SOLID STATE OPTRONICS

SDN139

Analog High Speed Optocoupler
100KBd, Photodiode with Darlington Output

Description

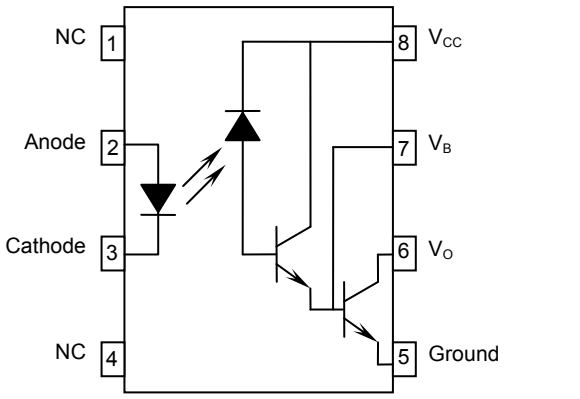
The SDN139 consists of a highly efficient AlGaAs Light Emitting Diode and an integrated high gain photo detector to provide extremely high current transfer ratio between input and output. Separate pins for the photodiode and output stage result in TTL compatible saturation voltage and high speed operation. Where desired the V_{CC} and V_O terminals may be tied together to achieve conventional photo Darlington operation. A base access terminal allows a gain bandwidth adjustment to be made.

The SDN139 comes standard in an 8 pin DIP package.

Applications

- Digital Logic Ground Isolation
- Replace Slower Speed Optocouplers
- Low Input Current Line Receivers
- Ring Detector Circuitry
- Loop Current Receiver
- High Common Mode Noise Line Receiver

Schematic Diagram



SDN139

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
- Low Control Current Requirements (0.5mA)
- High Output Current (60mA)
- High CTR Performance (2000%)
- High Isolation Voltage (5000V_{RMS})
- Instantaneous Common Mode Rejection (10kV/µS)
- 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
Max Input Current (I_F)	40mA
Input Power Dissipation	40mW
Supply Voltage, Output Voltage (V_{CC}, V_O)	-0.5 to 7V
Average Output Current (I_O)	50mA
Emitter-Base Reverse Voltage (V_{ER})	0.5V
Output Power Dissipation	100mW

Ordering Information

Part Number	Description
SDN139	8 pin DIP, (50/Tube)
SDN139-H	0.40" (10.16mm) Lead Spacing (VDE0884)
SDN139-S	8 pin SMD, (50/Tube)
SDN139-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						
Input Forward Voltage	V_F	-	1.1	1.7	V	I_F = 1.6mA
Input Forward Voltage Temp Coefficient	$\Delta V_F/\Delta T$	-	-1.9	-	mV/°C	I_F = 1.6mA
Input Reverse Voltage	BV_R	5	-	-	V	I_R = 10µA
Input Capacitance	C_{IN}	-	60	-	pF	f=1MHz, V_F=0V
Output Specifications						
Current Transfer Ratio	CTR	400	2000	5000	%	I_F=0.5mA, V_O=0.4V, V_{CC}=4.5V
		500	1600	2600	%	I_F=1.6mA, V_O=0.4V, V_{CC}=4.5V
Logic LOW Output Voltage	V_{OL}	-	0.1	0.4	V	I_F=0.5mA, V_{CC}=4.5V, I_O=2mA
		-	0.1	0.4	V	I_F=1.6mA, V_{CC}=4.5V, I_O=8mA
		-	0.1	0.4	V	I_F=5mA, V_{CC}=4.5V, I_O=15mA
		-	0.2	0.4	V	I_F=12mA, V_{CC}=4.5V, I_O=24mA
Logic HIGH Output Current	I_{OH}	-	0.1	100	µA	I_F=0mA, V_{CC}=18V, V_O=18V
Logic LOW Supply Current	I_{CCL}	-	0.4	1.5	mA	I_F=1.6mA, V_O=Open, V_{CC}=18V
Logic HIGH Supply Current	I_{CCH}	-	0.01	10	mA	V_E=0.5V, V_{CC}=5.5V, I_F=0mA
Switching Specifications, V_{CC} = 5V (unless otherwise specified)						
Propagation Delay Time to Low Output Level	t_{PHL}	-	5	25	µS	I_F=0.5mA, R_L=4.7kΩ
		-	0.1	1	µS	I_F=12mA, R_L=270Ω
Propagation Delay Time to High Output Level	t_{PLH}	-	18	60	µS	I_F=0.5mA, R_L=4.7kΩ
		-	2	7	µS	I_F=12mA, R_L=270Ω
Logic HIGH Common Mode Transient Immunity	$\|CM_H\|$	1	10	-	V/µS	I_F=0mA, $\|V_{CM}\|$=10V_{P-P}, R_L=2.2kΩ
Logic LOW Common Mode Transient Immunity	$\|CM_L\|$	1	10	-	V/µS	I_F=1.6mA, $\|V_{CM}\|$=10V_{P-P}, R_L=2.2kΩ
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}
Input-Output Capacitance	C_{I-O}	-	1.0	-	pF	f=1MHz

