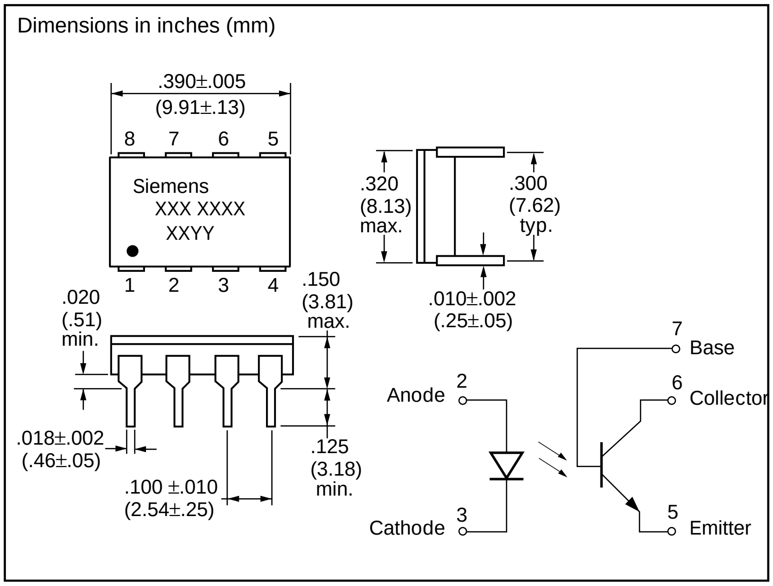
SIEMENS

ILH100
HERMETIC PHOTOTRANSISTOR OPTOCOUPLER

FEATURES
- **Operating Temperature Range, –55°C to +125°C**
- **Current Transfer Ratio Guaranteed from –55°C to +100°C Ambient Temperature Range**
- **High Current Transfer Ratio at Low Input Current**
- **Isolation Test Voltage, 3000 VDC**
- **Base Lead Available for Transistor Biasing**
- **Standard 8 Pin DIP Package**

DESCRIPTION
The ILH100 is designed especially for hi-rel applications requiring optical isolation with high current transfer ratio and low saturation VCE. Each optocoupler consists of a light emitting diode and a NPN silicon phototransistor mounted and coupled in an 8 pin hermetically sealed DIP package. The ILH100's low input current makes it well suited for direct CMOS to LSTTL/TTL interfaces.



Maximum Ratings

Emitter

Reverse Voltage ....6.0 V
Forward Current ....60 mA
Peak Forward Current(1) ....1 A
Power Dissipation....................150 mW
Derate Linearly from 25°C....................1.5 mW/°C

Detector

Collector–Emitter Voltage ....70 V
Emitter–Base Voltage ....7 V
Collector–Base Voltage ....70 V
Continuous Collector Current....................50 mA
Power Dissipation....................300 mW
Derate Linearly from 25°C....................3.0 mW/°C

Package

Input–Output Isolation Test Voltage(2) .... 3000 VDC
Storage Temperature Range ....–65°C to +150°C
Operating Temperature Range....................–55 to +125°C
Junction Temperature....................150°C
Soldering Time at 240°C, 1.6 mm from case .... 10 sec.
Power Dissipation....................350 mW
Derate Linearly from 25°C....................3.5 mW/°C

Notes:
1. Values applies for P_W≤1 ms, PRR£300 pps.
2. Measured between pins 1,2,3 and 4 shorted together and pins 5,6,7 and 8 shorted together. T_A=25°C and duration=1 second, RH=45%.

