



Description

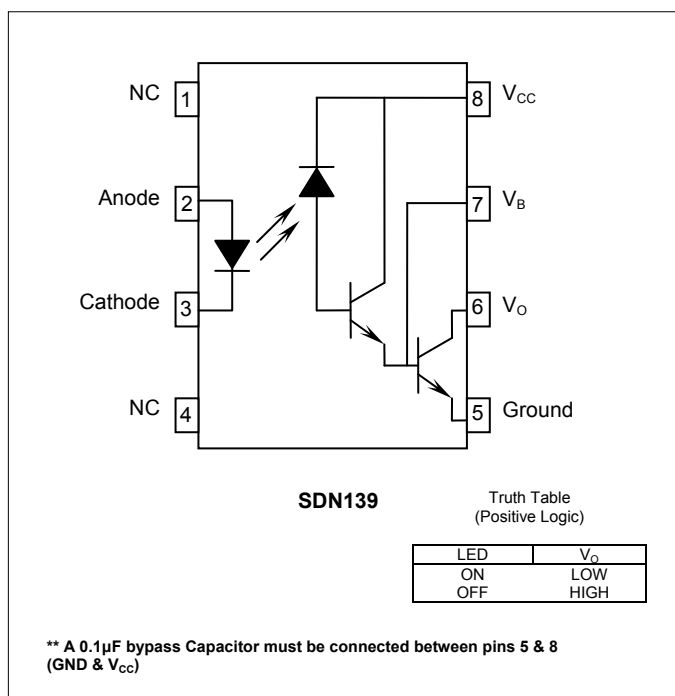
The SDN139 consists of a highly efficient AlGaAs Light Emitting Diode and an integrated high gain photo detector to provide extremely high current transfer ratio between input and output. Separate pins for the photodiode and output stage result in TTL compatible saturation voltage and high speed operation. 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



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, $T_A = 25^\circ\text{C}$ (unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Input Specifications						
Input Forward Voltage	V_F	-	1.1	1.7	V	$I_F = 1.6\text{mA}$
Input Forward Voltage Temp Coefficient	$\Delta V_F/\Delta T$	-	-1.9	-	mV/ $^\circ\text{C}$	$I_F = 1.6\text{mA}$
Input Reverse Voltage	BV_R	5	-	-	V	$I_R = 10\mu\text{A}$
Input Capacitance	C_{IN}	-	60	-	pF	$f=1\text{MHz}, V_F=0\text{V}$
Output Specifications						
Current Transfer Ratio	CTR	400	2000	5000	%	$I_F=0.5\text{mA}, V_O=0.4\text{V}, V_{CC}=4.5\text{V}$
		500	1600	2600	%	$I_F=1.6\text{mA}, V_O=0.4\text{V}, V_{CC}=4.5\text{V}$
Logic LOW Output Voltage	V_{OL}	-	0.1	0.4	V	$I_F=0.5\text{mA}, V_{CC}=4.5\text{V}, I_O=2\text{mA}$
		-	0.1	0.4	V	$I_F=1.6\text{mA}, V_{CC}=4.5\text{V}, I_O=8\text{mA}$
		-	0.1	0.4	V	$I_F=5\text{mA}, V_{CC}=4.5\text{V}, I_O=15\text{mA}$
		-	0.2	0.4	V	$I_F=12\text{mA}, V_{CC}=4.5\text{V}, I_O=24\text{mA}$
Logic HIGH Output Current	I_{OH}	-	0.1	100	μA	$I_F=0\text{mA}, V_{CC}=18\text{V}, V_O=18\text{V}$
Logic LOW Supply Current	I_{CCL}	-	0.4	1.5	mA	$I_F=1.6\text{mA}, V_O=\text{Open}, V_{CC}=18\text{V}$
Logic HIGH Supply Current	I_{CCH}	-	0.01	10	mA	$V_E=0.5\text{V}, V_{CC}=5.5\text{V}, I_F=0\text{mA}$
Switching Specifications, $V_{CC} = 5\text{V}$ (unless otherwise specified)						
Propagation Delay Time to Low Output Level	t_{PHL}	-	5	25	μS	$I_F=0.5\text{mA}, R_L=4.7\text{k}\Omega$
		-	0.1	1	μS	$I_F=12\text{mA}, R_L=270\Omega$
Propagation Delay Time to High Output Level	t_{PLH}	-	18	60	μS	$I_F=0.5\text{mA}, R_L=4.7\text{k}\Omega$
		-	2	7	μS	$I_F=12\text{mA}, R_L=270\Omega$
Logic HIGH Common Mode Transient Immunity	$ CM_H $	1	10	-	V/ μS	$I_F=0\text{mA}, V_{CM} =10\text{V}_{P-P}, R_L=2.2\text{k}\Omega$
Logic LOW Common Mode Transient Immunity	$ CM_L $	1	10	-	V/ μS	$I_F=1.6\text{mA}, V_{CM} =10\text{V}_{P-P}, R_L=2.2\text{k}\Omega$
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	$V_{I-O} = 500\text{V}_{DC}$
Input-Output Capacitance	C_{I-O}	-	1.0	-	pF	$f=1\text{MHz}$