SDN139 Electrical Test Circuits

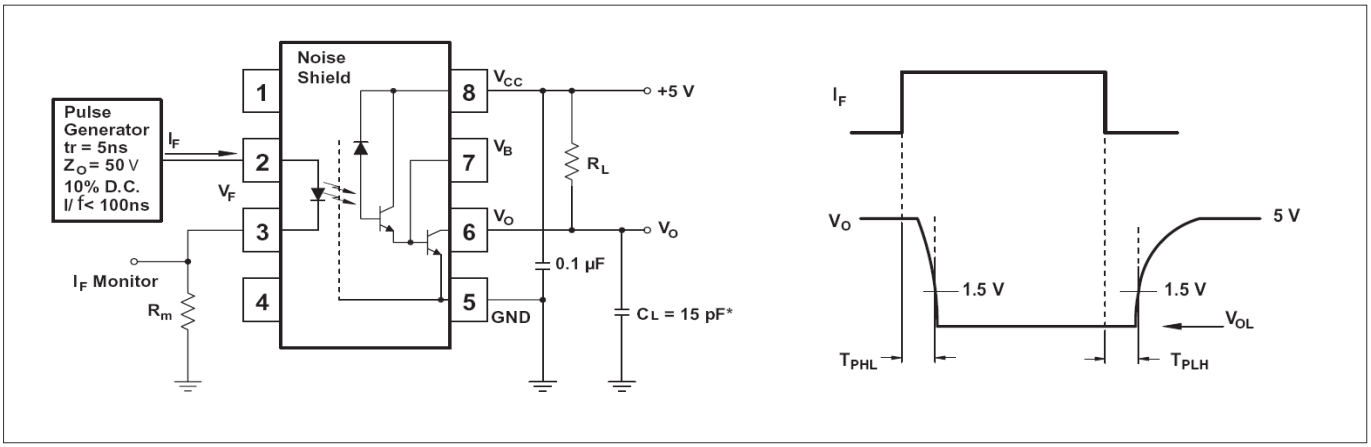


Figure 1: *Single Channel Test Circuit for t_{PHL} and t_{PLH}*

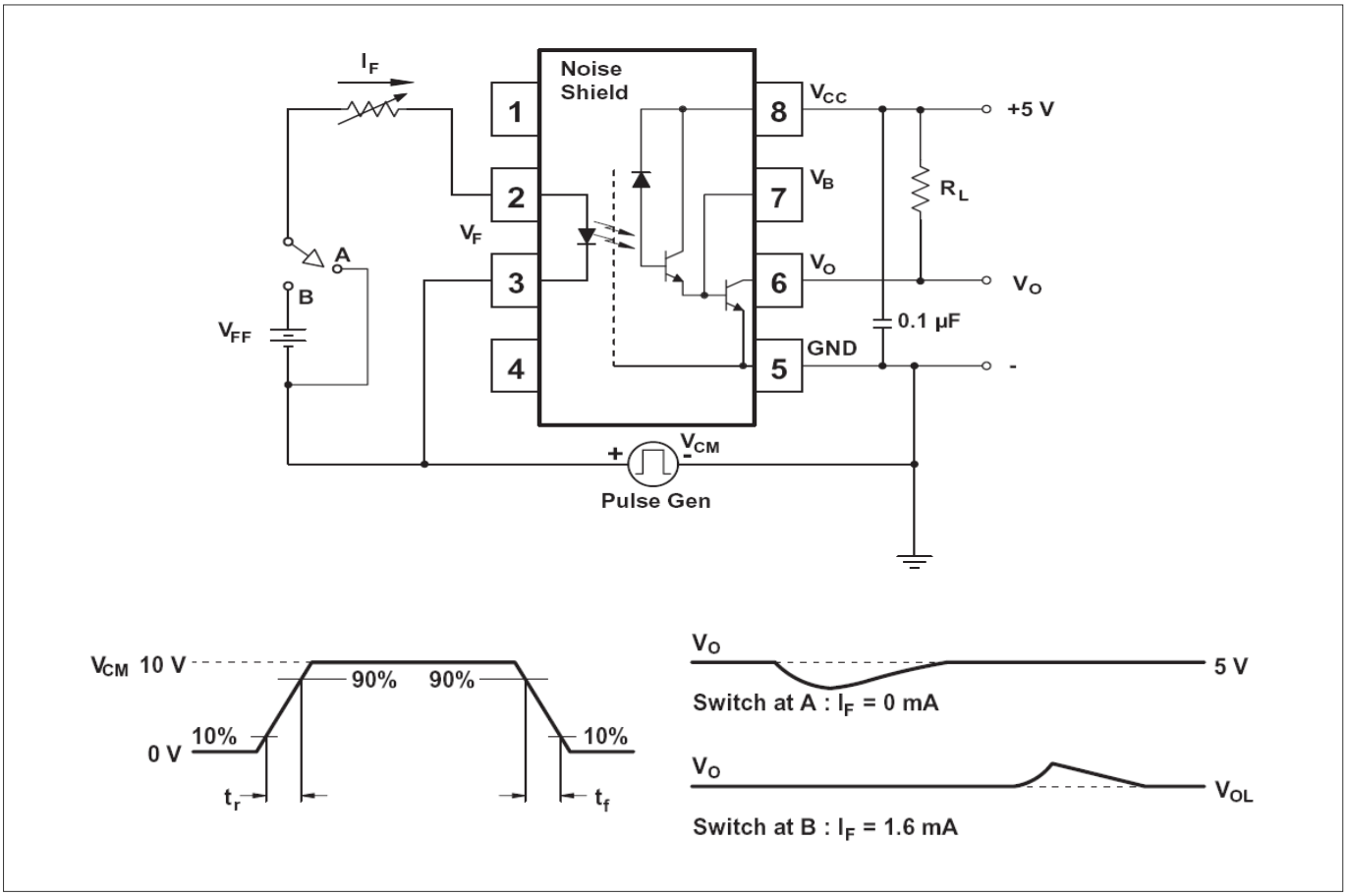


Figure 2: *Single Channel Test Circuit for t_{EHL} and t_{ELH}*

SDN139 Performance & Characteristics Plots, T_A = 25°C (unless otherwise specified)