Characteristics (T_A=25°C, unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Emitter						
Forward Voltage	V_F		1.45	1.7	V	I_F=60 mA
Reverse Breakdown Voltage	V_{BR}	6			V	I_R=10 µA
Reverse Current	I_R		0.01	10	µA	V_R=6 V
Capacitance	C_J		20		pF	V_F=0 V, f=1 MHz
Thermal Resistance	R_{TH}		220		°C/W	Junction to Lead
Detector						
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		0.25	0.4	V	I_B=20µA, I_{CE}=1 mA
Base-Emitter Voltage	V_{BE}		0.65		V	I_B=20µA
Collector-Emitter Leakage Current	I_{CEO}		5	50	nA	V_{CE}=10 V
DC Forward Current Gain	HFE	250	400	750		V_{CE}=10 V, I_B=20µA
Saturated DC Forward Gain	$HFE_{(sat)}$	125	200	325		V_{CE}=0.4 V, I_B=20µA
Capacitance	C_{CE} C_{CB} C_{EB}		6.8 8.5 11		pF pF pF	V_{CE}=5 V, f=1 MHz
Thermal Resistance	R_{TH}		220		°C/W	Junction to Lead
Coupled Characteristics (-55°C to 100° C)						
Saturated Current Transfer Ratio	$CTR_{(sat)}$	70	210	250	%	I_F=10 mA V_{CE}=0.4 V
Current Transfer Ratio, Collector-Emitter	CTE_{ce}	100	300	450	%	I_F=10 mA, V_{CE}=10 V
Current Transfer Ratio, Collector-Base	CTR_{cb}	0.4	0.7	0.9	%	I_F=10 mA, V_{CB}=9.3 V
Isolation and Insulation						
Common Mode Rejection Output High	CM_H	1000	2000		V/µs	V_{CM}=500 V_{p-p}, V_{CC}=5 V, R_L=1 KΩ, I_F=0 mA
Common Mode Rejection Output High	CM_L	1000	2000		V/µs	V_{CM}=500 V_{p-p}, V_{CC}=5 V, R_L=1 KΩ, I_F=10 mA
Package Capacitance	C_{IO}		1.5		pF	V_{IO}=0 V, 1 MHz
Insulation Resistance	R_{IO}	10^{11}	10^{14}		Ω	V_{IO}=500 VDC
Leakage Current, Input-Output	I_{IO}			10	µA	Relative Humidity ≤50%, V_{IO} 3000 VDC, 5 sec.

Typical Switching Speeds (T_A=25°C)

Non-Saturated Switching	Symbol	Typ.	Max.	Unit	Test Condition
Delay	td	0.8	2	µs	
Rise	tr	2	5	µs	V_{CC}=5 V
Storage	ts	0.4	1.5	µs	R_L=75 Ω
Fall	tf	2	5	µs	I_F=10 mA
Propagation-High to Low	tpHL	1	3	µs	50% of V_{PP}
Propagation-Low to High	tpLH	1.5	4	µs	R_{BE}=open
Saturated Switching(1)					
Delay	td	0.7	2	µs	V_{CE}=0.4 V
Rise	tr	1	3	µs	V_{CE}=0.4 V
Storage	ts	13.5	30	µs	R_L=1 KΩ
Fall	tf	12	30	µs	I_F=10 mA
Propagation-High to Low	tpHL	1.4	5	µs	V_{CC}=5 V, V_{TH}=1.5 V
Propagation-Low to High	tpLH	15	40	µs	R_{BE}=open

Figure 1. Switching time waveform and test schematic—non-saturated test condition

