



**MTIL113**

**6-Pin DIP Optoisolators  
Darlington Output**

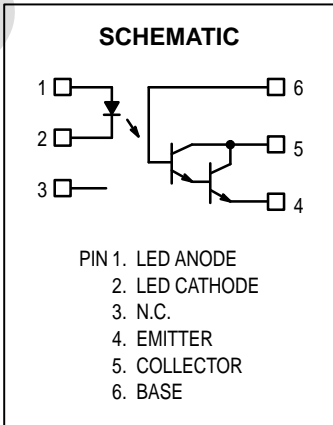
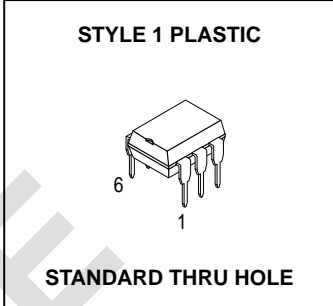
The MTIL113 device consists of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon photodarlington detector.

This device is designed for use in applications requiring high collector output currents at lower input currents.

- Higher Sensitivity to Low Input Drive Current
- Meets or Exceeds All JEDEC Registered Specifications

**Applications**

- Low Power Logic Circuits
- Interfacing and coupling systems of different potentials and impedances
- Telecommunications Equipment
- Portable Electronics
- Solid State Relays



**MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Rating	Symbol	Value	Unit
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**INPUT LED**

Reverse Voltage	$V_R$	3	Volts
Forward Current — Continuous	$I_F$	60	mA
LED Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	100 1.41	mW mW/ $^\circ\text{C}$

**OUTPUT DETECTOR**

Collector–Emitter Voltage	$V_{CEO}$	30	Volts
Emitter–Collector Voltage	$V_{ECO}$	5	Volts
Collector–Base Voltage	$V_{CBO}$	30	Volts
Collector Current — Continuous	$I_C$	125	mA
Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	150 1.76	mW mW/ $^\circ\text{C}$

**TOTAL DEVICE**

Isolation Surge Voltage <sup>(2)</sup> (Peak ac Voltage, 60 Hz, 1 sec Duration)	$V_{ISO}$	7500	Vac(pk)
Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	250 2.94	mW mW/ $^\circ\text{C}$
Ambient Operating Temperature Range <sup>(3)</sup>	$T_A$	-55 to +100	$^\circ\text{C}$
Storage Temperature Range <sup>(3)</sup>	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Soldering Temperature (10 sec, 1/16" from case)	$T_L$	260	$^\circ\text{C}$

1. All Motorola 6–Pin devices exceed JEDEC specification and are 7500 Vac(pk).
2. Isolation surge voltage is an internal device dielectric breakdown rating. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.
3. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.

# MTIL113

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)<sup>(1)</sup>

Characteristic	Symbol	Min	Typ <sup>(1)</sup>	Max	Unit
<b>INPUT LED</b>					
Reverse Leakage Current ( $V_R = 3\text{ V}$ , $R_L = 1\text{ M ohms}$ )	$I_R$	—	0.05	100	$\mu\text{A}$
Forward Voltage ( $I_F = 10\text{ mA}$ )	$V_F$	—	1.34	1.5	Volts
Capacitance ( $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ )	$C$	—	1.8	—	$\text{pF}$

## OUTPUT DETECTOR ( $T_A = 25^\circ\text{C}$ and $I_F = 0$ , unless otherwise noted)

Collector–Emitter Dark Current ( $V_{CE} = 10\text{ V}$ , Base Open)	$I_{CEO}$	—	—	100	$\text{nA}$
Collector–Base Breakdown Voltage ( $I_C = 100\ \mu\text{A}$ , $I_E = 0$ )	$V_{(BR)CBO}$	30	—	—	Volts
Collector–Emitter Breakdown Voltage ( $I_C = 100\ \mu\text{A}$ , $I_B = 0$ )	$V_{(BR)CEO}$	30	—	—	Volts
Emitter–Collector Breakdown Voltage ( $I_E = 100\ \mu\text{A}$ , $I_B = 0$ )	$V_{(BR)ECO}$	5	—	—	Volts
DC Current Gain ( $V_{CE} = 5\text{ V}$ , $I_C = 500\ \mu\text{A}$ )	$h_{FE}$	—	16K	—	—