Figure 3: *DC Transfer Characteristics (I_O vs V_O)*

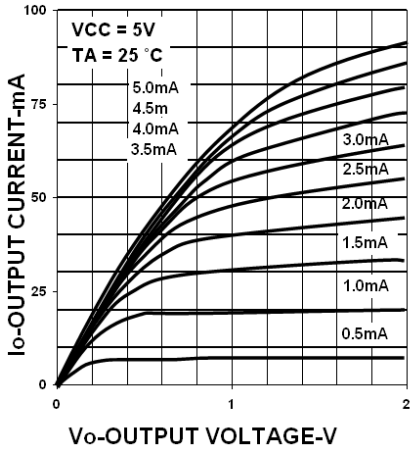


Figure 4: *Current Transfer Ratio vs. Forward Current*

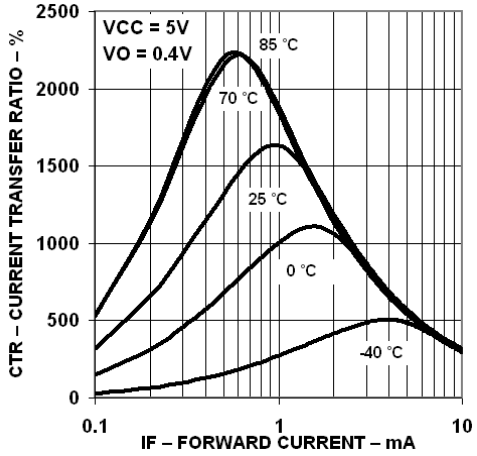


Figure 5: *Output Current vs. Forward Current*

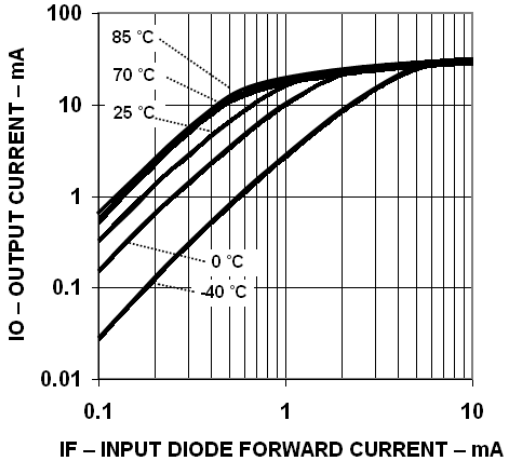


Figure 6: *Forward Current vs. Forward Voltage*

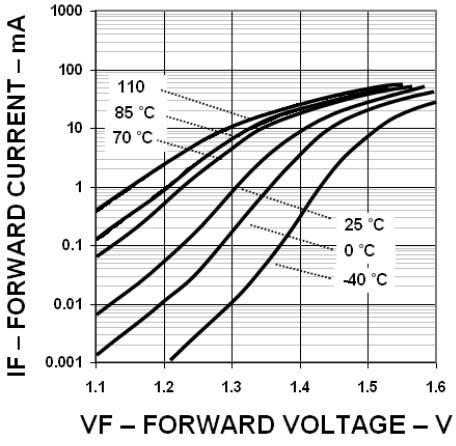


Figure 7: *Propagation Delay vs. Temperature*

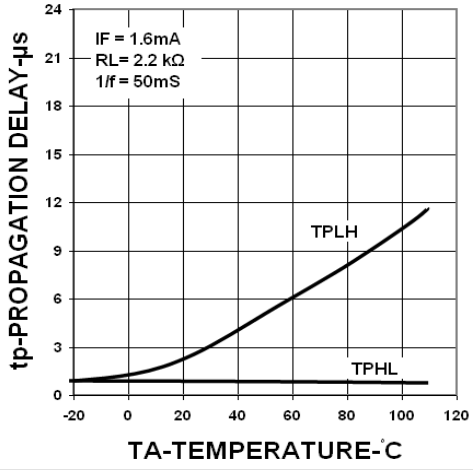
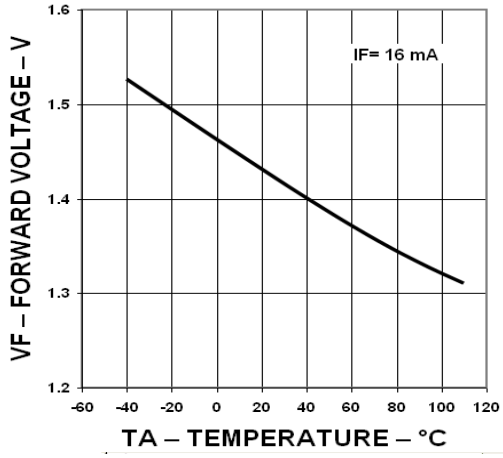


