FAIRCHILD
SEMICONDUCTOR®

6-PIN PHOTOTRANSISTOR OPTOCOUPLERS

SL5500 SL5501 SL5511

DESCRIPTION

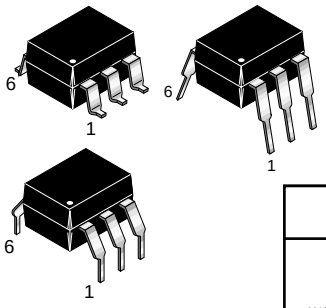
The SL5500, SL5501 and SL5511 are optically coupled isolators each consisting of an infrared emitting GaAs diode and a silicon NPN phototransistor with accessible base. These devices are housed in 6-pin dual-in-line packages (DIP).

FEATURES

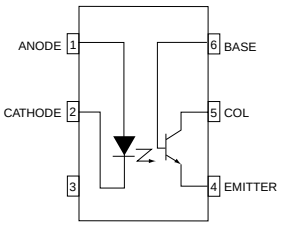
- High output/input DC current transfer ratio
- Low saturation voltage
- High isolation voltage of 5.3 kV RMS
- UL recognized (File # E90700)
- VDE recognized (File # 94766)
  - Ordering option '300' (e.g. SL5500.300)

APPLICATIONS

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance sensor systems
- Industrial controls



SCHEMATIC



Parameters	Symbol	Value	Units
TOTAL DEVICE			
Storage Temperature	T_{STG}	-55 to +150	°C
Operating Temperature	T_{OPR}	-55 to +100	°C
Lead Solder Temperature	T_{SOL}	260 for 10 sec	°C
Total Power Dissipation at T_A=25°C Ambient	P_D	260	mW
Derate Linearly from 25°C		3.3	mW/°C
EMITTER			
Continuous Reverse Voltage	V_R	3	V
Continuous Forward Current	I_F	100	mA
Forward Current - Peak (10 µs pulse, δ = 0.01)	I_F(pk)	3.0	A
Total Power Dissipation T_A=25°C Ambient	P_D	150	mW
Derate Linearly from 25°C		2.0	mW/°C
DETECTOR			
Collector to Emitter Voltage (open base)	V_{CEO}	30	V
Collector to Base Voltage (open emitter)	V_{CBO}	70	V
Emitter to Collector Voltage (open base)	V_{ECO}	7	V
Emitter to Base Voltage (open colletor)	V_{EBO}	7	V
DC Collector Current	I_C	100	mA
Detector Power Dissipation @ T_A=25°C Ambient	P_D	150	mW
Derate Linearly from 25°C		2.0	mW/°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

INDIVIDUAL COMPONENT CHARACTERISTICS

Parameters	Test Conditions	Symbol	Device	Min	Typ*	Max	Units
EMITTER							
Input Forward Voltage	I_F = 20 mA, T_A = 25 to 70°C	V_F	All		1.23	1.3	V
	I_F = 2 mA				1.10	1.2	V
Reverse Current	V_R = 3 V, T_A = 25 to 70°C	I_R	All		0.001	10	µA
DETECTOR	V_{CE} = 10 V	I_{CEO}	All		1	50	nA
Leakage Current Collector to Emitter	V_{CE} = 30 V				0.005	10	µA
	V_{CE} = 10 V, T_A = 70°C					500	nA
	V_{CB} = 30 V	I_{CBO}			0.001	50	µA
Breakdown Voltage							
Collector to Emitter	I_C = 10 µA, I_F = 0	BV_{CEO}	All	30	100		V
Collector to Base	I_C = 10 µA, I_F = 0	BV_{CBO}	All	30	120		V
Emitter to Collector	I_E = 10 µA, I_F = 0	BV_{ECO}	All	7	10		V
Emitter to Base	I_E = 10 µA, I_F = 0	BV_{EBO}	All	7	10		V

ISOLATION CHARACTERISTICS

Characteristic	Test Conditions	Symbol	Min	Typ*	Max	Units
Input-Output Isolation Voltage (note 1)	f = 60Hz, T = 1 min.	V_{ISO}	5300			$V_{AC(RMS)}$
Isolation Resistance	V_{I-O} = ±500 VDC	R_{ISO}	1	10		$^{T}\Omega$
Isolation Capacitance	f = 1 MHz, V = 0V	C_{ISO}		0.6	1.3	pF

* Typical values at T_A=25°C.

