



MTIL113

**6-Pin DIP Optoisolators
Darlington Output**

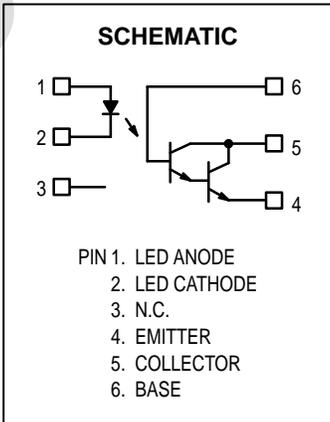
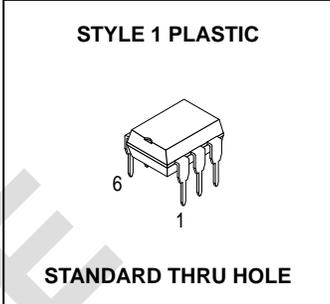
The MTIL113 device consists of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon photodarlington detector.

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
--------	--------	-------	------

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°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°C	P_D	150 1.76	mW mW/ $^\circ\text{C}$

TOTAL DEVICE

Isolation Surge Voltage ⁽²⁾ (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°C	P_D	250 2.94	mW mW/ $^\circ\text{C}$
Ambient Operating Temperature Range ⁽³⁾	T_A	-55 to +100	$^\circ\text{C}$
Storage Temperature Range ⁽³⁾	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)⁽¹⁾

Characteristic	Symbol	Min	Typ ⁽¹⁾	Max	Unit
INPUT LED					
Reverse Leakage Current ($V_R = 3\text{ V}$, $R_L = 1\text{ M ohms}$)	I_R	—	0.05	100	μA
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	—	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	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 ⁽³⁾ ($V_{CE} = 1\text{ V}$, $I_F = 10\text{ mA}$)	I_C (CTR) ⁽²⁾	30 (300)	—	—	$\text{mA} (\%)$
Isolation Surge Voltage ^(4,5) (60 Hz ac Peak, 1 Second)	V_{ISO}	7500	—	—	$V_{ac}(\text{pk})$
Isolation Resistance ⁽⁴⁾ ($V = 500\text{ V}$)	R_{ISO}	—	10^{11}	—	Ohms
Collector–Emitter Saturation Voltage ⁽³⁾ ($I_C = 2\text{ mA}$, $I_F = 8\text{ mA}$)	$V_{CE(\text{sat})}$	—	—	1.25	Volts
Isolation Capacitance ⁽⁴⁾ ($V = 0\text{ V}$, $f = 1\text{ MHz}$)	C_{ISO}	—	0.2	—	pF
Turn–On Time ⁽⁶⁾ ($I_C = 50\text{ mA}$, $I_F = 200\text{ mA}$, $V_{CC} = 10\text{ V}$)	t_{on}	—	0.6	5	μs
Turn–Off Time ⁽⁶⁾ ($I_C = 50\text{ mA}$, $I_F = 200\text{ mA}$, $V_{CC} = 10\text{ V}$)	t_{off}	—	45	100	μs

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.