Figure 8: *Forward Voltage vs. Temperature*



SDN139 Performance & Characteristics Plots, T_A = 25°C (unless otherwise specified)

Figure 9: *Non-Saturated Rise & Fall Times vs. Load Resistance*

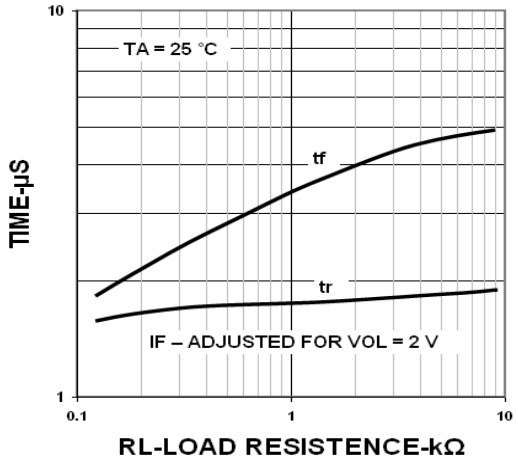
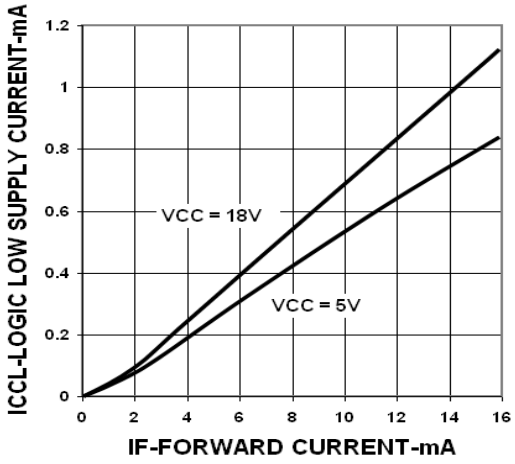


Figure 10: *Logic LOW Supply Current vs. Forward Current*



SDN139 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:

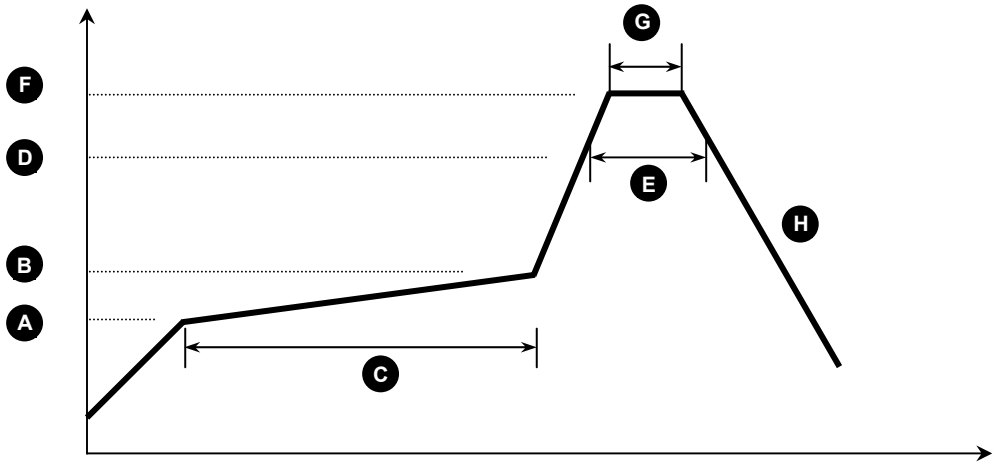


Figure 11

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	

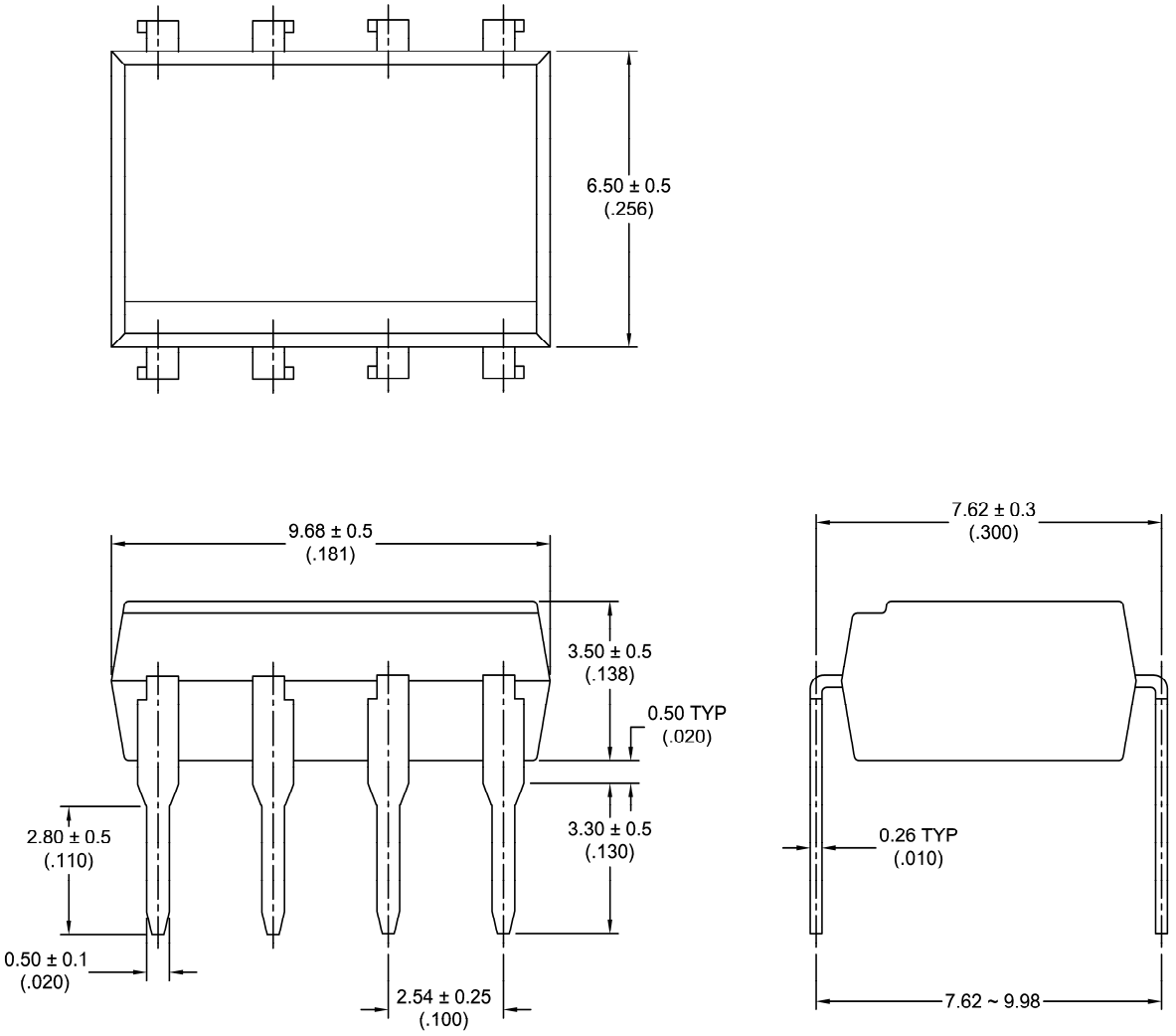
(3) *Hand Solder:*