SDN139 Electrical Test Circuits

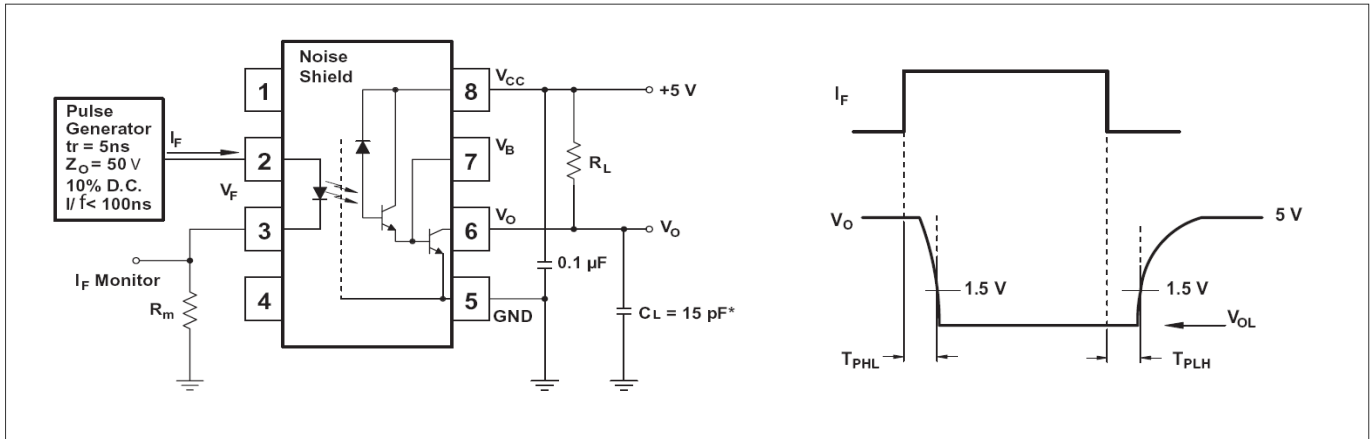


Figure 1: Single Channel Test Circuit for t_{PHL} and t_{PLH}

