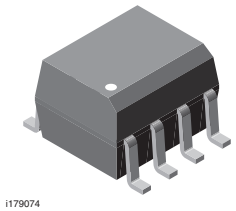
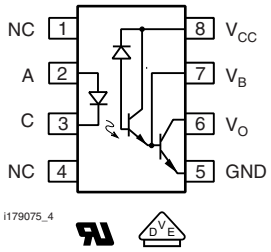
High Speed Optocoupler, 100 kBd, Low Input Current, High Gain





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, 4000 V_{RMS}
- TTL compatible output, V_{OL} = 0.1 V
- Adjustable bandwidth access to base
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

RoHS COMPLIANT

DESCRIPTION

Very high current ratio together with 4000 V_{RMS} isolation are achieved by coupling an LED with an integrated high gain photo detector in a SOIC-8 package. Separate pins for the photo diode 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.

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

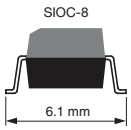
AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- DIN EN 60747-5-5 (VDE 0884) available with option 1
- CSA 93751

ORDERING INFORMATION

S	F	H	6	3	#	#	T

PART NUMBER



AGENCY CERTIFIED/ PACKAGE	CTR (%)	
UL, CSA	**≥ 300**	**≥ 500**
SOIC-8	SFH6318T (1)	SFH6319T (1)
SOIC-8, tube	SFH6318	SFH6319

Note

(1) Available in tubes and in tape and reel

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	PART	SYMBOL	VALUE	UNIT
INPUT					
Reverse voltage			V_R	3	V
Supply and output voltage	V_{CC} (pin 8 to 5), V_O (pin 6 to 5)	SFH6318T	V_{CC}, V_O	- 0.5 to 7	V
		SFH6319T	V_{CC}, V_O	- 0.5 to 18	V
Input power dissipation			P_{diss}	35	mW

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)					
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**VALUE**	**UNIT**
INPUT					
Derate linearly above				50	°C
Free air temperature				0.7	mW/°C
Average input current			$I_{F(AVG)}$	20	mA
Peak input current	50 % duty cycle - 1 ms pulse width		I_{FRM}	40	mA
Peak transient input current	$t_p \leq 1$ µs, 300 pps		I_{FSM}	1	A
OUTPUT					
Output current (pin 6)			I_O	60	mA
Emitter-base reverse current (pin 5 to 7)				0.5	V
Output power dissipation			P_{diss}	150	mW
Derate linearly from 25 °C				2	mW/°C
COUPLER					
Isolation test voltage between emitter and detector			V_{ISO}	4000	V_{RMS}
Storage temperature			T_{stg}	- 55 to + 125	°C
Lead soldering temperature (1)	t = 10 s		T_{sld}	260	°C
Junction temperature			T_j	100	°C
Ambient temperature range			T_{amb}	- 55 to + 100	°C
Pollution degree (DIN VDE 0110)				2	
Creepage distance				≥ 4	mm
Clearance distance				≥ 4	mm
Comparative tracking index per DIN IEC112/VDE 0303, part 1			CTI	175	
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C		R_{IO}	≥ 10^{12}	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C		R_{IO}	≥ 10^{11}	Ω

Notes

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

(1) Refer to reflow profile soldering conditions for surface mounted devices.

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 1.6 mA	V_F		1.4	1.7	V
Temperature coefficient, forward voltage	I_F = 1.6 mA	$\Delta V_F/\Delta T_{amb}$		- 1.8		mV/°C
OUTPUT						
Logic low output voltage (1)	I_F = 1.6 mA, I_O = 4.8 mA, V_{CC} = 4.5 V	V_{OL}		0.1	0.4	V
	I_F = 1.6 mA, I_O = 8 mA, V_{CC} = 4.5 V	V_{OL}		0.1	0.4	V
	I_F = 5 mA, I_O = 15 mA, V_{CC} = 4.5 V	V_{OL}		0.15	0.4	V
	I_F = 12 mA, I_O = 24 mA, V_{CC} = 4.5 V	V_{OL}		0.25	0.4	V
Logic high output current (1)	I_F = 0 mA, V_O = V_{CC} = 7 V	I_{IO}		0.1	250	µA
	I_F = 0 mA, V_O = V_{CC} = 18 V	I_{IO}		0.05	100	µA
Logic low supply current (1)	I_F = 1.6 mA, V_O = OPEN, V_{CC} = 18 V	I_{CCL}		0.2	1.5	mA
Logic high supply current (1)	I_F = 0 mA, V_O = OPEN, V_{CC} = 18 V	I_{CCH}		0.01	10	µA