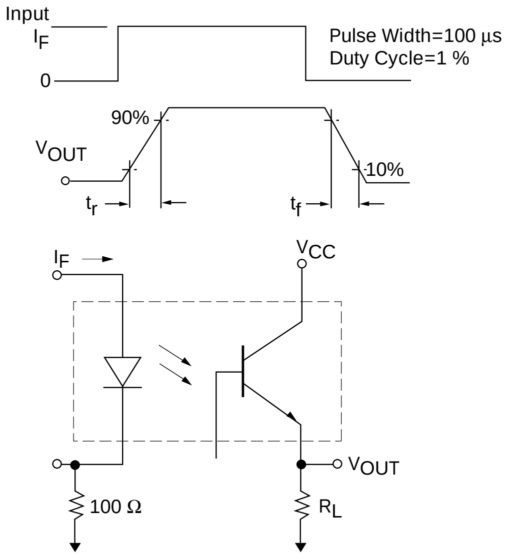


Figure 2. Forward current versus forward voltage and temperature

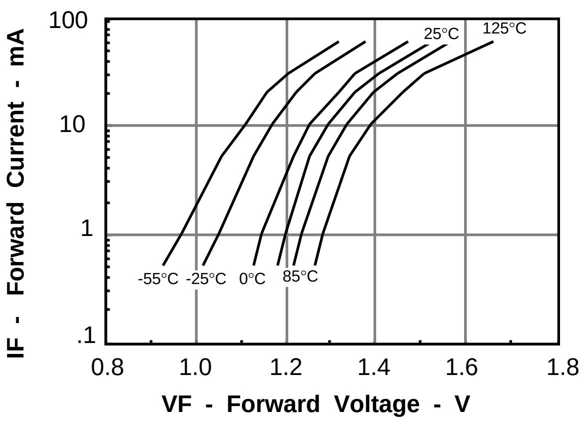


Figure 3. Peak LED current versus duty factor refresh rate and temperature

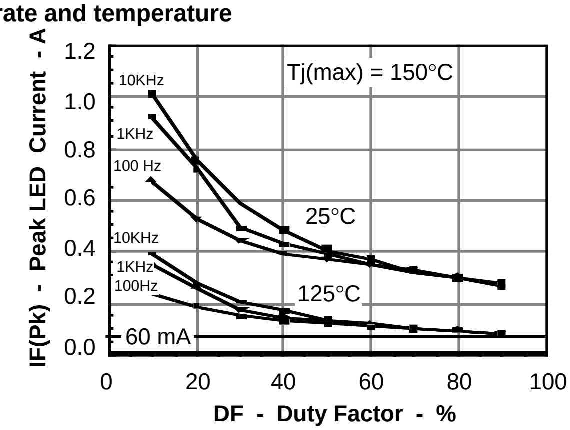


Figure 4. Normalized non-saturated current transfer ratio versus temperature and LED current

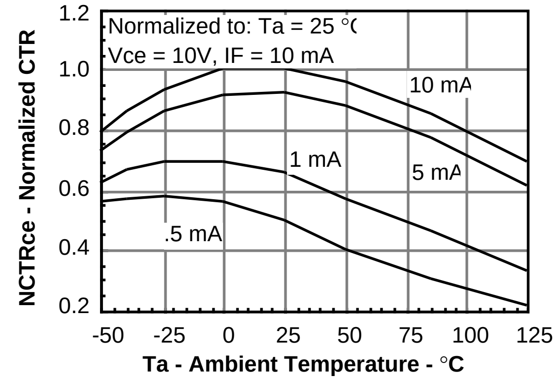


Figure 5. Normalized saturated current transfer ratio versus temperature and LED current

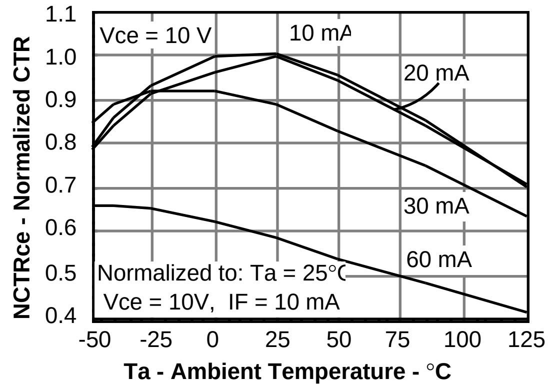


Figure 6. Normalized saturated current transfer ratio versus temperature and LED current