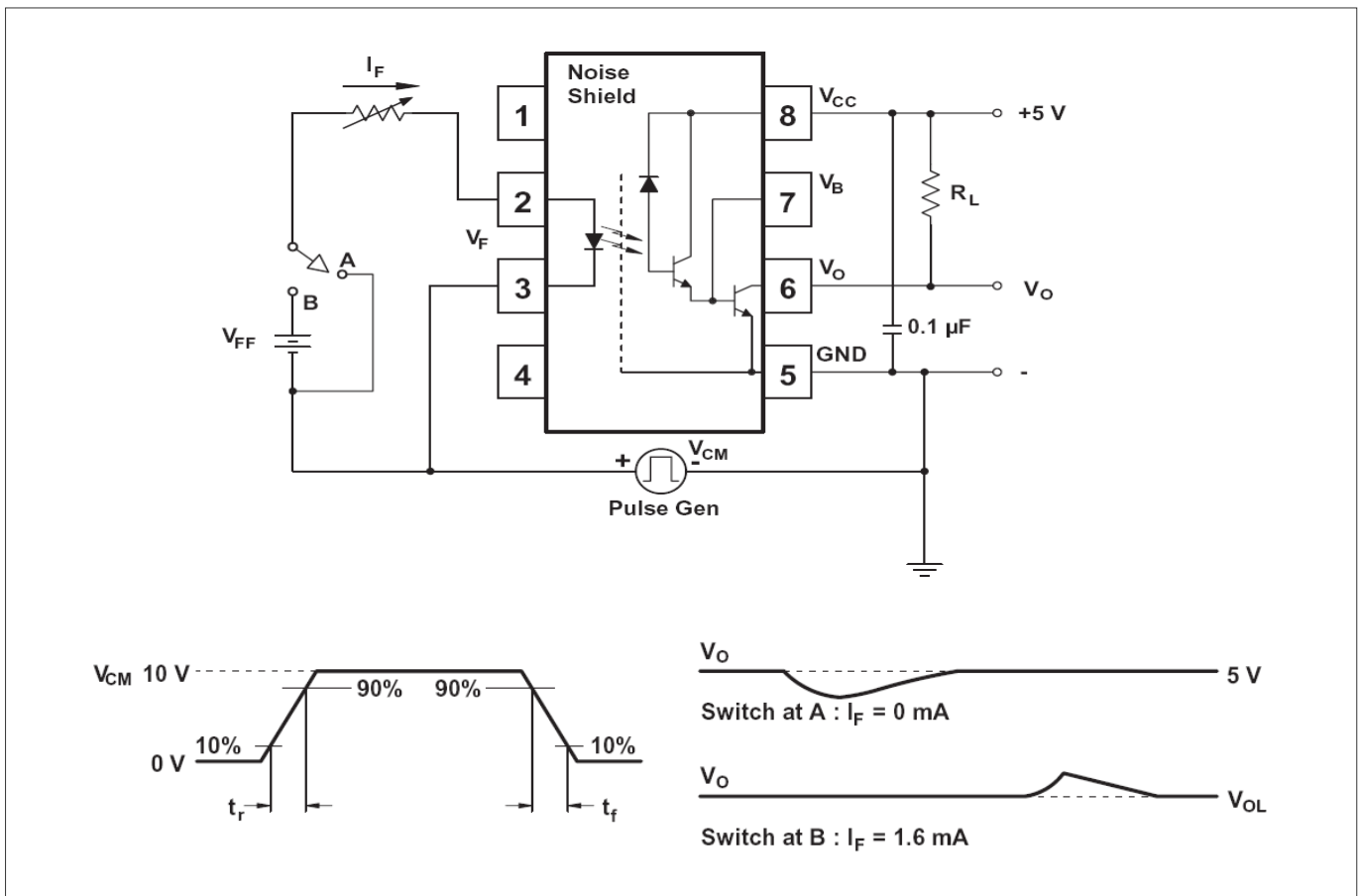
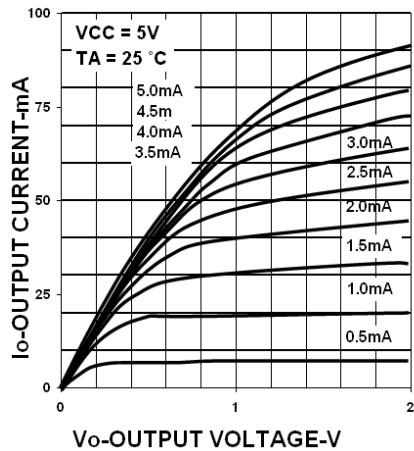
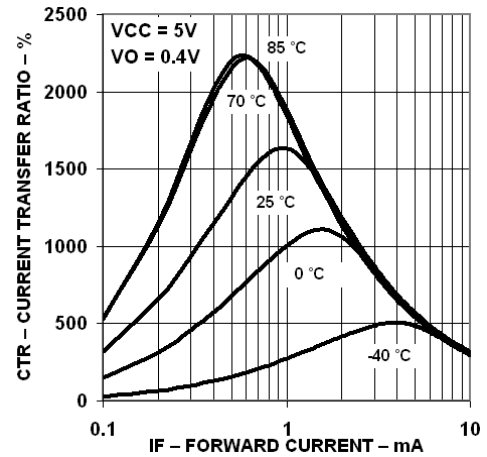
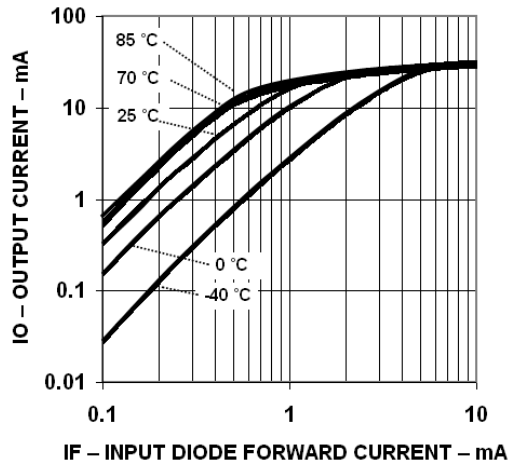