TRANSFER CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

DC Characteristics	Test Conditions	Symbol	Device	Min	Typ	Max	Units
Output/Input Current Transfer Ratio	I_F = 10 mA, V_{CE} = 0.4 V	CTR	SL5500	50		300	%
	I_F = 10 mA, V_{CE} = 0.4 V, T_A = 70°C		SL5500	40		300	
	I_F = 10 mA, V_{CE} = 0.4 V, T_A = 25°C to 70°C		SL5501	25		400	
	I_F = 2 mA, V_{CE} = 5 V		SL5500	40			
	I_F = 2 mA, V_{CE} = 5 V, T_A = 70°C		SL5500	30			
	I_F = 2 mA, V_{CE} = 5 V, T_A = 25°C to 70°C		SL5501	15			
	I_F = 2 mA, V_{CE} = 5 V, T_A = 25°C to 70°C		SL5511	25			
	I_F = 0.5 mA, V_{CE} = 0.4 V, T_A = 25°C to 70°C		SL5511	20			
Collector-Emitter Saturation Voltage	I_F = 50 mA, I_C = 10 mA	$V_{CE(SAT)}$	SL5500			0.4	V
	I_F = 20 mA, I_C = 2 mA		SL5501, SL5511			0.4	
AC Characteristics	**Test Conditions**	**Symbol**	**Device**	**Min**	**Typ**	**Max**	**Units**
Saturated Switching Times							
Turn-On Time	R_L = 1 kΩ, I_F = 16 mA, V_{CC} = 5 V	t_{on}	All			20	µs
Turn-Off Time	See Fig. 1 and Fig. 2	t_{off}	All			50	µs