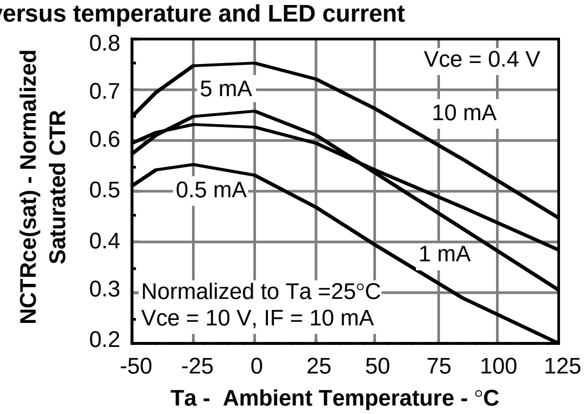


Figure 7. Collector-emitter current versus temperature and LED current

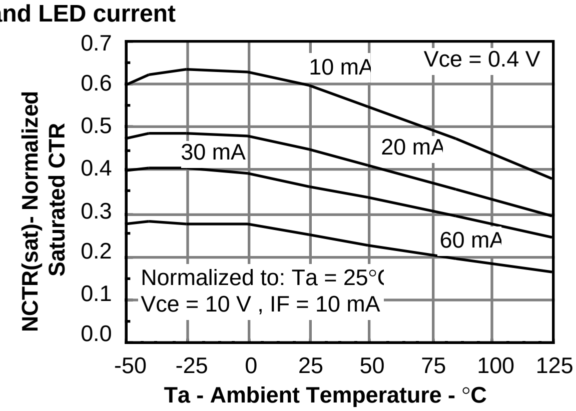


Figure 8. Collector-emitter current versus temperature and LED current

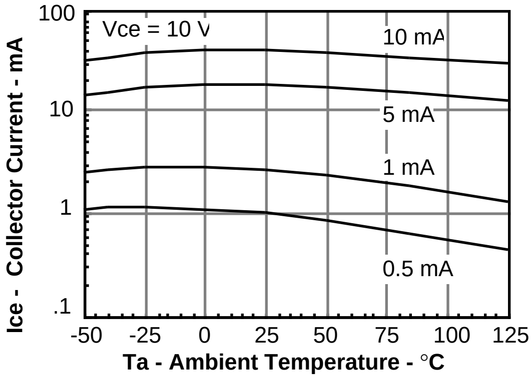


Figure 12. Normalized collector base CRT versus temperature and LED current

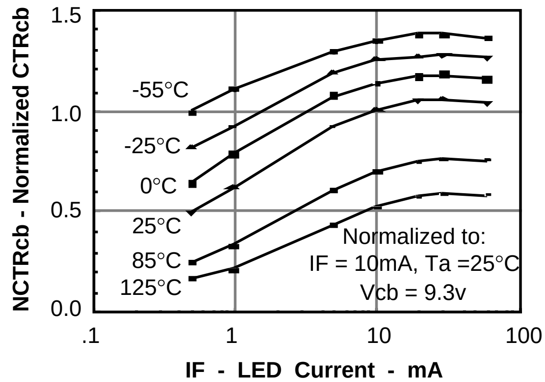


Figure 9. Collector-emitter current versus temperature and LED current

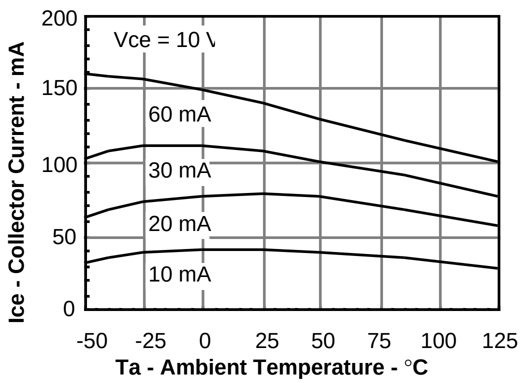


Figure 13. Normalizied Icb photocurrent versus temperature and LED current

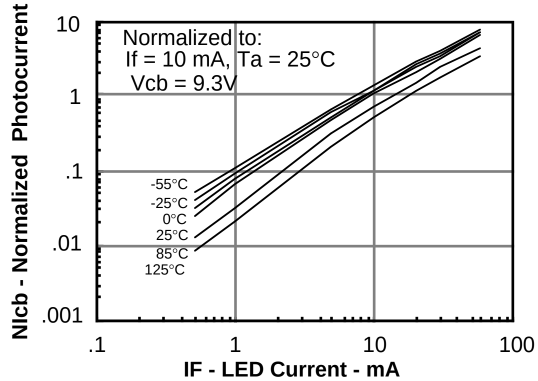


Figure 10. Saturated collector-emitter current versus temperature and LED current

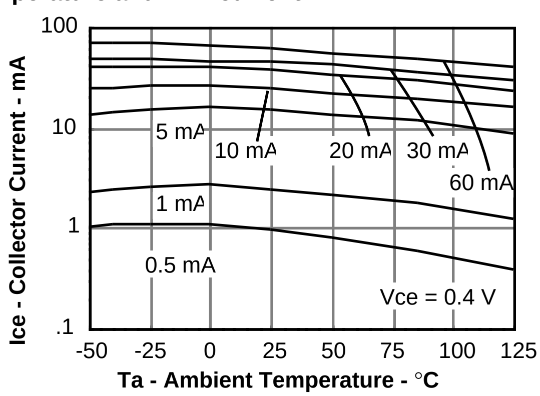


Figure 14. Normalized non-saturated and saturated HFE at T_A=25°C versus base current

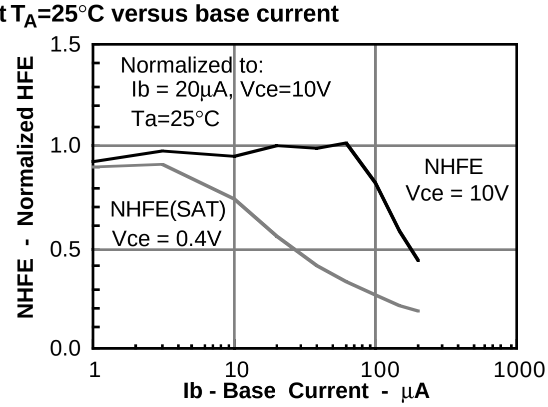


Figure 11. Saturated collector-emitter current versus temperature and LED current

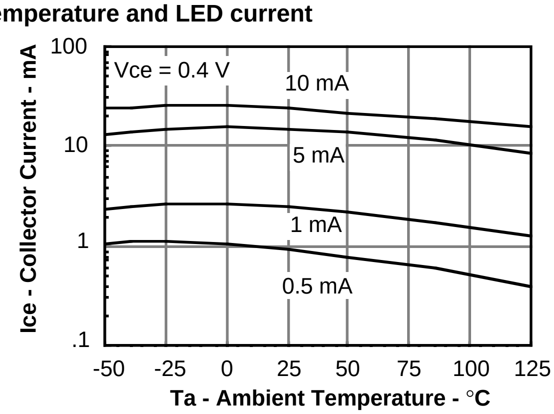


Figure 15. Normalizied non-saturated and saturated HFE at T_A=50°C versus base current

