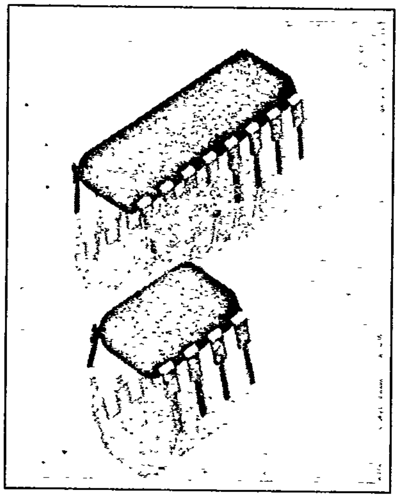
T-41-83

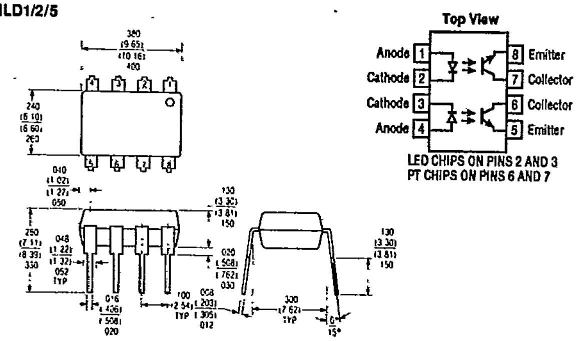
SIEMENS

DUAL CHANNEL ILD1/2/5
QUAD CHANNEL ILQ1/2/5
PHOTOTRANSISTOR OPTOCOUPLER

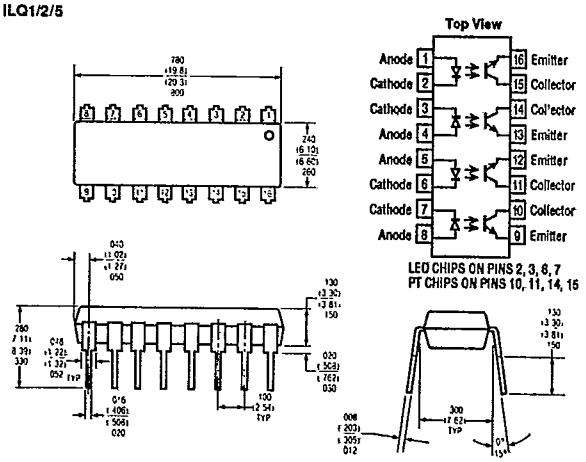


Package Dimensions in Inches (mm)

ILD1/2/5



ILQ1/2/5



FEATURES

- Current Transfer Ratio @ I_F = 10 mA
  ILD/Q1 – 20% Min.
  ILD/Q2 – 100% Min.
  ILD/Q5 – 50% Min.
- High Collector-Emitter Voltage
  ILD/Q1 – BV_{CEO} = 50 V
  ILD/Q2, ILD/Q5 – BV_{CEO} = 70 V
- Field-Effect Stable by TRansparent IOn Shield (TRIOS)
- Double Molded Package Offers Withstand Test Voltage
  7500 VAC_{PEAK}, 1 sec.
  4420 VAC_{RMS}, 1 min.
- UL Approval #E52744
- VDE Approval #0883

DESCRIPTION

The ILD/Q1/2/5 are optically coupled isolated pairs employing GaAs infrared LEDs and silicon NPN phototransistor. Signal information, including a DC level, can be transmitted by the drive while maintaining a high degree of electrical isolation between input and output. The ILD/Q1/2/5 are especially designed for driving medium-speed logic and can be used to eliminate troublesome ground loop and noise problems. Also these couplers can be used to replace relays and transformers in many digital interface applications such as CRT modulation. The ILD1/2/5 has two isolated channels in a single DIP package and the ILQ1/2/5 has four isolated channels per package.

See Appnote 45, "How to Use Optocoupler Normalized Curves."