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

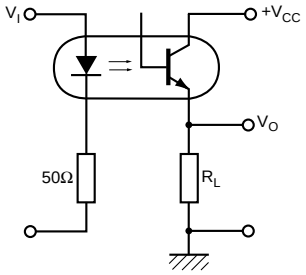


Fig. 1 Switching Circuit

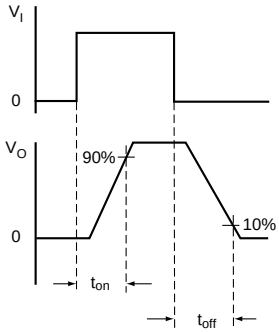


Fig. 2 Waveforms

Fig.3 LED Forward Voltage vs. Forward Current

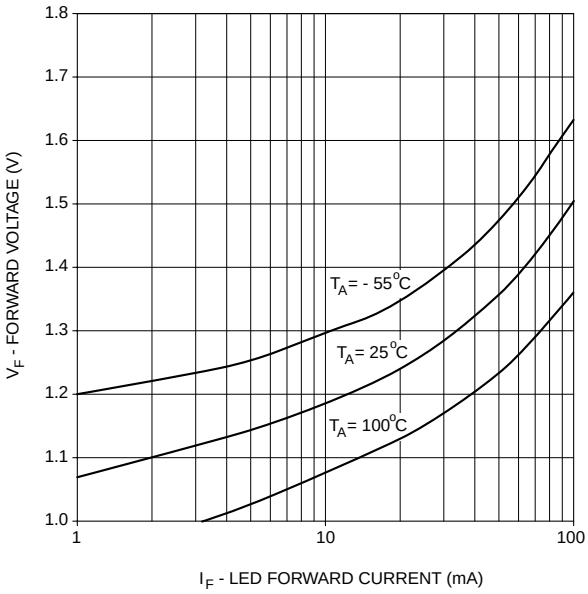


Fig.4 Normalized CTR vs. Forward Current

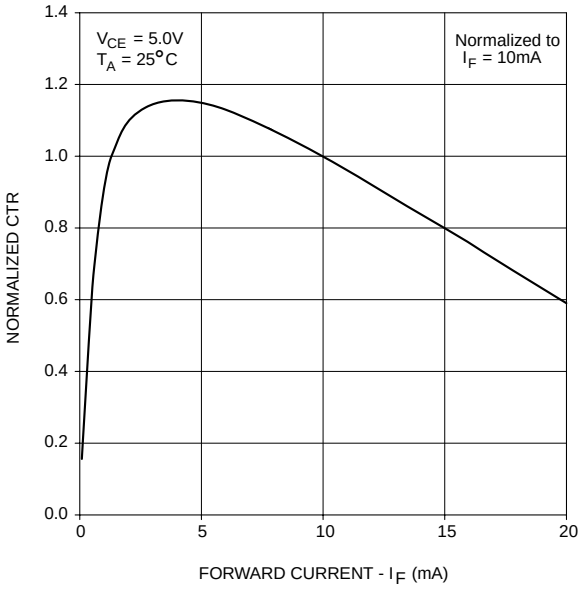


Fig. 5 Normalized CTR vs. Ambient Temperature

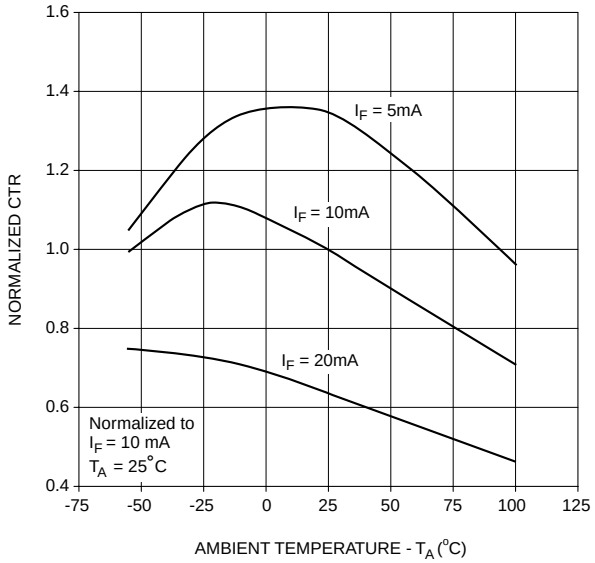


Fig. 7 CTR vs. RBE (Unsaturated)

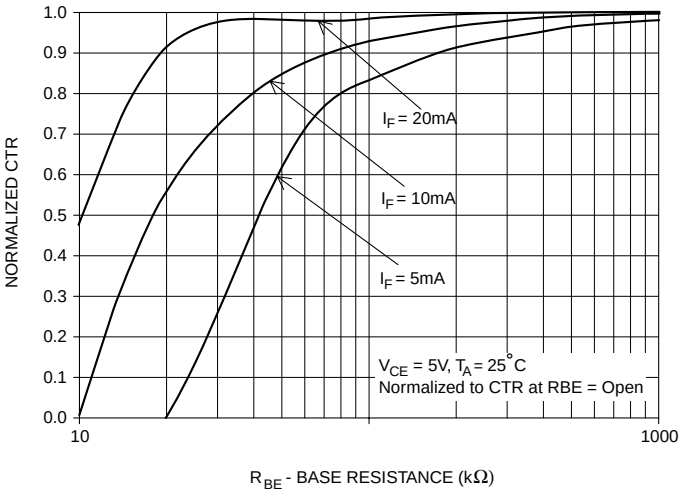


Fig. 7 CTR vs. RBE (Saturated)