## COUPLED ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Collector Output Current <sup>(3)</sup> ( $V_{CE} = 1\text{ V}$ , $I_F = 10\text{ mA}$ )	$I_C$ (CTR) <sup>(2)</sup>	30 (300)	—	—	$\text{mA} (\%)$
Isolation Surge Voltage <sup>(4,5)</sup> (60 Hz ac Peak, 1 Second)	$V_{ISO}$	7500	—	—	$\text{Vac}(\text{pk})$
Isolation Resistance <sup>(4)</sup> ( $V = 500\text{ V}$ )	$R_{ISO}$	—	$10^{11}$	—	Ohms
Collector–Emitter Saturation Voltage <sup>(3)</sup> ( $I_C = 2\text{ mA}$ , $I_F = 8\text{ mA}$ )	$V_{CE(\text{sat})}$	—	—	1.25	Volts
Isolation Capacitance <sup>(4)</sup> ( $V = 0\text{ V}$ , $f = 1\text{ MHz}$ )	$C_{ISO}$	—	0.2	—	$\text{pF}$
Turn–On Time <sup>(6)</sup> ( $I_C = 50\text{ mA}$ , $I_F = 200\text{ mA}$ , $V_{CC} = 10\text{ V}$ )	$t_{\text{on}}$	—	0.6	5	$\mu\text{s}$
Turn–Off Time <sup>(6)</sup> ( $I_C = 50\text{ mA}$ , $I_F = 200\text{ mA}$ , $V_{CC} = 10\text{ V}$ )	$t_{\text{off}}$	—	45	100	$\mu\text{s}$

1. Always design to the specified minimum/maximum electrical limits (where applicable).
2. Current Transfer Ratio (CTR) =  $I_C/I_F \times 100\%$ .
3. Pulse Test: Pulse Width =  $300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
4. For this test, Pins 1 and 2 are common and Pins 4, 5 and 6 are common.
5. Isolation Surge Voltage,  $V_{ISO}$ , is an internal device dielectric breakdown rating.
6. For test circuit setup and waveforms, refer to Figures 8 and 9.