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Maximum Ratings

Emitter

Reverse Voltage	6 V
Forward Current	100 mA
Surge Current	2.5 A
Power Dissipation	200 mW
Derate Linearly from 25°C	2.6 mW/°C

Detector

Collector-Emitter Reverse Voltage	
ILD/Q1	50 V
ILD/Q2, ILD/Q5	70 V
Emitter-Base Reverse Voltage	7 V
Collector-Base Reverse Voltage	70 V
Collector Current	50 mA
Collector Current (t<1 ms)	400 mA
Power Dissipation	200 mW
Derate Linearly from 25°C	2.6 mW/°C

Package

Storage Temperature	-40°C to +150°C
Operating Temperature	-40°C to +100°C
Junction Temperature	100°C
Soldering Temperature (in a 2 mm distance from case bottom)	260°C
Package Power Dissipation	250 mW
Derate Linearly from 25°C	3.3 mW/°C
UL Withstand Test Voltage (PK) (t=1 sec.)	7500 VDC/5300 VAC_{RMS}
VDE Isolation Test Voltage In Accordance with DIN 57883/6.80	5300 VDC/3750 VAC_{RMS}
Creepage Path	8 min mm
Clearance Path	7 min mm
Tracking Index According to VDE 0303	KB100/A
Working Voltage	1700 VAC_{RMS}
Insulation Resistance	10^{11} Ω

Characteristics

	Symbol	Min.	Typ.	Max.	Unit
Emitter					
Forward Voltage (I_F=60 mA)	V_F		1.25	1.65	V
Breakdown Voltage (I_R=10 µA)	V_{BR}	6	30		V
Reverse Current (V_R=6 V)	I_R		0.01	10	µA
Capacitance (V_R=0 V, f=1 MHz)	C_0		40		pF
Thermal Resistance Junction to Lead	R_{THJL}		750		°C/W
Detector					
Capacitance (V_{CE}=5 V, f=1 MHz)	C_{CE}		6.8		pF
(V_{CB}=5 V, f=1 MHz)	C_{CB}		8.5		pF
(V_{EB}=5 V, f=1 MHz)	C_{EB}		11		pF
Collector-Emitter Leakage Current (V_{CE}=10 V)	I_{CEO}		5	50	nA
Collector-Emitter Saturation Voltage (I_{CE}=1 mA, I_B=20 µA)	$V_{CE(SAT)}$		0.25	0.4	
Base-Emitter Voltage (V_{CE}=10 V, I_B=20 µA)	V_{BE}		0.65		V
DC Forward Current Gain (V_{CE}= 10 V, I_B=20 µA)	HFE	200	650	1800	
Saturated DC Forward Current Gain (V_{CE}= 0.4 V, I_B=20 µA)	HFE_{SAT}	120	400	600	
Thermal Resistance Junction to Lead	R_{THJL}		500		C°/W

Characteristics (Cont.)