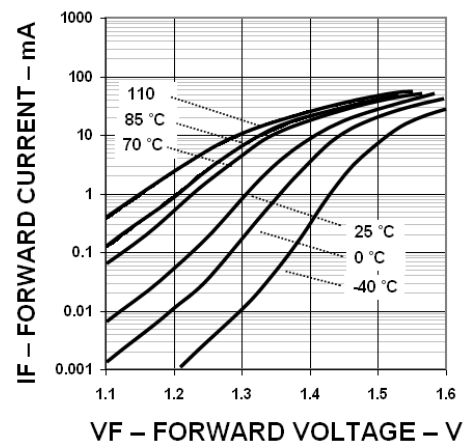
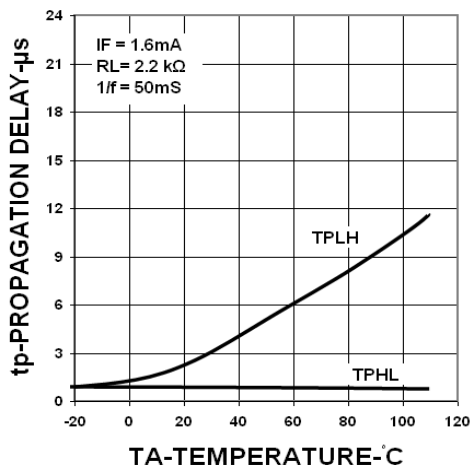
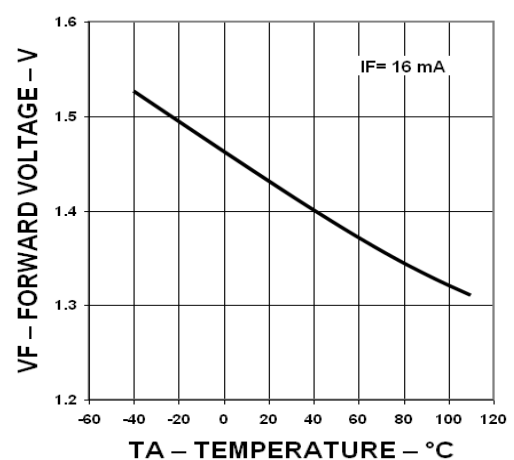