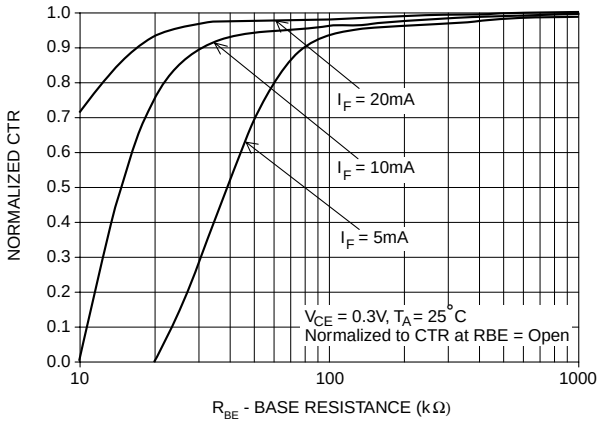


Fig. 8 Normalized t_{off} vs. R_{BE}

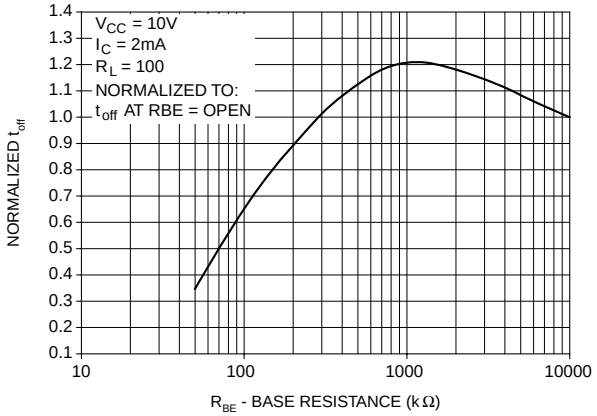


Fig. 9 Normalized t_{on} vs. R_{BE}

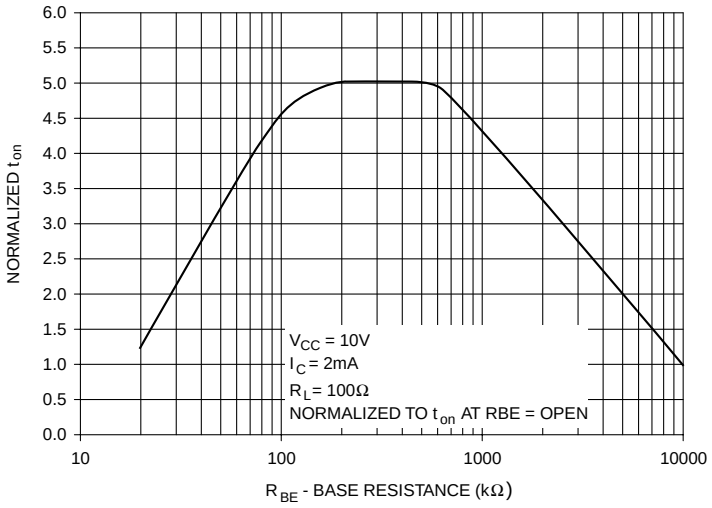


Fig. 10 Switching Speed vs. Load Resistor

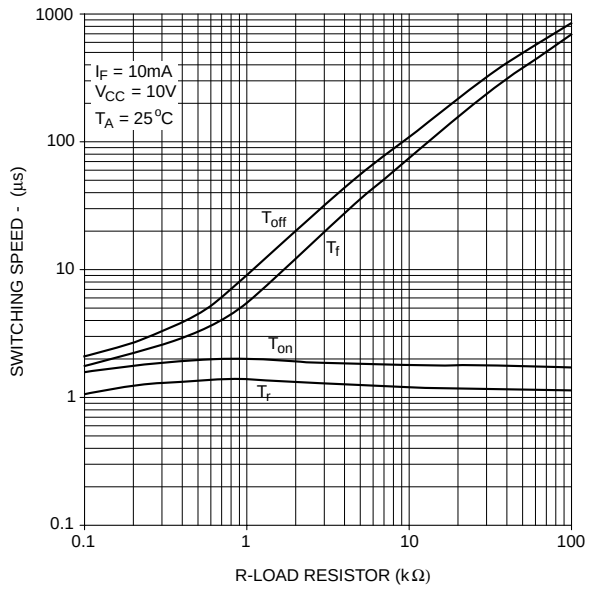