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
COUPLER						
Capacitance (input to output) (2)	f = 1 MHz	C_{IO}		0.6		pF
Input capacitance	f = 1 MHz, V_F = 0	C_{IN}		25		pF
Resistance (input to output) (2)	V_{IO} = 500 VDC, T_{amb} = 25 °C	R_{IO}		10^{12}		Ω
	V_{IO} = 500 VDC, T_{amb} = 100 °C	R_{IO}		10^{11}		Ω

Notes

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements. T_{amb} = 0 °C to 70 °C. Typical values are specified at T_{amb} = 25 °C.

(1) Pin 7 open.

(2) Device considered a two-terminal device: pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7 and 8 shorted together.

CURRENT TRANSFER RATIO							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Current transfer ratio	I_F = 1.6 mA, V_O = 0.4 V, V_{CC} = 4.5 V	SFH6318T	CTR	300	1600	2600	%
	I_F = 0.5 mA, V_O = 0.4 V, V_{CC} = 4.5 V	SFH6319T	CTR	400	2000	3500	%
	I_F = 1.6 mA, V_O = 0.4 V, V_{CC} = 4.5 V	SFH6319T	CTR	500	1600	2600	%

Note

- T_{amb} = 0 °C to 70 °C. Typical values are specified at T_{amb} = 25 °C. 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 %. Pin 7 open.

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Propagation delay time to logic low at output	I_F = 1.6 mA, R_L = 2.2 kΩ	SFH6318T	t_{PHL}		2	10	µs
Propagation delay time to logic low at output (2)	I_F = 0.5 mA, R_L = 4.7 kΩ	SFH6319T	t_{PHL}		6	25	µs
Propagation delay time to logic low at output	I_F = 12 mA, R_L = 270 Ω	SFH6319T	t_{PHL}		0.6	1	µs
Propagation delay time to logic high at output	I_F = 1.6 mA, R_L = 2.2 kΩ	SFH6318T	t_{PLH}		2	35	µs
Propagation delay time to logic high at output (2)	I_F = 0.5 mA, R_L = 4.7 kΩ	SFH6319T	t_{PLH}		4	60	µs
Propagation delay time to logic high at output	I_F = 12 mA, R_L = 270 Ω	SFH6319T	t_{PLH}		1.5	7	µs

Note

(1) Pin 7 open. Using a resistor between pin 5 and 7 will decrease gain and delay time.

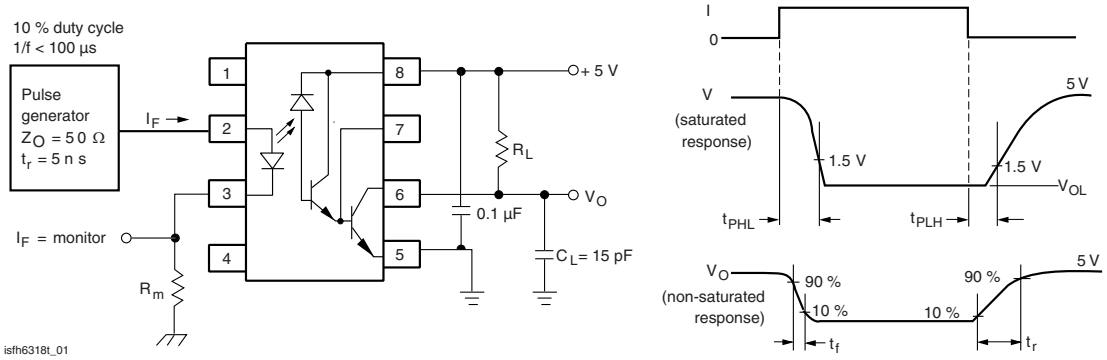


Fig. 1 - Switching Test Circuit

COMMON MODE TRANSIENT IMMUNITY						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Common mode transient immunity at logic high level output	I_F = 0 mA, R_L = 2.2 kΩ, V_{CM} = 10 V_{P-P}	$\|CM_H\|$		1K		V/µs
Common mode transient immunity at logic low level output	I_F = 1.6 mA, R_L = 2.2 kΩ, V_{CM} = 10 V_{P-P}	$\|CM_H\|$		1K		V/µs

Note

- 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 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).
  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 refer to figure 2.
  $R_{CC} \cong [(IV)/0.15\ I_F\ (mA)]$ kΩ.