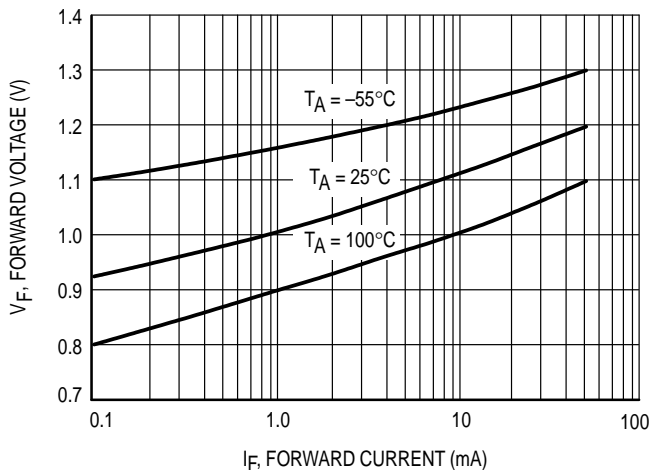


Figure 1. Forward Voltage versus Forward Current

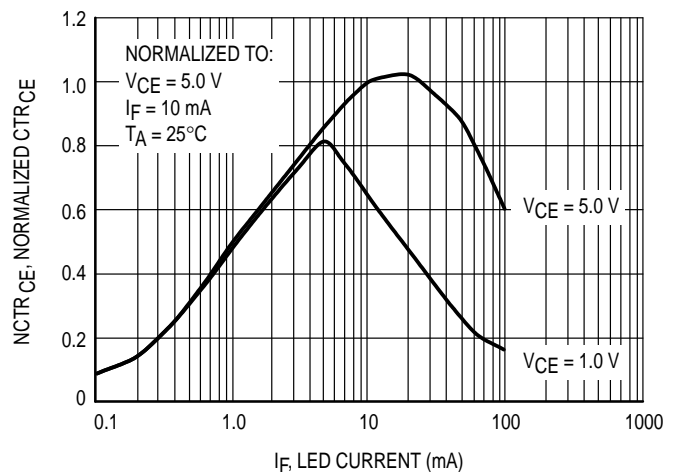


Figure 2. Normalized Non–Saturated and Saturated CTRce versus LED Current

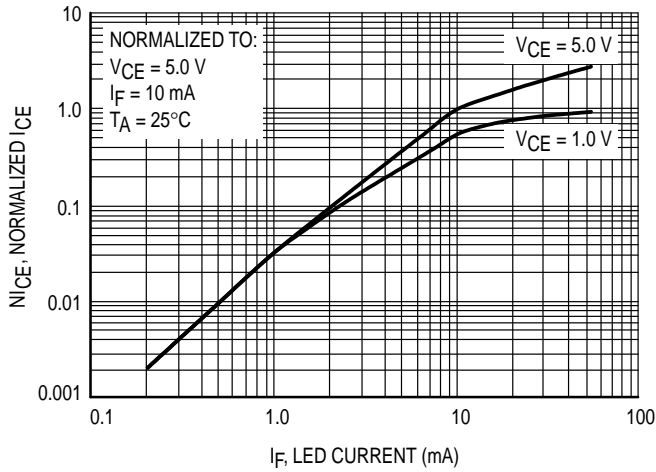


Figure 3. Normalized Non-Saturated and Saturated Collector-Emitter Current versus LED Current

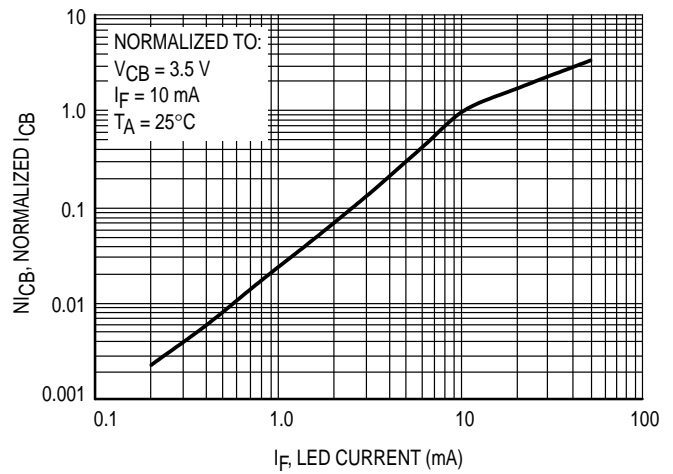


Figure 4. Normalized Collector-Base Photocurrent versus LED Current

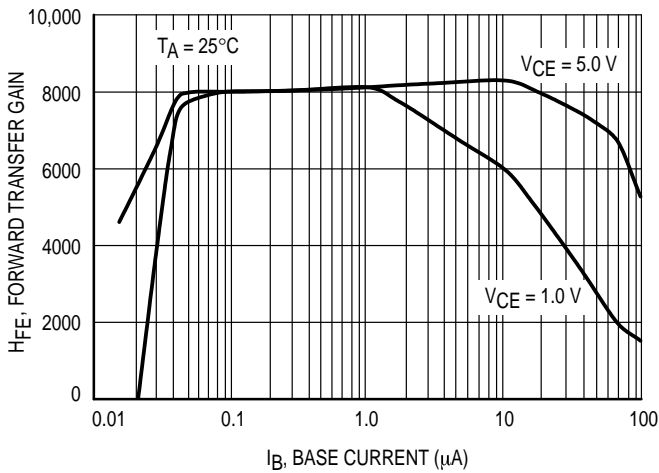


Figure 5. Non-Saturated and Saturated HFE versus Base Current

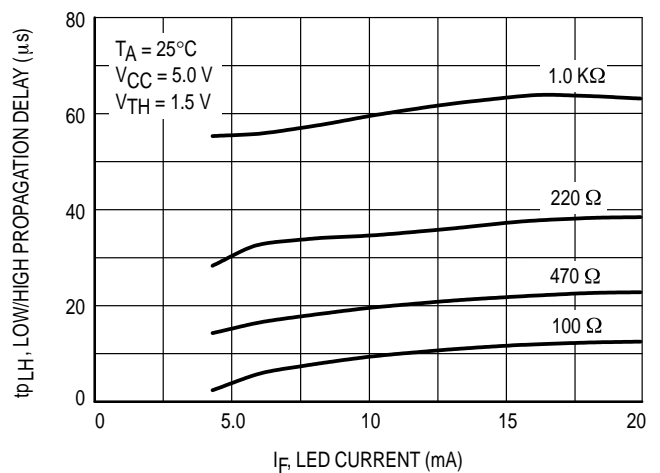


Figure 6. Low to High Propagation Delay versus Collector Load Resistance and LED Current