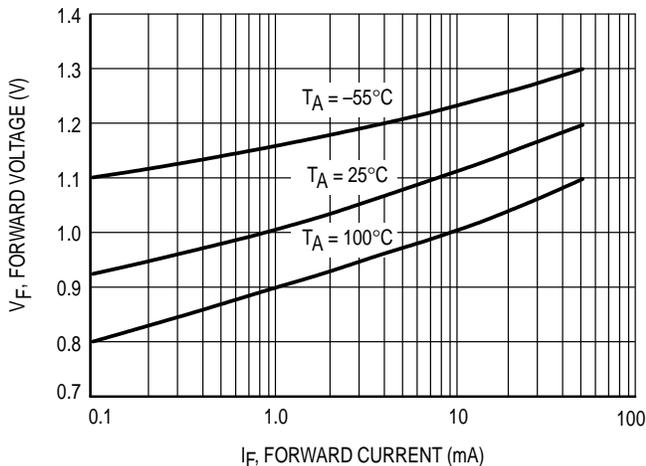


Figure 1. Forward Voltage versus Forward Current

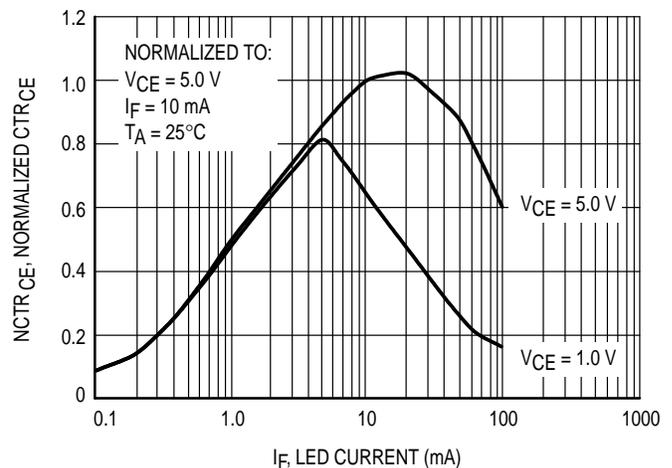


Figure 2. Normalized Non–Saturated and Saturated CTRce versus LED Current

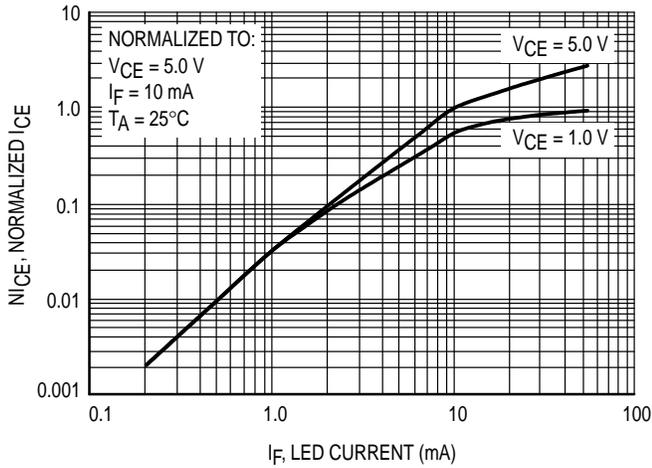


Figure 3. Normalized Non-Saturated and Saturated Collector-Emitter Current versus LED Current

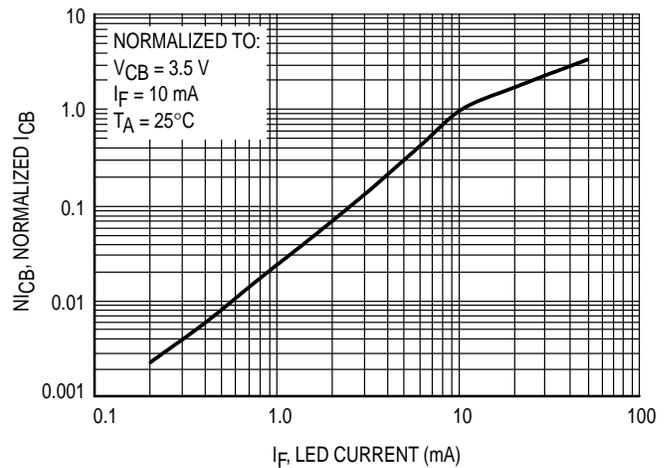


Figure 4. Normalized Collector-Base Photocurrent versus LED Current

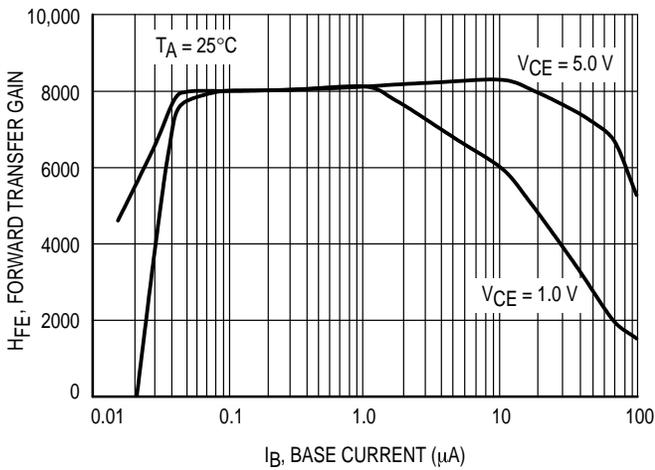


Figure 5. Non-Saturated and Saturated HFE versus Base Current

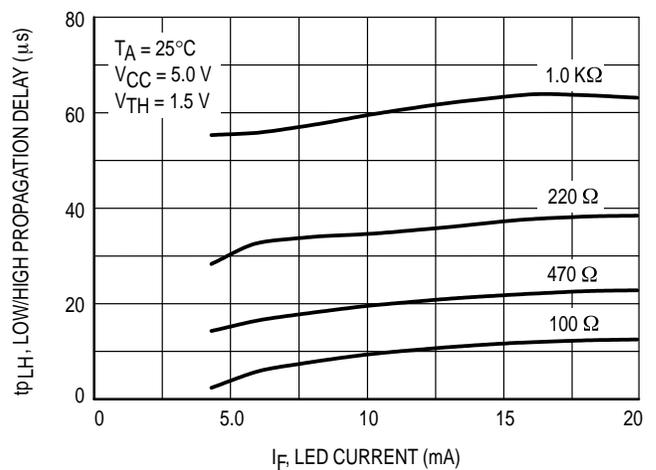


Figure 6. Low to High Propagation Delay versus Collector Load Resistance and LED Current

