SFH6318T/6319T

Low Current, High Gain Optocoupler

FEATURES

- **Industry Standard SOIC-8 Surface Mountable Package**
- **High Current Transfer Ratio, 800%**
- **Low Input Current, 0.5 mA**
- **High Output Current, 60 mA**
- **Isolation Test Voltage, 3000 V_{RMS}**
- **TTL Compatible Output, V_{OL}=0.1 V**
- **Adjustable Bandwidth—Access to Base**
- **Underwriters Lab File #E52744**
- **VDE 0884 Available with Option 1**

APPLICATIONS

- **Logic Ground Isolation—TTL/TTL, TTL/CMOS, CMOS/CMOS, CMOS/TTL**
- **EIA RS 232C Line Receiver**
- **Low Input Current Line Receiver—Long Lines, Party Lines**
- **Telephone Ring Detector**
- **117 VAC Line Voltage Status Indication—Low Input Power Dissipation**
- **Low Power Systems—Ground Isolation**

DESCRIPTION

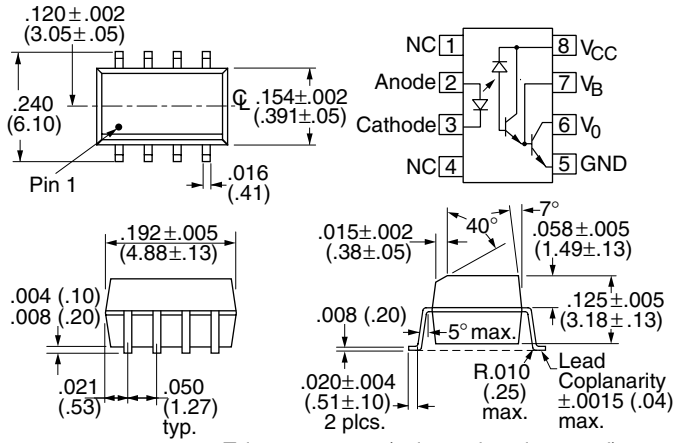
Very high current ratio together with 3000 V_{RMS} isolation are achieved by coupling an LED with an integrated high gain photodetector in a SOIC-8 package. Separate pins for the photodiode and output stage enable TTL compatible saturation voltages with high speed operation. Photodarlington operation is achieved by tying the V_{CC} and V_O terminals together. Access to the base terminal allows adjustment to the gain bandwidth.

The SFH6318T is ideal for TTL applications since the 300% minimum current transfer ratio with an LED current of 1.6 mA enables operation with one unit load-in and one unit load-out with a 2.2 kΩ pull-up resistor.

The SFH6319T is best suited for low power logic applications involving CMOS and low power TTL. A 400% current transfer ratio with only 0.5 mA of LED current is guaranteed from 0°C to 70°C.

Caution:
Due to the small geometries of this device, it should be handled with Electrostatic Discharge (ESD) precautions. Proper grounding would prevent damage further and/or degradation which may be induced by ESD.

Package Dimensions in Inches (mm)



Maximum Ratings (T_A=25°C)

Emitter

Reverse Input Voltage ..... 3.0 V
Supply and Output Voltage, V_{CC} (pin 8-5), V_O (pin 6-5)
SFH6318T ..... –0.5 to 7.0 V
SFH6319T ..... –0.5 to 18 V
Input Power Dissipation ..... 35 mW
Derate Linearly above ..... 50°C
Free Air Temperature ..... 0.7 mW/°C
Average Input Current ..... 20 mA
Peak Input Current ..... 40 mA
(50% Duty Cycle-1.0 ms pulse width)
Peak Transient Input Current
(t_p≤1.0 µs, 300 pps) ..... 1.0 A

Detector (Si Photodiode + Photodarlington)

Output Current I_O (pin 6) ..... 60 mA
Emitter-base Reverse Voltage (pin 5-7) ..... 0.5 V
Output Power Dissipation ..... 150 mW
Derate Linearly from 25°C ..... 2.0 mW/°C

Package

Storage Temperature ..... –55°C to +125°C
Operating Temperature ..... –40°C to +85°C
Lead Soldering Temperature (t=10 s) ..... 260°C
Junction Temperature ..... 100°C
Ambient Temperature Range ..... –55°C to +100°C
Isolation Test Voltage between
Emitter and Detector ..... 3000 V_{RMS}
(refer to climate DIN 40046, part 2, Nov. 74)
Pollution Degree (DIN VDE 0110) 2
Creepage Distance ..... ≥4.0 mm
Clearance ..... ≥4.0 mm
Comparative Tracking Index
per DIN IEC 112/VDE 0303, part 1 175
Isolation Resistance
V_{IO}=500 V, T_A=25°C R_{ISOL} ..... $\geq 10^{12}$ Ω
V_{IO}=500 V, T_A=100°C R_{ISOL} ..... $\geq 10^{11}$ Ω

Electro-Optical Characteristics (T_A=0°C to 70°C, T_A=25°C—Typical, unless otherwise specified)