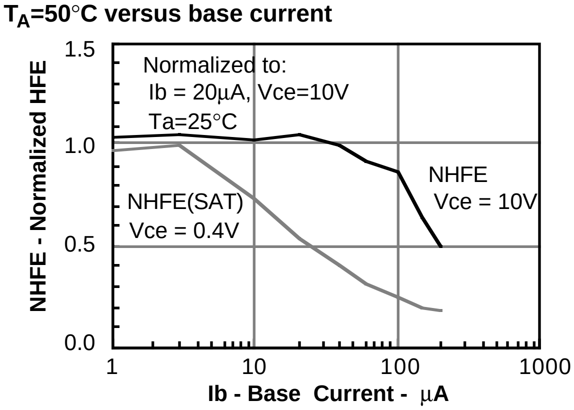


Figure 16. Normalized non-saturated and saturated HFE at T_A=70°C versus base current

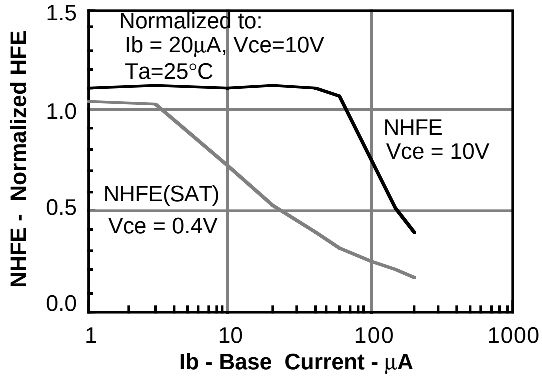


Figure 17. Collector-emitter leakage current versus temperature

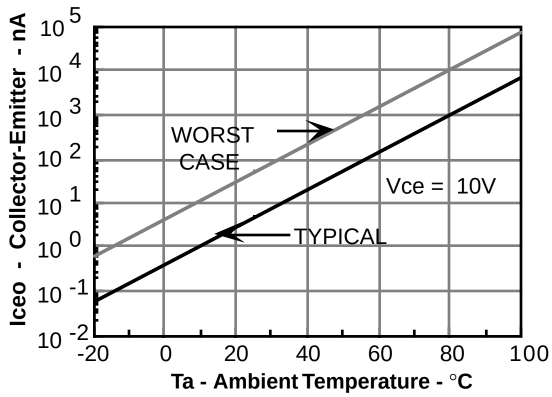


Figure 18. Base emitter voltage versus base current

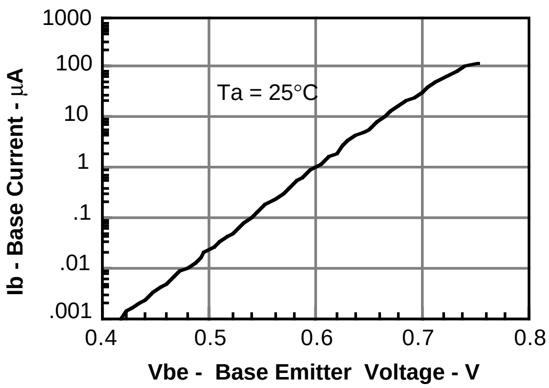


Figure 19. Base emitter capacitance versus base emitter voltage

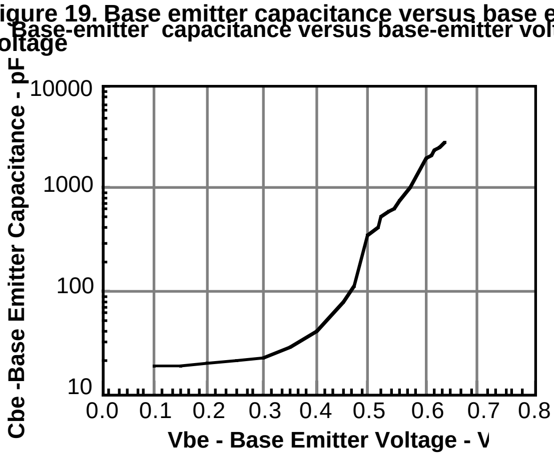


Figure 20. Propagation delay versus temperatureand collector load resistance for I_F=5 mA