Figure 2: Single Channel Test Circuit for t_{EHL} and t_{ELH}

SDN139 Performance & Characteristics Plots, $T_A = 25^\circ\text{C}$ (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, $T_A = 25^\circ\text{C}$ (unless otherwise specified)

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

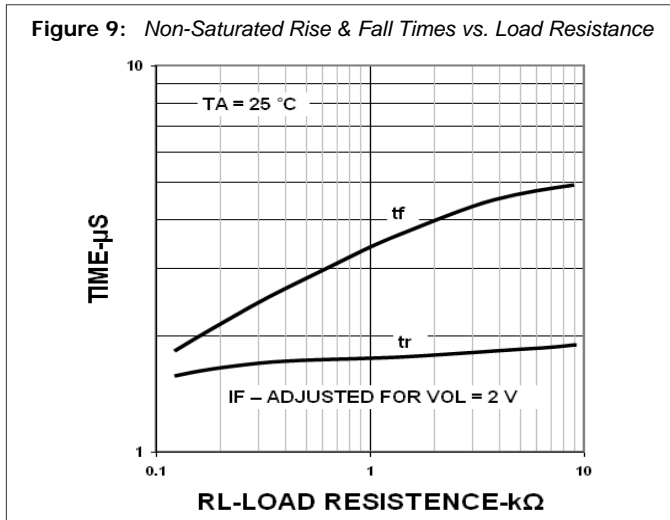
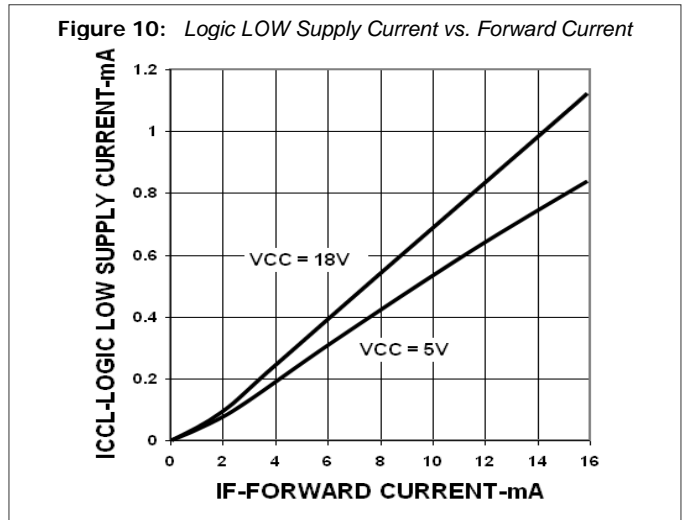


Figure 10: Logic LOW Supply Current vs. Forward Current



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 250°C:

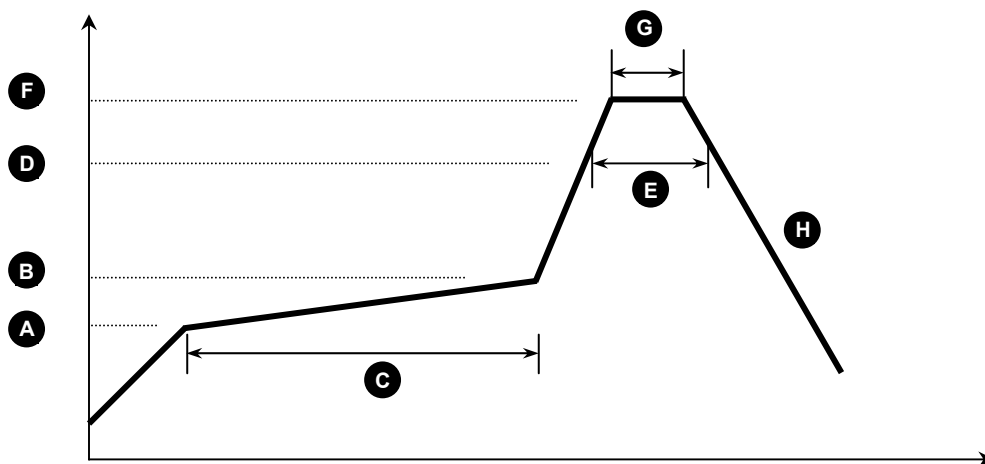


Figure 11

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

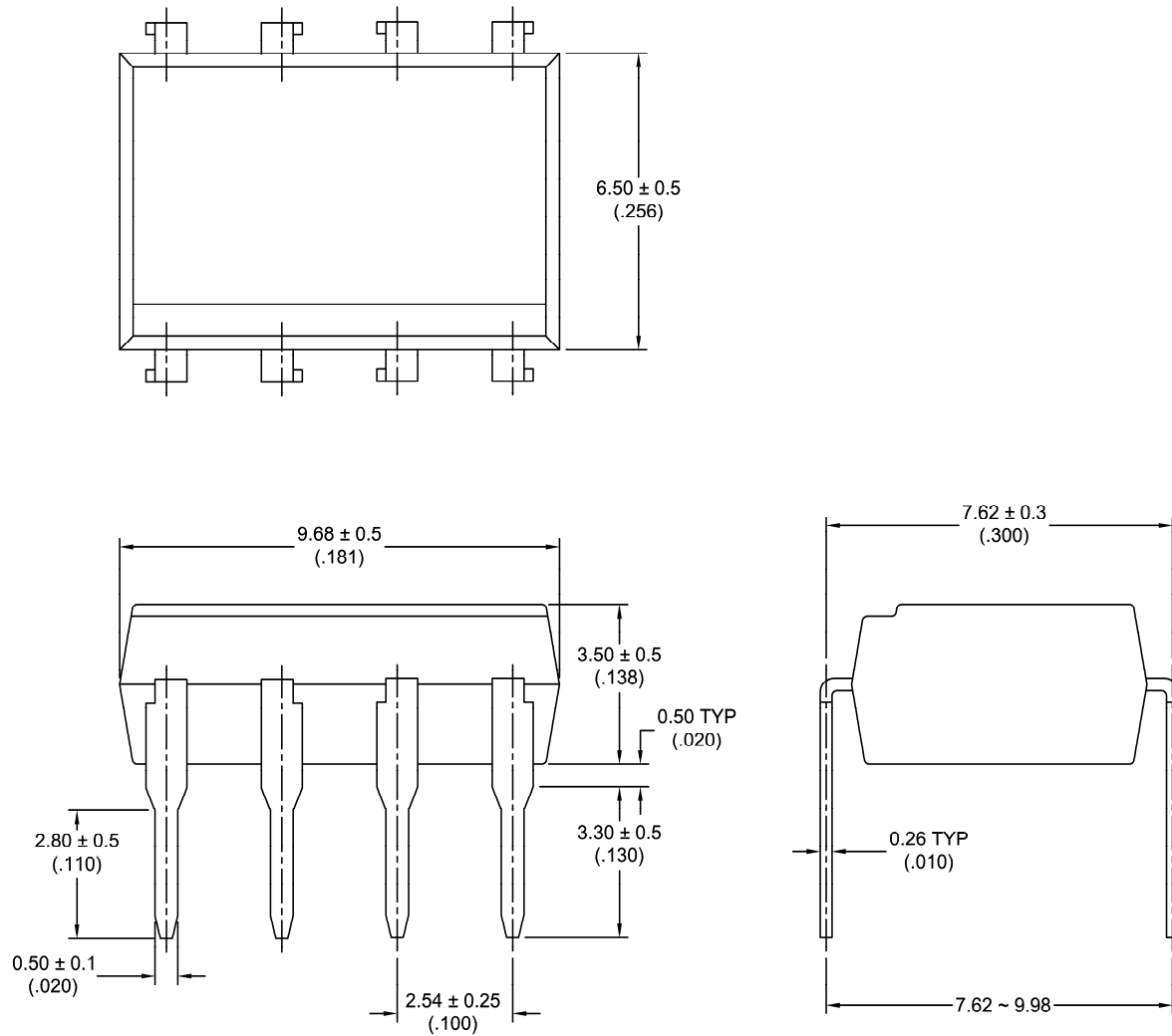
(3) Hand Solder:

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

SDN139 Package Dimensions

8 PIN DIP Package

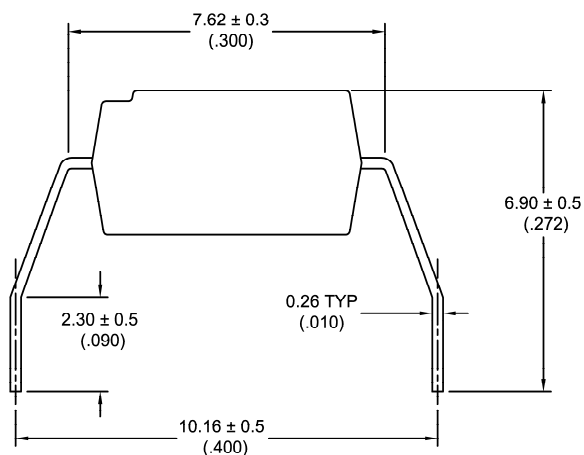
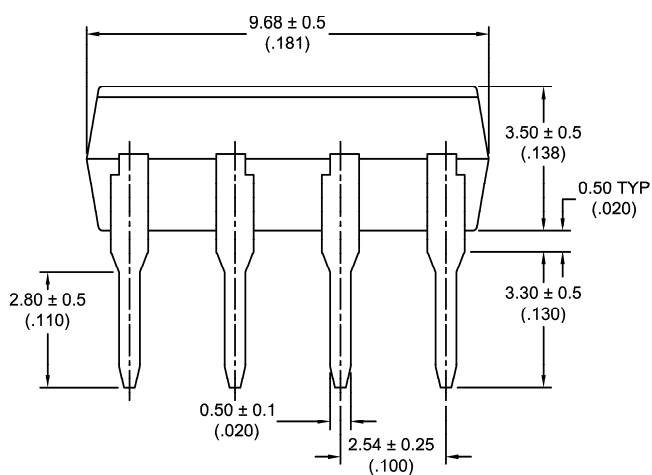
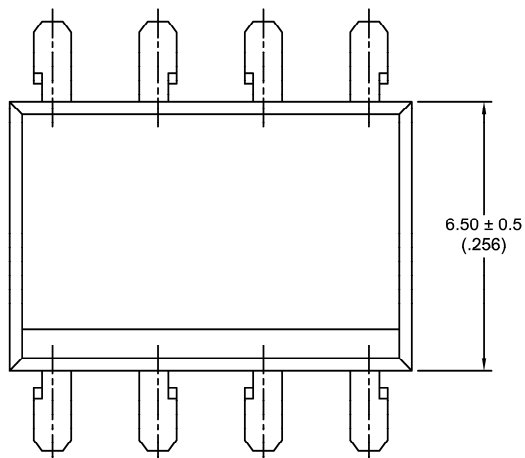
Note: All dimensions in millimeters [mm] with inches in parenthesis ()