Parameter	Symbol	Device	Min	Typ	Max	Units	Test Conditions	Note
Current Transfer Ratio	CTR	SFH6318T	300	1600	2600	%	I_F=1.6 mA, V_O=0.4 V, V_{CC}=4.5 V	1,2
	—	SFH6319T	400 500	2000 1600	3500 2600		I_F=0.5 mA, V_O=0.4 V, V_{CC}=4.5 V I_F=1.6 mA, V_O=0.4 V, V_{CC}=4.5 V	
Logic Low Output Voltage	V_{OL}	SFH6318T	—	0.1	0.4	V	I_F=1.6 mA, I_O=4.8 mA, V_{CC}=4.5 V	2
	—	SFH6319T		0.1 0.15 0.25	0.4 0.4 0.4		I_F=1.6 mA, I_O=8.0 mA, V_{CC}=4.5 V I_F=5.0 mA, I_O=15 mA, V_{CC}=4.5 V I_F=12 mA, I_O=24 mA, V_{CC}=4.5 V	
Logic High Output Current	I_{OH}	SFH6318T	—	0.1	250	µA	I_F=0 mA, V_O=V_{CC}=7.0 V	
		SFH6319T	—	0.05	100		I_F=0 mA, V_O=V_{CC}=18 V	
Logic Low Supply Current	I_{CCL}	—	—	0.2	1.5	mA	I_F=1.6 mA, V_O=OPEN, V_{CC}=18 V	
Logic High Supply Current	I_{CCH}	—	—	0.01	10	µA	I_F=0 mA, V_O=OPEN, V_{CC}=18 V	
Input Forward Voltage	V_F	—	—	1.4	1.7	V	I_F=1.6 mA, T_A=25°C	—
Temperature Coefficient, Forward Voltage	$\Delta V_F/\Delta T_A$	—	—	–1.8	—	mV/°C	I_F=1.6 mA	
Input Capacitance	C_{IN}	—	—	25	—	pF	f=1.0 MHz, V_F=0	
Resistance (Input-Output)	R_{I-O}	—	—	10^{12} 10^{11}	—	Ω	V_{IO}=500 VDC, T_A=25°C V_{IO}=500 VDC, T_A=100°C	3
Capacitance (Input-Output)	C_{I-O}	—	—	0.6	—	pF	f=1.0 MHz	3

Switching Specifications (T_A=25°C)

Parameter	Symbol	Device	Min	Typ	Max	Units	Test Conditions	Note
Propagation Delay Time To Logic Low at Output	t_{PHL}	SFH6318T	—	2.0	10	µs	I_F=1.6 mA, R_L=2.2 kΩ	
		SFH6319T	—	6.0 0.6	25 1.0		I_F=0.5 mA, R_L=4.7 kΩ I_F=12 mA, R_L=270 Ω	2,4
Propagation Delay Time To Logic High at Output	t_{PLH}	SFH6318T	—	2.0	35		I_F=1.6 mA, R_L=2.2 kΩ	—
		SFH6319T	—	4.0 1.5	60 7.0		I_F=0.5 mA, R_L=4.7 kΩ I_F=12 mA, R_L=270 Ω	2,4
Common Mode Transient Immunity at Logic High Level Output	$\|CM_H\|$	—	—	1 K	—	V/µs	I_F=0 mA, R_L=2.2 kΩ V_{CM}=10 V_{P-P}	5,6
Common Mode Transient Immunity at Logic Low Level Output	$\|CM_L\|$	—	—		—		I_F=1.6 mA, R_L=2.2 kΩ V_{CM}=10 V_{P-P}	

Notes

1. DC current transfer ratio is defined as the ratio of output collector current, I_O, to the forward LED input current, I_F times 100%.
2. Pin 7 open.
3. Device considered a two-terminal device: pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7 and 8 shorted together.
4. Using a resistor between pin 5 and 7 will decrease gain and delay time.
5. Common mode transient immunity in logic high level is the maximum tolerable (positive) dV_{cm}/dt on the leading edge of the common mode pulse, V_{CM}, to assure that the output will remain in a logic high state (i.e. V_O>2.0 V) common mode transient immunity in logic low level is the maximum tolerable (negative) dV_{cm}/dt on the trailing edge of the common mode pulse signal, V_{CM}, to assure that the output will remain in a logic low state (i.e. V_O<0.8 V).
6. In applications where dv/dt may exceed 50,000 V/µs (such as state discharge) a series resistor, R_{CC} should be included to protect I_C from destructively high surge currents. The recommended value is $R_{CC} \cong \frac{IV}{0.15\, I_F\,(mA)} k\Omega$ Refer to Figure 2.

Figure 1. Switching test circuit

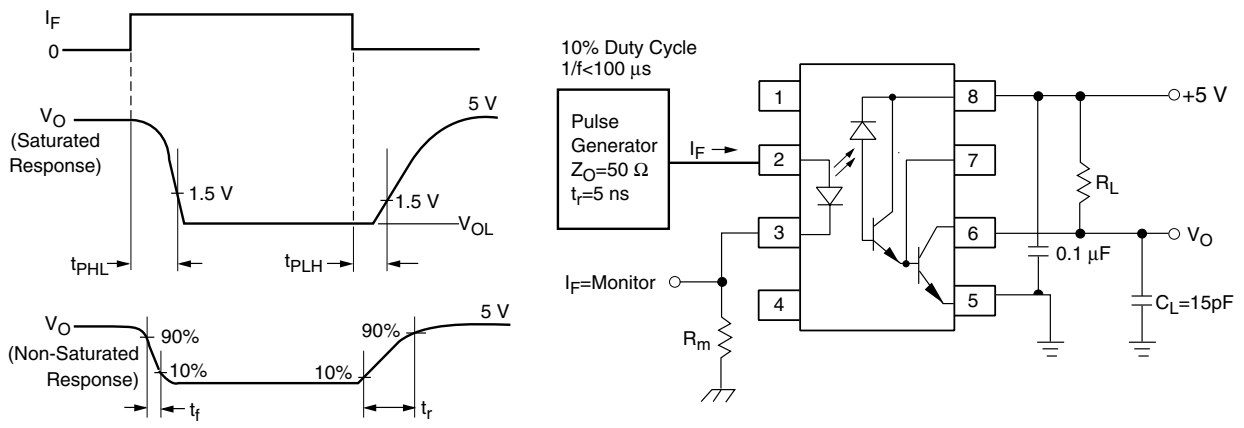


Figure 2. Test circuit for transient immunity and typical waveforms