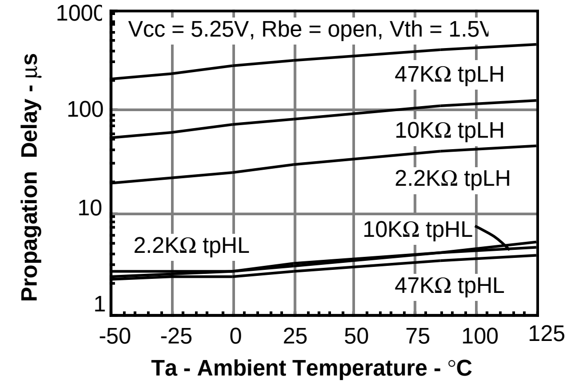


Figure 21. Propagation delay versus temperatureand collector load resistance for I_F=10 mA

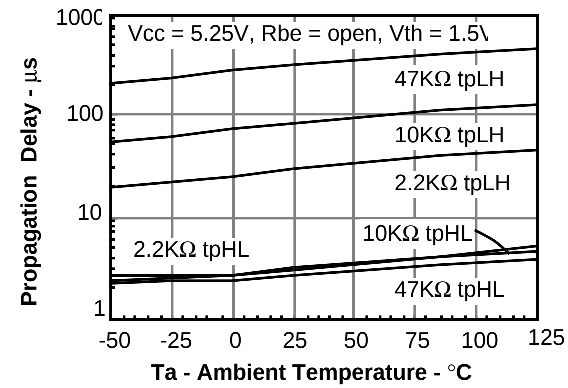


Figure 22. Propagation delay versus temperatureand collector load resistance for I_F=20 mA

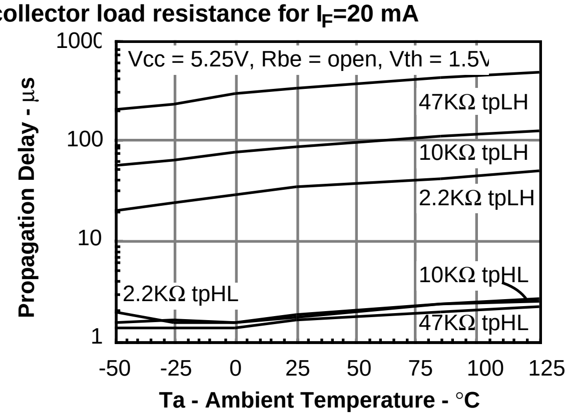


Figure 23. Propagation delay versus temperatureand collector load resistance for I_F=5 mA

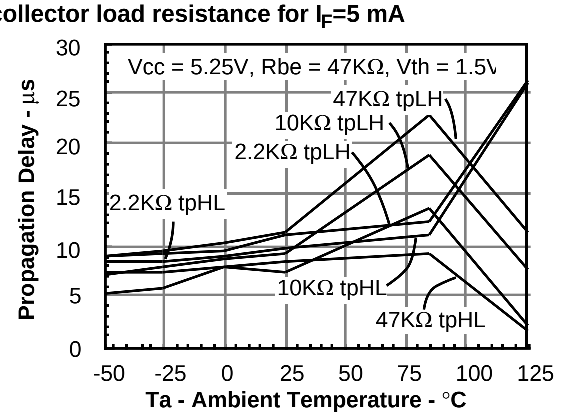


Figure 24. Switching time waveform and test schematic—saturated test condition

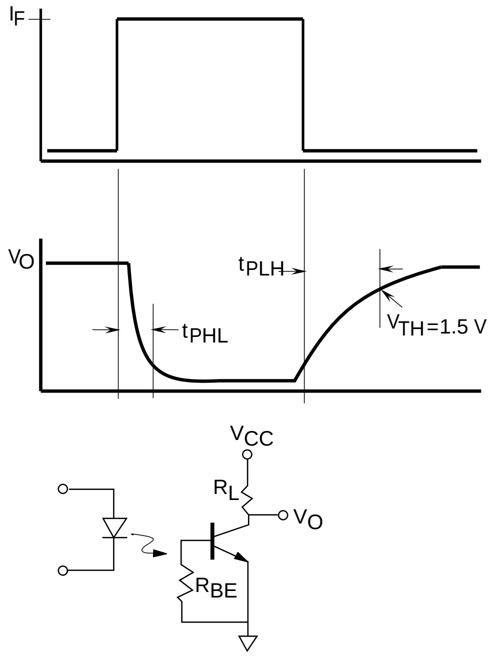


Figure 25. Propagation delay versus temperature and collector load resistance for I_F=10 mA