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

SDN139 Package Dimensions

8 PIN DIP Package

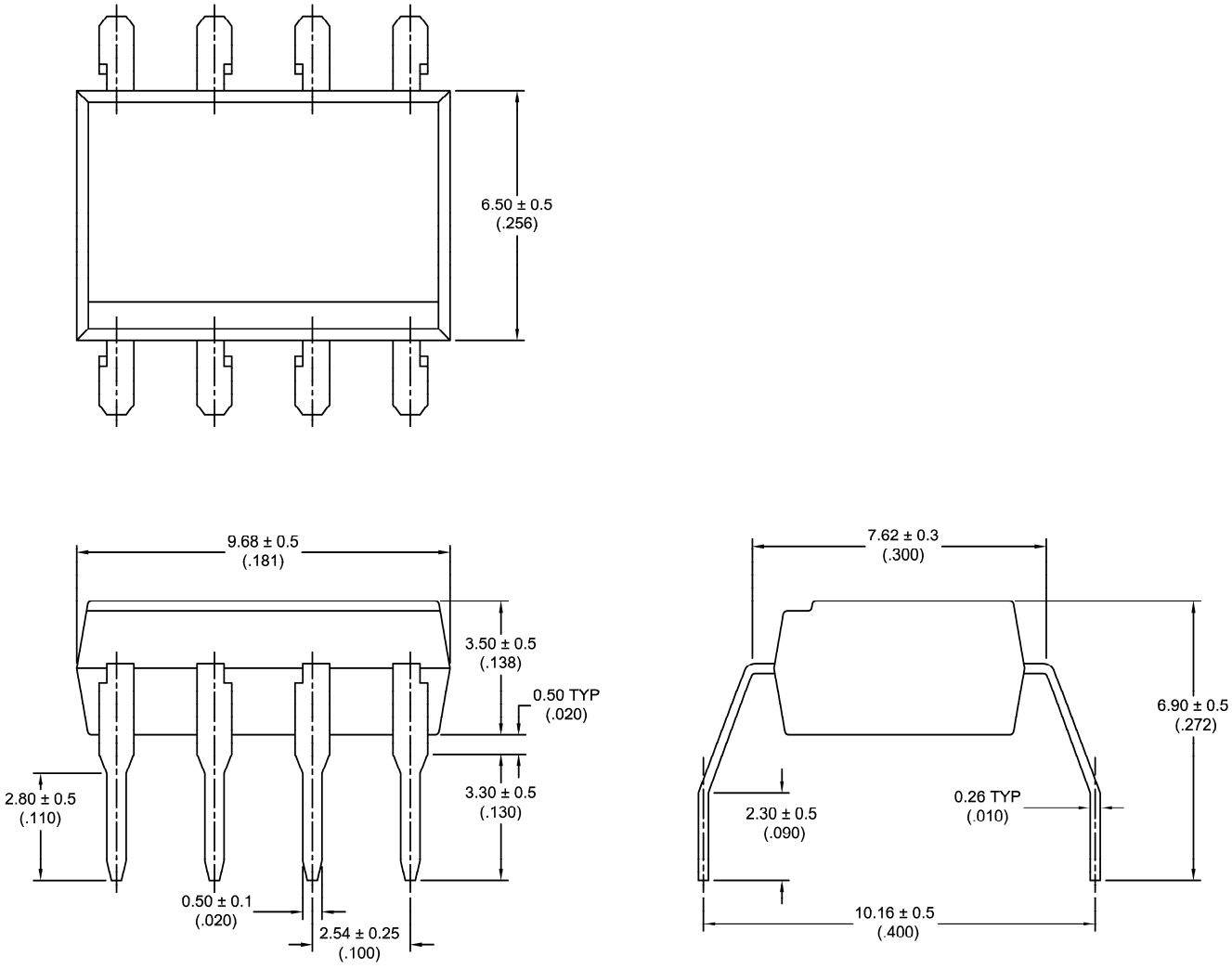
Note: *All dimensions in millimeters [mm] with inches in parenthesis ()*