	Symbol	Min.	Typ.	Max.	Unit
Package Transfer Characteristics					
ILD/Q1					
Saturated Current Transfer Ratio (Collector-Emitter) (I_F=10 mA, V_{CE}=0.4 V)	CTR_{CESAT}		75		%
Current Transfer Ratio (Collector-Emitter) (I_F=10 mA, V_{CE}=10 V)	CTR_{CE}	20	80	300	%
Current Transfer Ratio (Collector-Base) (I_F=10 mA, V_{CB}=9.3 V)	CTR_{CB}		0.25		%
ILD/Q2					
Saturated Current Transfer Ratio (Collector-Emitter) (I_F=10 mA, V_{CE}=0.4 V)	CTR_{CESAT}		170		%
Current Transfer Ratio (Collector-Emitter) (I_F=10 mA, V_{CE}=10 V)	CTR_{CE}	100	200	500	%
Current Transfer Ratio (I_F=10 mA, V_{CB}=9.3 V)	CTR_{CB}		0.35		%
ILD/Q5					
Saturated Current Transfer Ratio (Collector-Emitter) (I_F=10 mA, V_{CE}=0.4 V)	CTR_{CESAT}		100		%
Current Transfer Ratio (Collector-Emitter) (I_F=10 mA, V_{CE}=10 V)	CTR_{CE}	50	130	400	%
Current Transfer Ratio (I_F=10 mA, V_{CB}=9.3 V)	CTR_{CB}		0.3		%
Isolation and Insulation					
Common Mode Rejection Output High (V_{CM}=50 V_{P-P}, R_L=1 kΩ, I_F=0 mA)	CMH		5000		V/µs
Common Mode Rejection Output Low (V_{CM}=50 V_{P-P}, R_L=1 kΩ, I_F=10 mA)	CML		5000		V/µs
Common Mode Coupling Capacitance	C_{CM}		0.01		pF
Package Capacitance (V_{I-O}=0 V, f=1 MHz.)	C_{I-O}	0.8			pF
Insulation Resistance (V_{I-O}=500 V)	R_S	5^{+10}	10^{+14}		Ω
Dielectric Leakage Current (V_{IO}=4420 $AC_{(RMS)}$, 1 min., 60 Hz)	I_{I-O}		3.3	10	µA
(V_{IO}=6250 VDC, 1 min.)			0.5	10	µA
(V_{IO}=5304 $AC_{(RMS)}$, 1 sec., 60 Hz)			4	10	µA
(V_{IO}=7500 VDC, 1 sec.)			0.6	12	µA

Optocouplers (Optoisolators)

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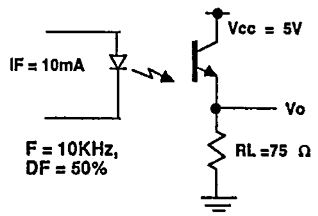
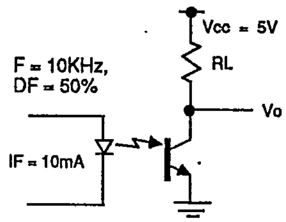
SWITCHING TIMES

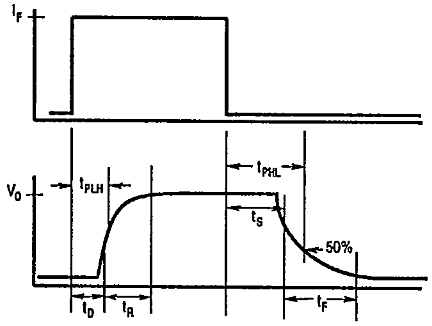
Non-Saturated Switching



Saturated Switching

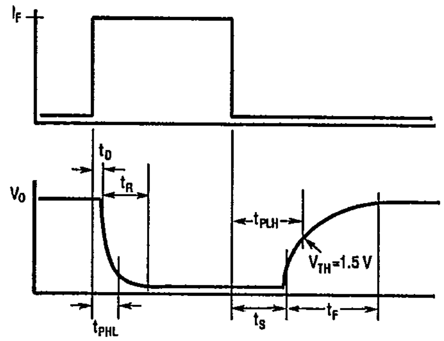


Non-Saturated Switching Timing



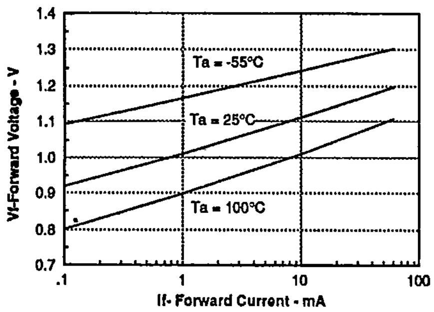
Characteristic		ILD/Q1 I_F=20 mA	ILD/Q2 I_F=5 mA	ILD/Q5 I_F=10 mA	Unit
Delay	T_D	0.8	1.7	1.7	µs
Rise Time (V_{CC}=5 V)	t_R	1.9	2.6	2.6	µs
Storage (R_L=75 Ω)	t_S	0.2	0.4	0.4	µs
Fall Time	t_F	1.4	2.2	2.2	µs
Propagation H-L (50% of V_{PP})	t_{PHL}	0.7	1.2	1.1	µs
Propagation L-H	t_{PLH}	1.4	2.3	2.5	µs