Fig. 11 Collector Emitter Saturation Voltage vs. Collector Current

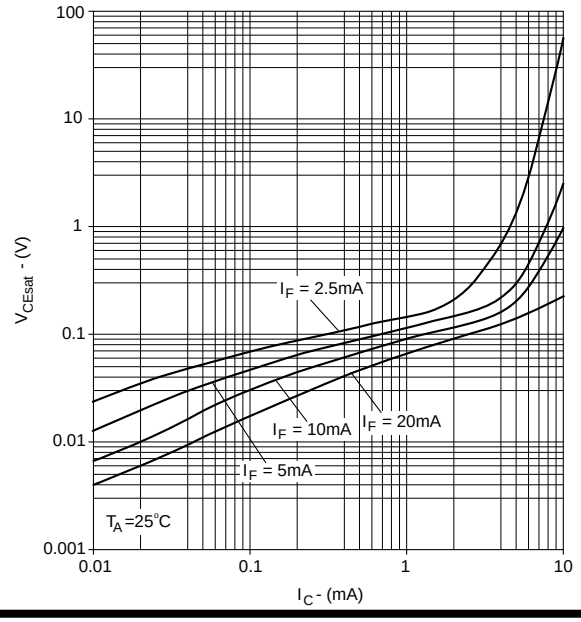
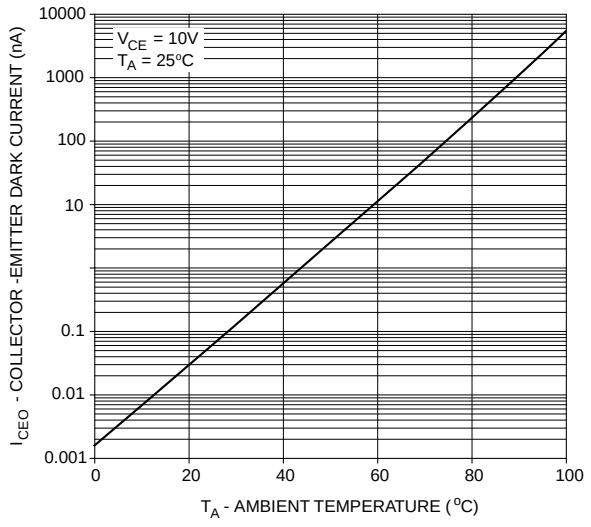
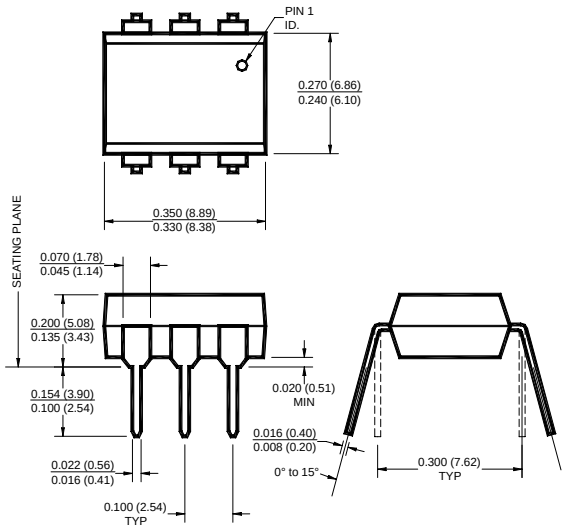


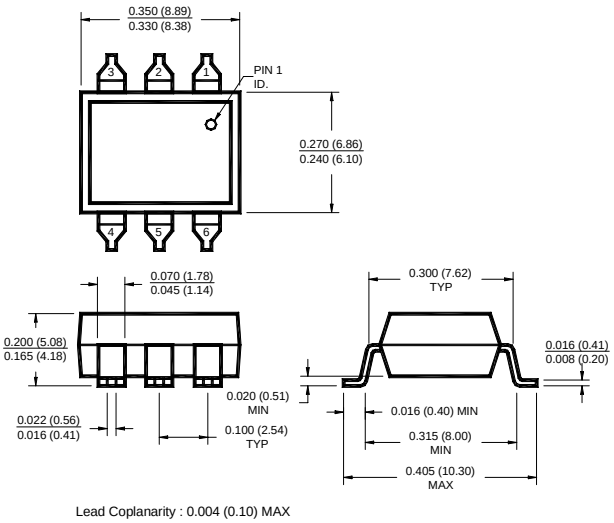
Fig. 12 Dark Current vs. Ambient Temperature