SDN139 Package Dimensions

8 PIN WIDE Lead Space Package (-H)

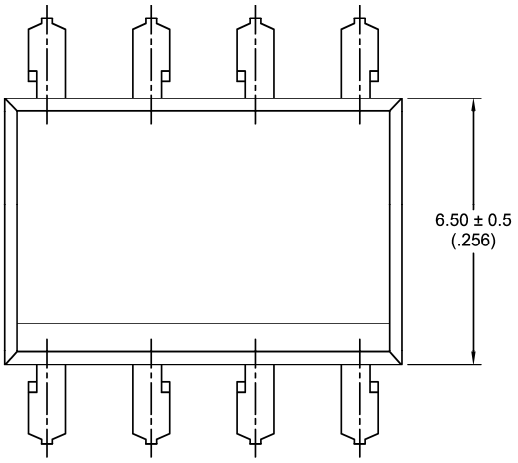
Note: *All dimensions in millimeters [mm] with inches in parenthesis ()*

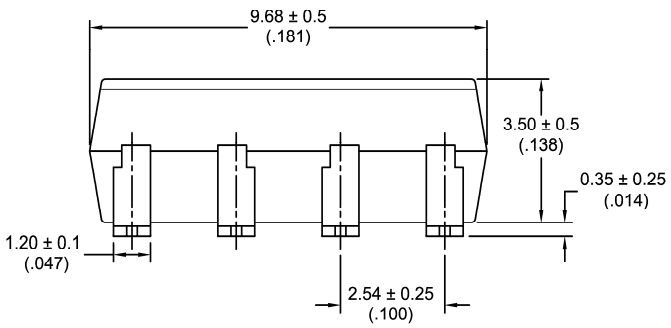


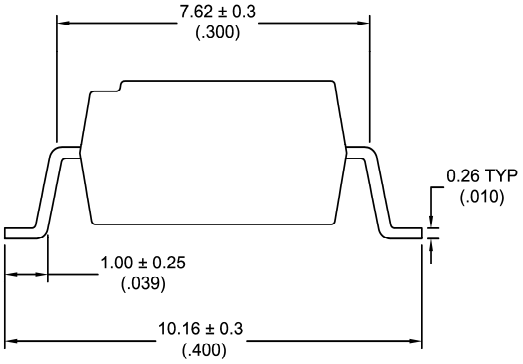
SDN139 Package Dimensions

8 PIN SMD Surface Mount Package (-S)

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



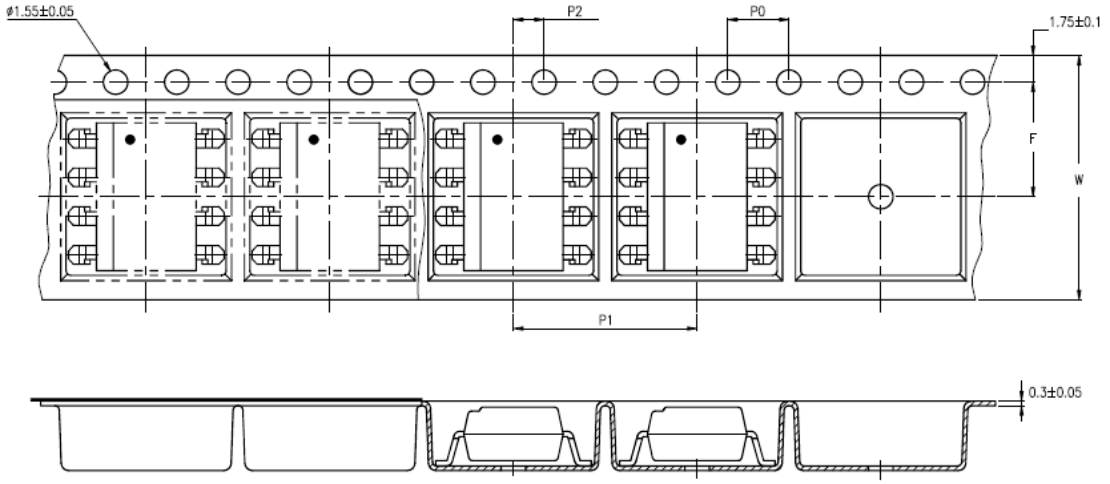




SDN139 Packaging Specifications

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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