Saturated Switching Timing

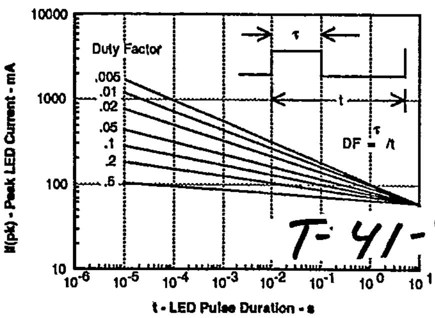


Characteristic		ILD/Q1 I_F=20 mA	ILD/Q2 I_F=5 mA	ILD/Q5 I_F=10 mA	Unit
Delay	T_D	0.8	1	1.7	µs
Rise Time (V_{CE}=0.4 V)	t_R	1.2	2	7	µs
Storage (R_L=1 kΩ)	t_S	7.4	5.4	4.6	µs
Fall Time (V_{CC}=5 V)	t_F	7.6	13.5	20	µs
Propagation H-L (V_{TH}=1.5 V)	t_{PHL}	1.6	5.4	2.6	µs
Propagation L-H	t_{PLH}	8.6	7.4	7.2	µs

Forward voltage versus forward current



Peak LED current versus duty factor, Tau



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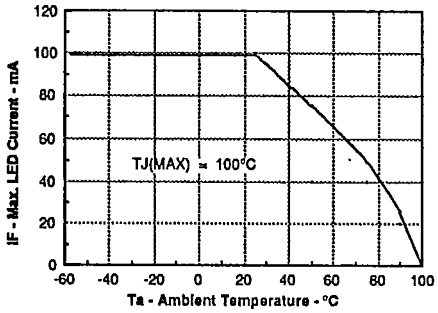
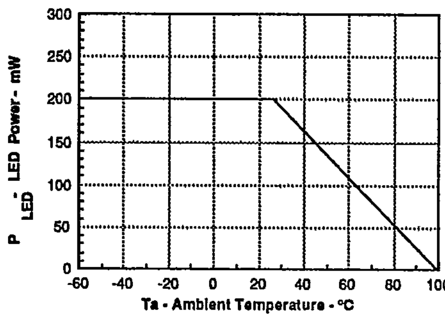
Maximum LED current versus ambient temperature

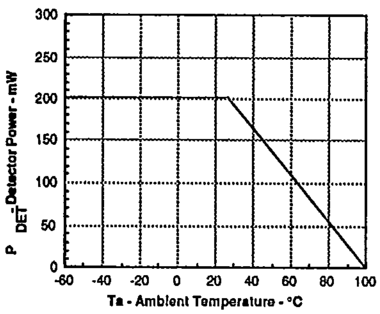


Maximum LED power dissipation

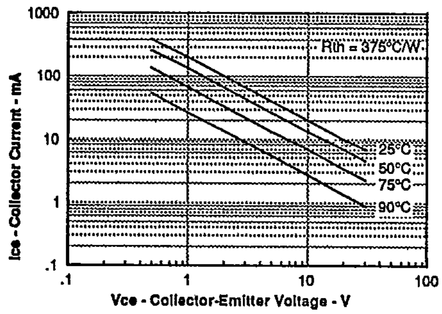


Optocouplers (Optoisolators)