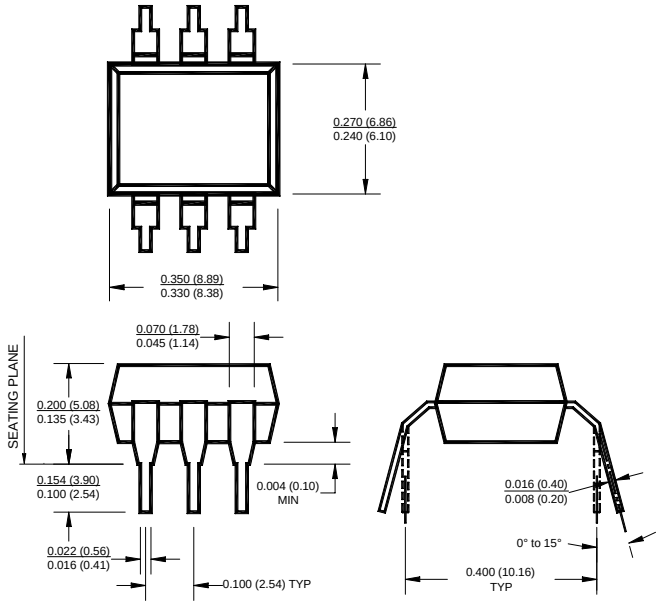
Package Dimensions (Through Hole)



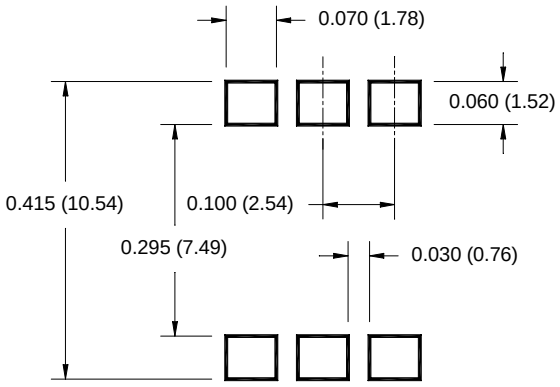
Package Dimensions (Surface Mount)



Package Dimensions (0.4”Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



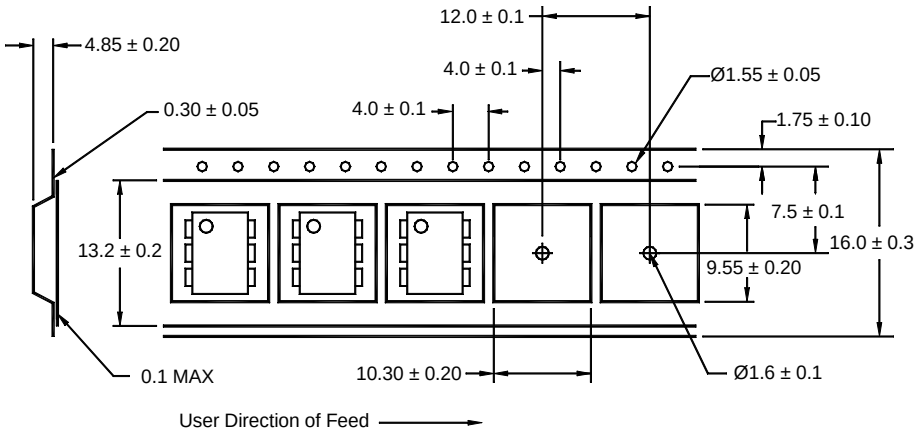
NOTE

All dimensions are in inches (millimeters)

ORDERING INFORMATION

Option	Order Entry Identifier	Description
S	.S	Surface Mount Lead Bend
SD	.SD	Surface Mount; Tape and reel
W	.W	0.4” Lead Spacing
300	.300	VDE 0884
300W	.300W	VDE 0884, 0.4” Lead Spacing
3S	.3S	VDE 0884, Surface Mount
3SD	.3SD	VDE 0884, Surface Mount, Tape & Reel

Carrier Tape Specifications (“D” Taping Orientation)



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