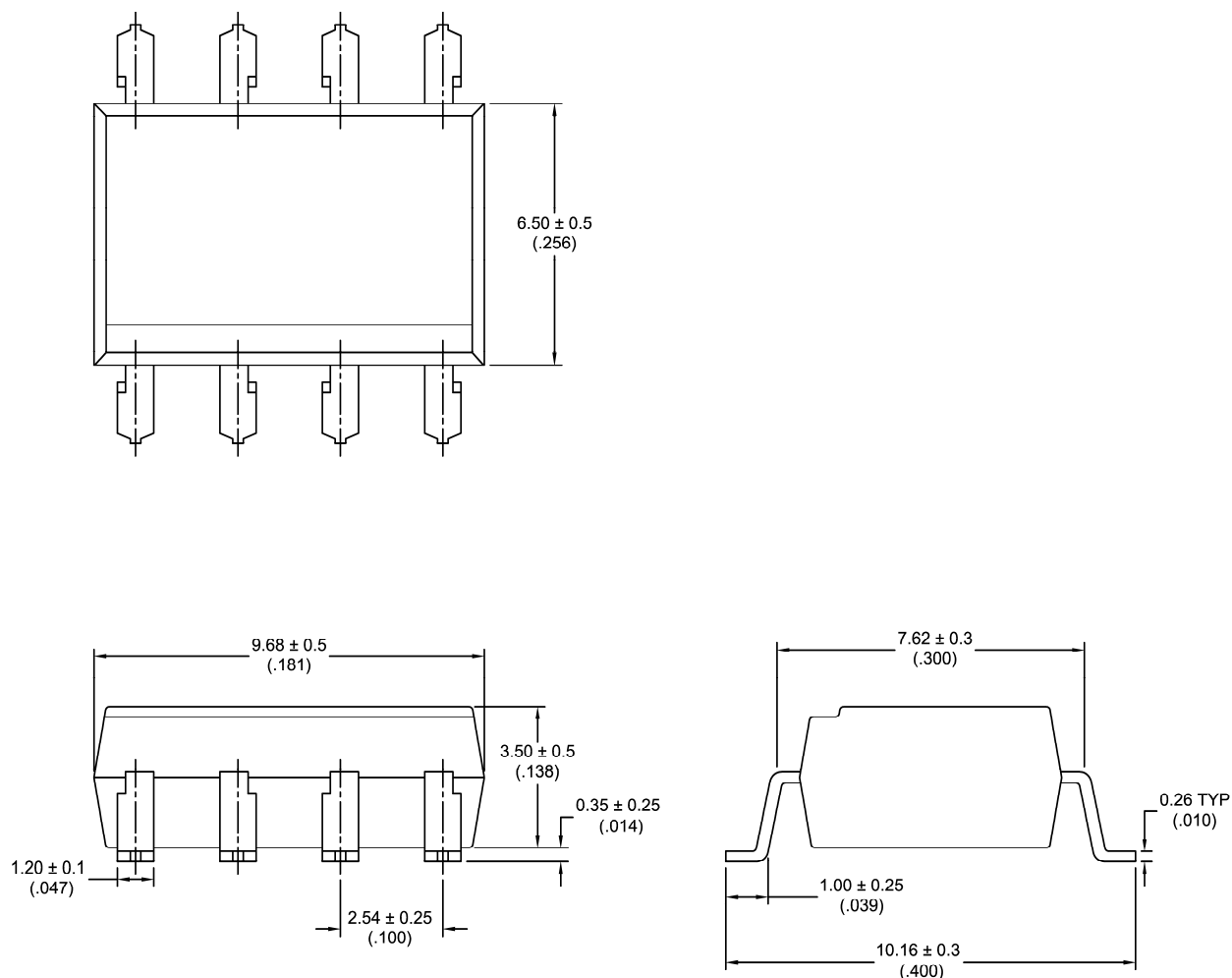
SDN135 Package Dimensions

8 PIN WIDE Lead Space Package (-H)

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


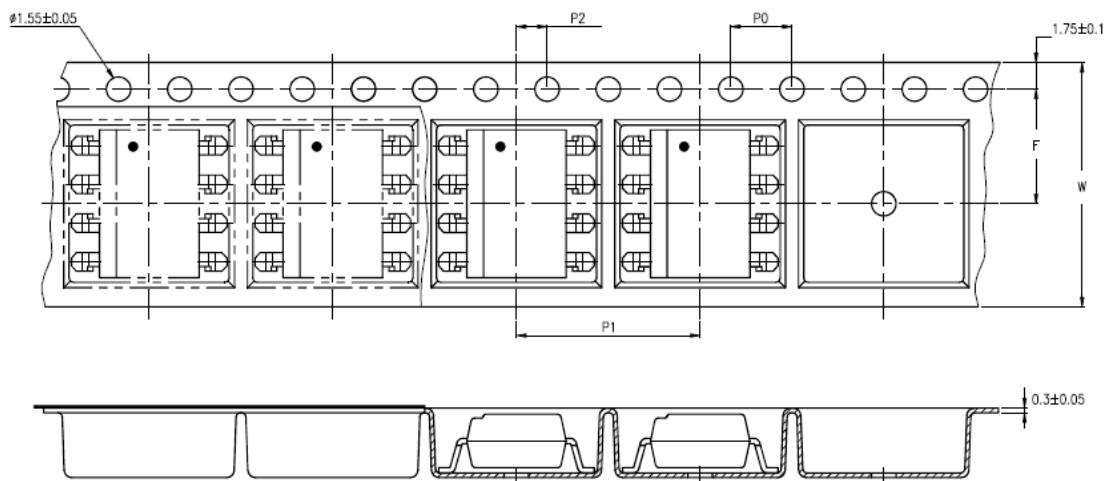
SDN135 Package Dimensions

8 PIN SMD Surface Mount Package (-S)

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


SDN135 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)

DISCLAIMER

Solid State Optronics (SSO) makes no warranties or representations with regards to the completeness and accuracy of this document. SSO reserves the right to make changes to product description, specifications at any time without further notices.

SSO shall not assume any liability arising out of the application or use of any product or circuit described herein. Neither circuit patent licenses nor indemnity are expressed or implied.

Except as specified in SSO's Standard Terms & Conditions, SSO disclaims liability for consequential or other damage, and we make no other warranty, expressed or implied, including merchantability and fitness for particular use.

LIFE SUPPORT POLICY

SSO does not authorize use of its devices in life support applications wherein failure or malfunction of a device may lead to personal injury or death. Users of SSO devices in life support applications assume all risks of such use and agree to indemnify SSO against any and all damages resulting from such use. Life support devices are defined as devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when used properly in accordance with instructions for use can be reasonably expected to result in significant injury to the user, or (d) a critical component of a life support device or system whose failure can be reasonably expected to cause failure of the life support device or system, or to affect its safety or effectiveness.