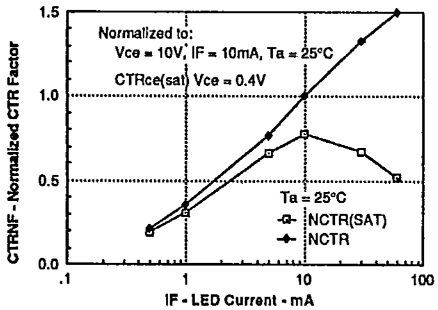
Maximum detector power dissipation



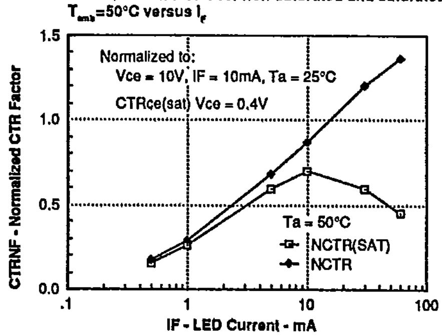
Maximum collector current versus collector voltage



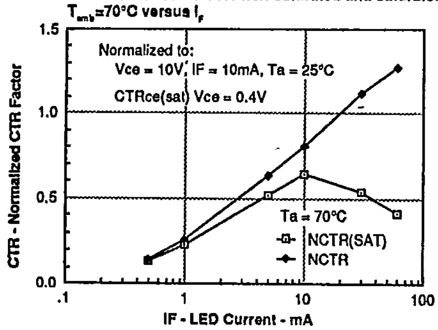
Normalization factor for non-saturated and saturated CTR T_{amb}=25°C versus I_F



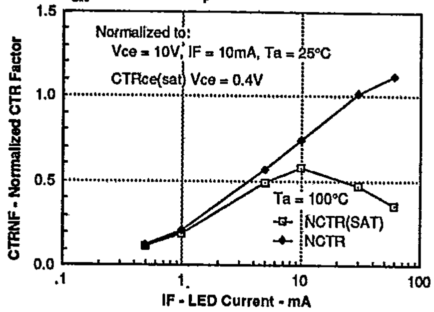
Normalization factor for non-saturated and saturated CTR T_{amb}=50°C versus I_F



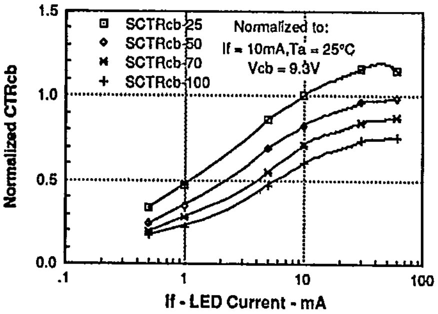
Normalization factor for non-saturated and saturated CTR T_{amb}=70°C versus I_F



Normalization factor for non-saturated and saturated CTR T_{amb}=100°C versus I_F



Normalized CTR_{cb} versus LED Current



Collector current versus diode forward current

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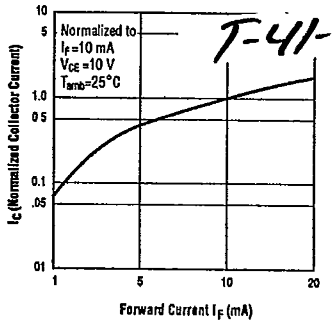
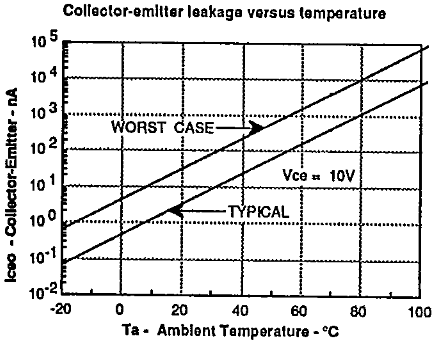
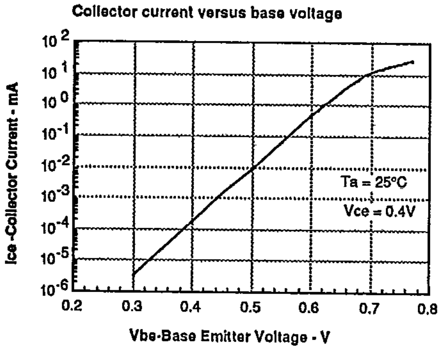