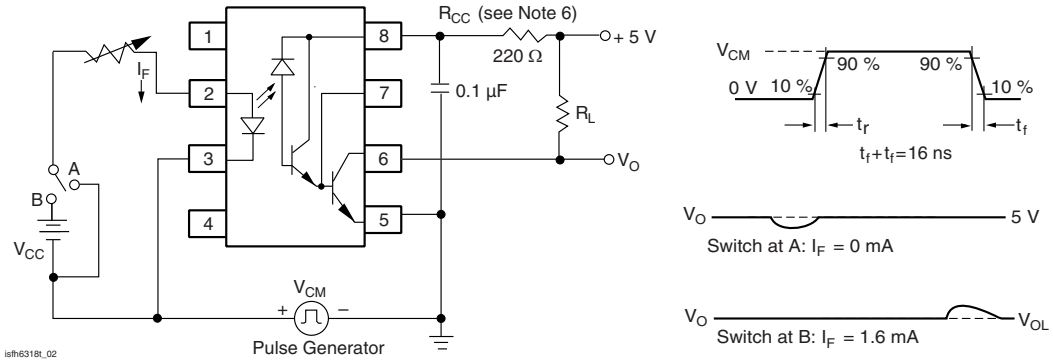


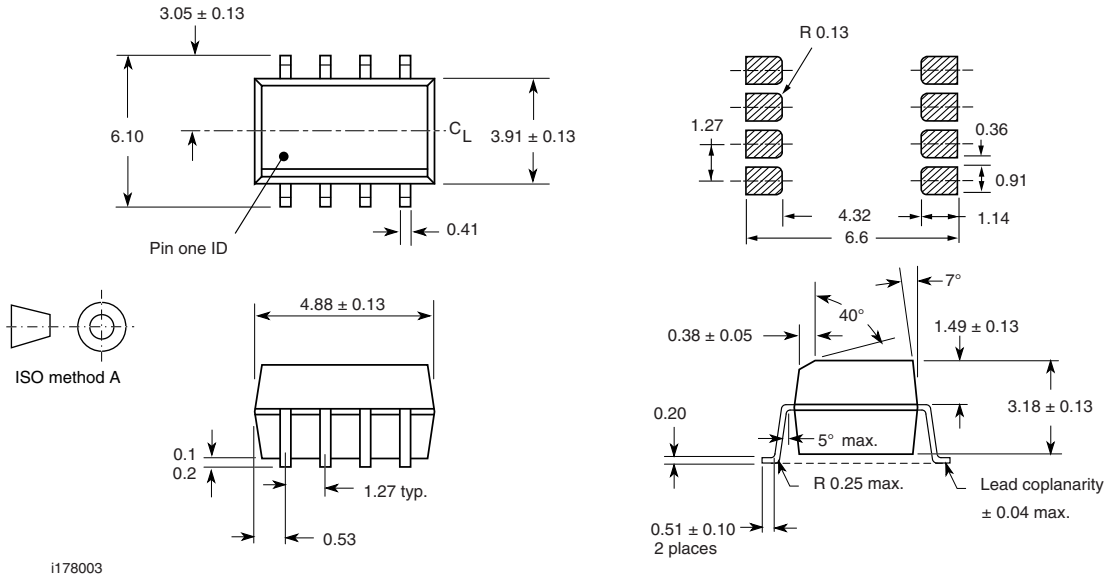
Fig. 2 - Test Circuit for Transient Immunity and Typical Waveforms

SAFETY AND INSULATION RATINGS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Climatic Classification (according to IEC 68 part 1)				55/100/21		
Comparative Tracking Index		CTI	175		399	
V_{IOTM}			6000			V
V_{IORM}			560			V
P_{SO}					350	mW
I_{SI}					150	mA
T_{SI}					165	°C
Creepage distance			4			mm
Clearance distance			4			mm
Insulation thickness			0.2			mm

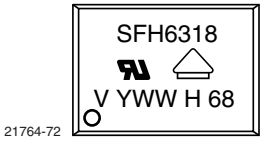
Note

- As per IEC 60747-5-5, §7.4.3.8.1, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING



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