SDN139 Package Dimensions

8 PIN WIDE Lead Space Package (-H)

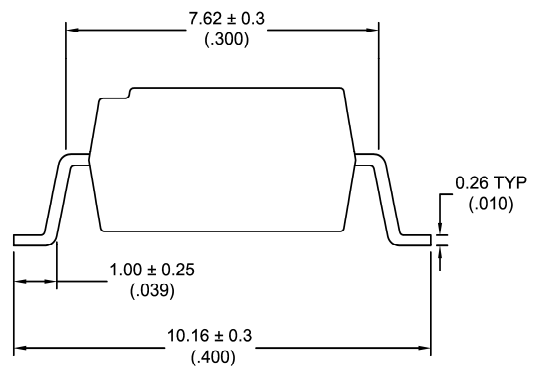
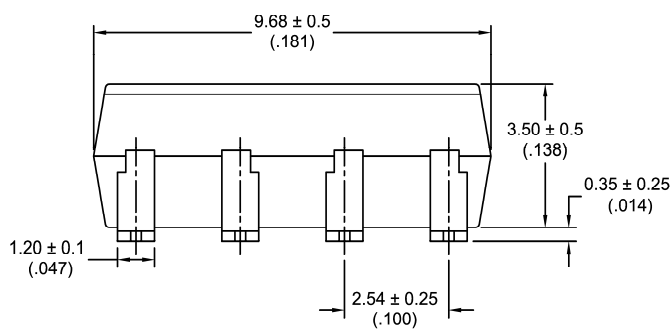
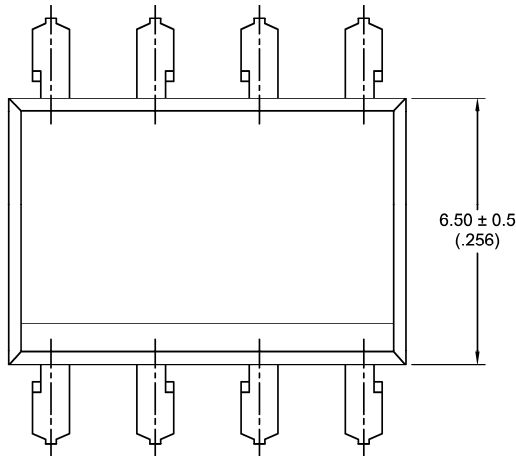
Note: All dimensions in millimeters [mm] with inches in parenthesis ()

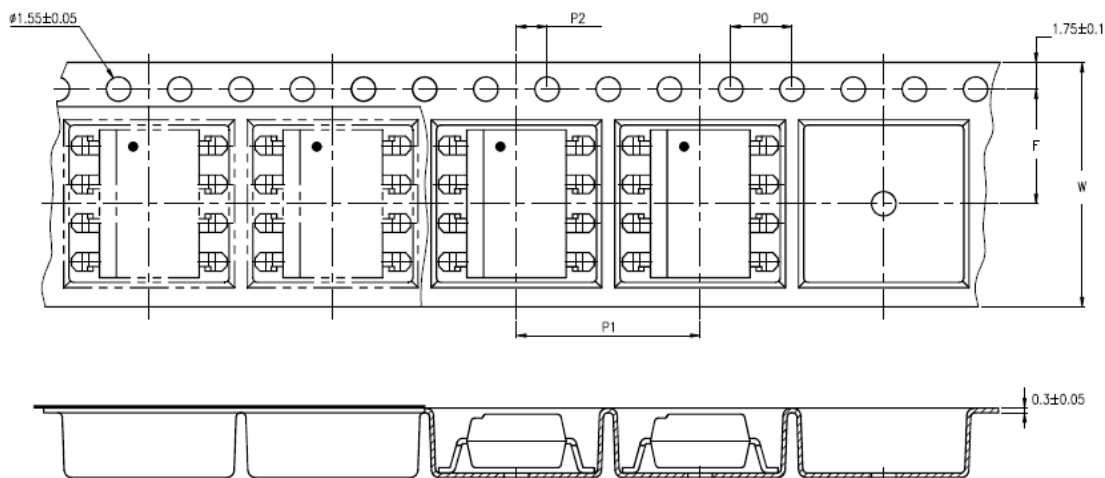


SDN139 Package Dimensions

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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