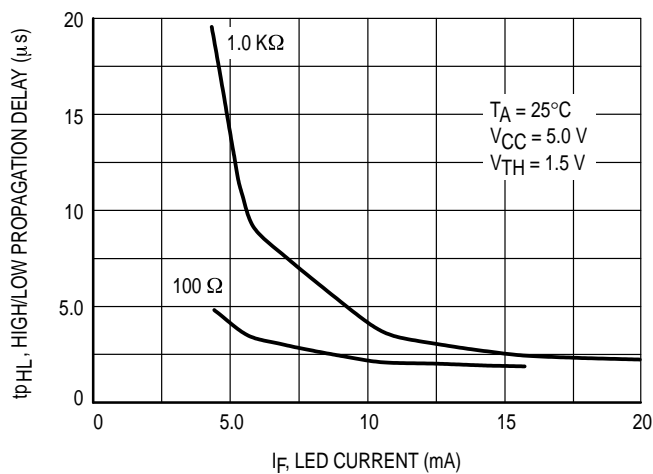


Figure 7. High to Low Propagation Delay versus Collector Load Resistance and LED Current

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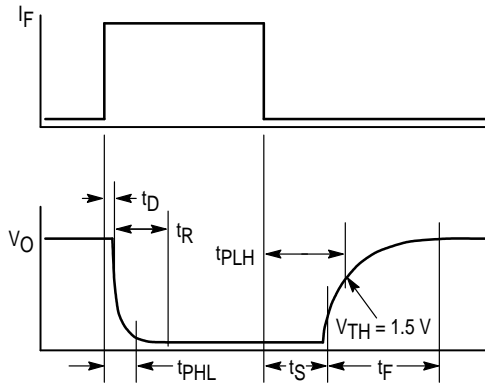


Figure 8. Switching Waveform

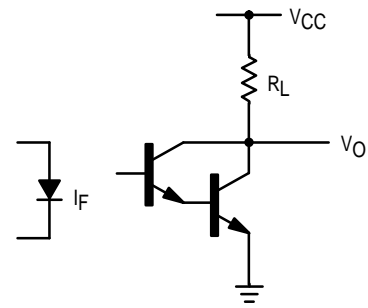
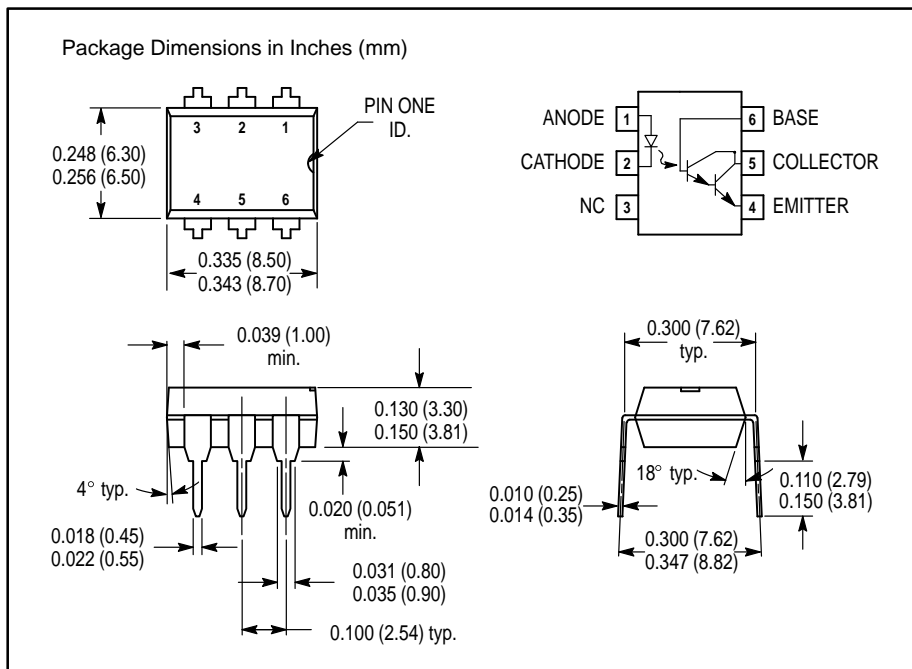



Figure 9. Switching Schematic



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