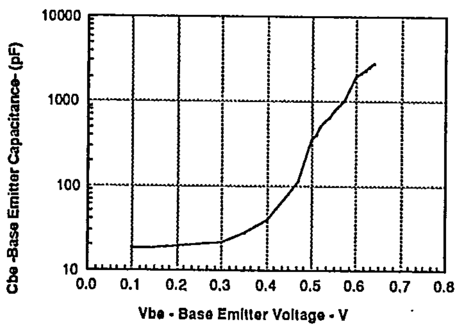
Collector-emitter leakage versus temperature



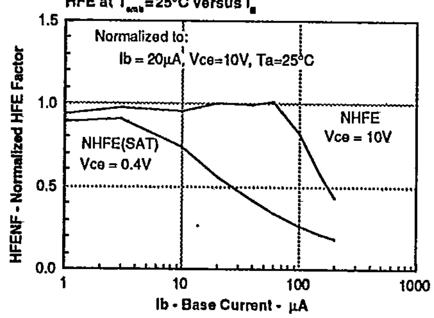
Collector current versus base voltage



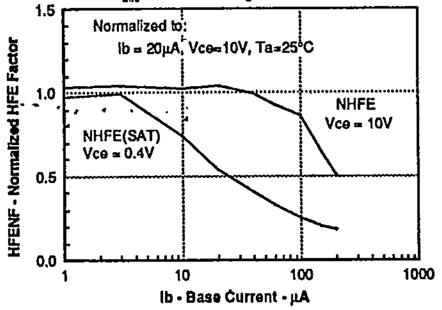
C_{BE} versus V_{BE}



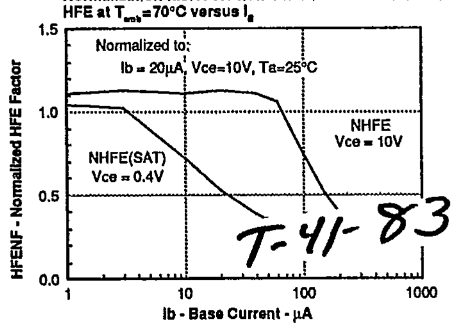
Normalization factor for non-saturated and saturated HFE at T_{amb}=25°C versus I_B



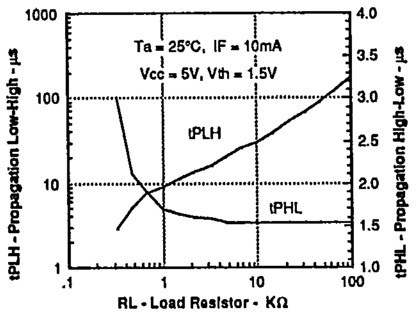
Normalization factor for non-saturated and saturated HFE at T_{amb}=50°C versus I_B



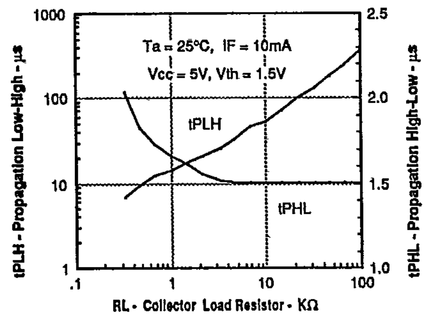
Normalization factor for non-saturated and saturated HFE at T_{amb}=70°C versus I_B



ILD/Q1 propagation delay versus collector load resistor



ILD/Q2 propagation delay versus collector load resistor



Optocouplers
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ILD/Q5 propagation delay versus collector load resistor