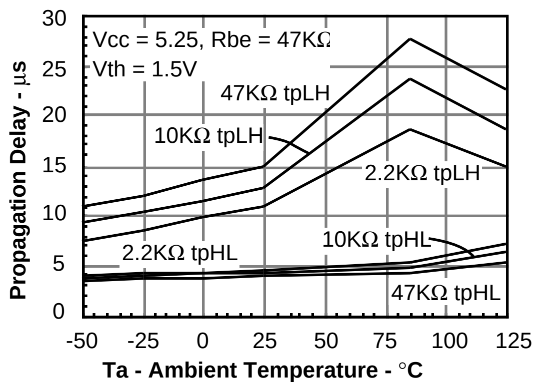


Figure 26. Propagation delay versus temperature and collector load resistance for I_F=20 mA

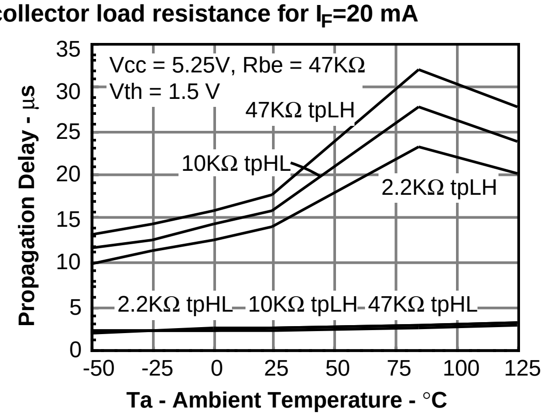


Figure 27. Propagation delay versus collector load and base-emitter resistance for I_F=5 mA

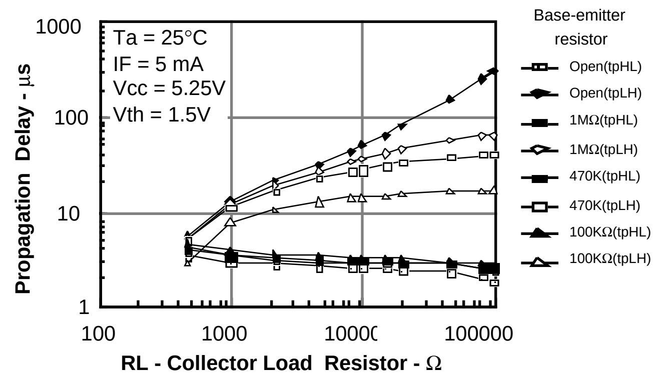


Figure 28. Propagation delay versus collector load and base-emitter resistance for I_F=5 mA

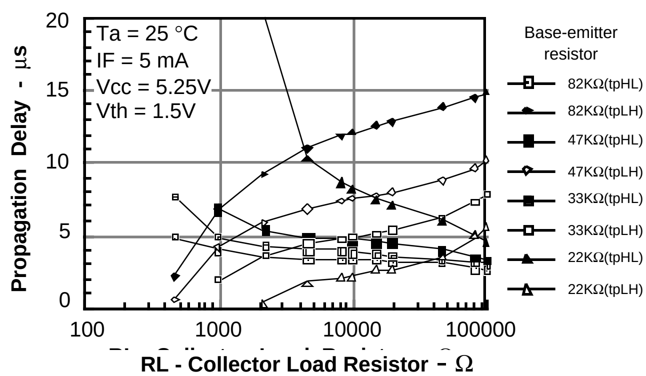


Figure 29. Propagation delay versus collector load and base-emitter resistance for I_F=10 mA

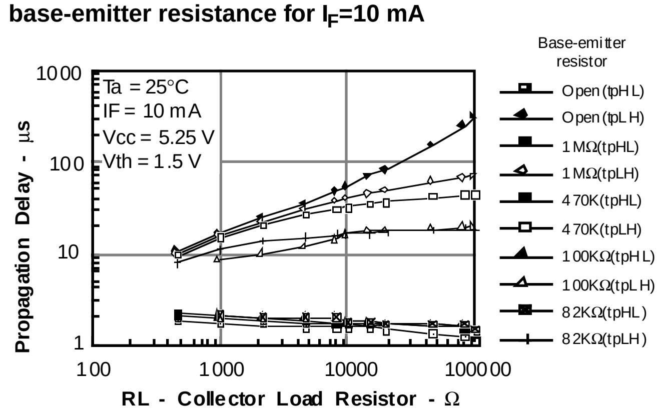


Figure 30. Propagation delay versus collector load and base-emitter resistance for I_F=10 mA

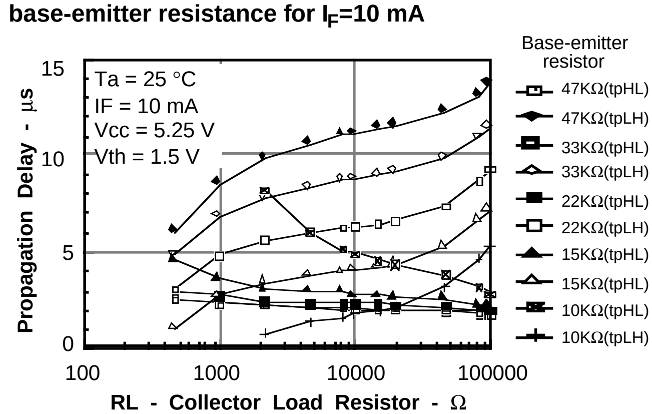


Figure 31. Propagation delay versus collector load and base-emitter resistance for I_F=15 mA

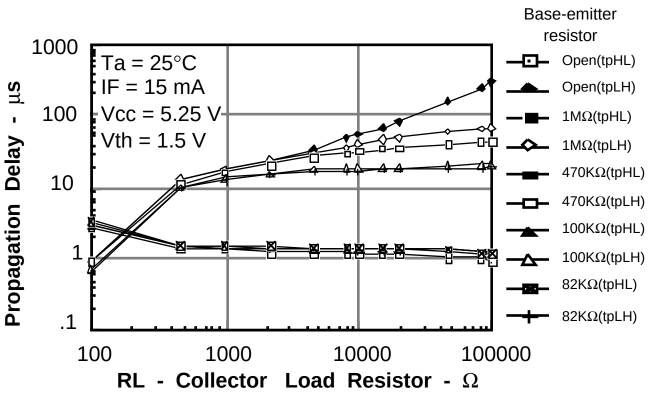


Figure 32. Propagation delay versus collector load and base-emitter resistance for I_F=15 mA

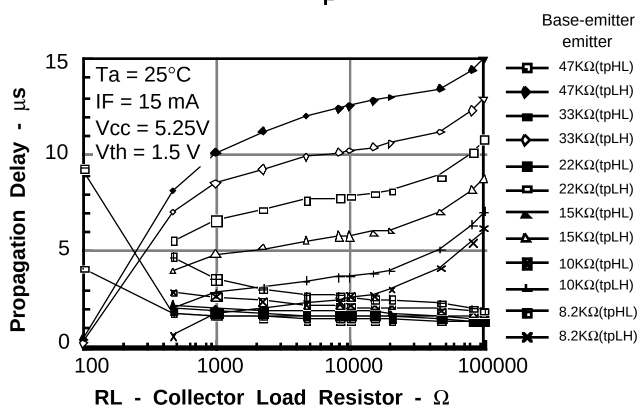


Figure 33. Propagation delay versus collector load and base-emitter resistance for I_F=15 mA

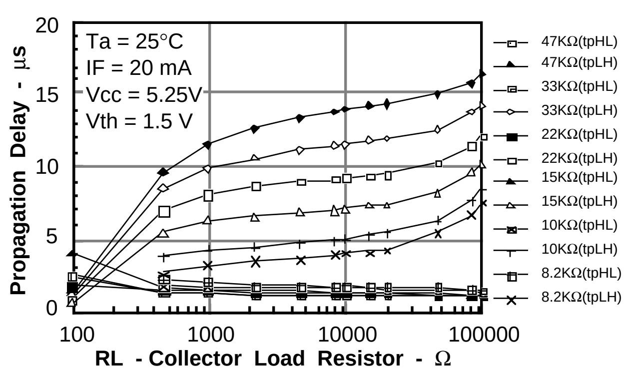


Figure 34. Propagation delay versus collector load and base-emitter resistance for I_F=15 mA

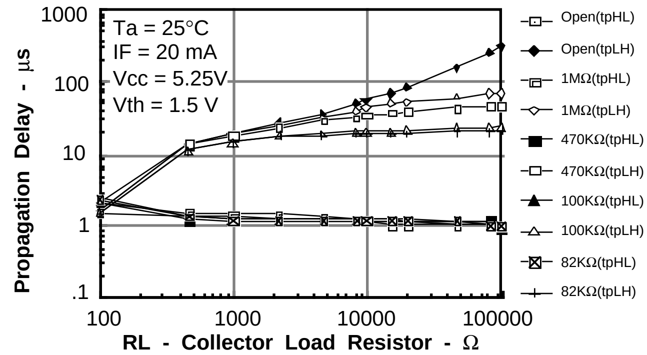


Figure 35. Common mode transient rejection