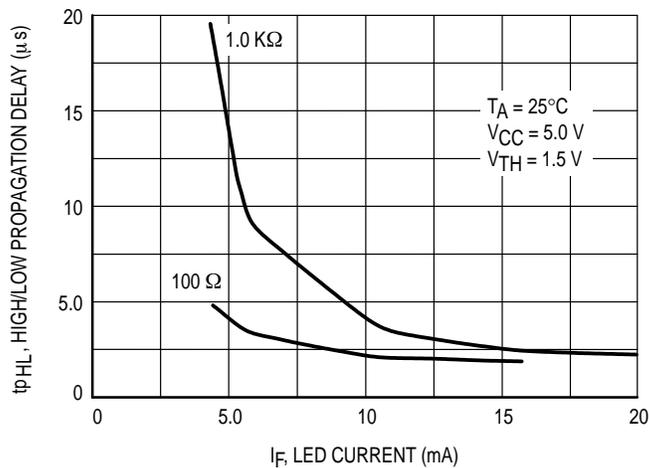


Figure 7. High to Low Propagation Delay versus Collector Load Resistance and LED Current

MTIL113

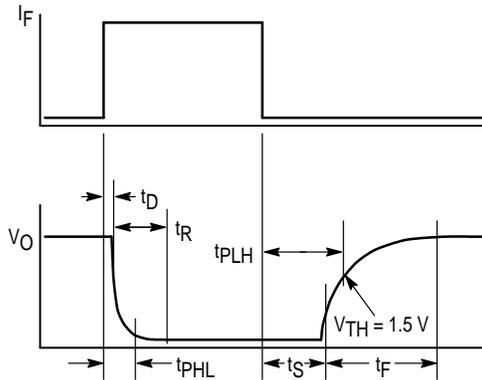


Figure 8. Switching Waveform

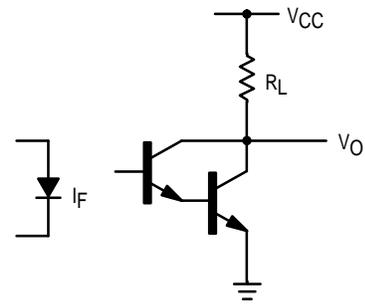
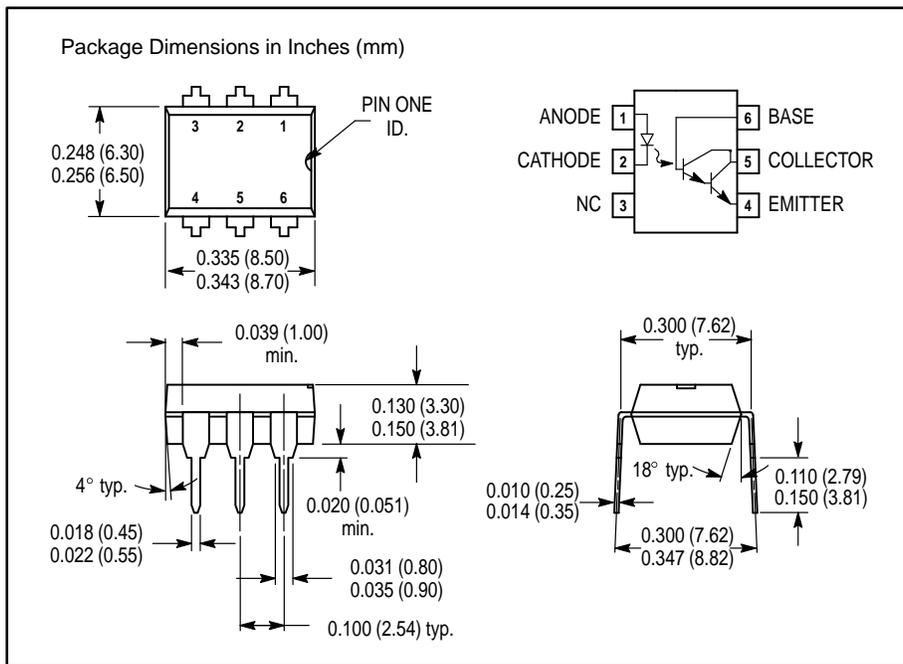


Figure 9. Switching Schematic



Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Mfax is a trademark of Motorola, Inc.

How to reach us:

USA/EUROPE/Locations Not Listed: Motorola Literature Distribution; P.O. Box 5405, Denver, Colorado 80217. 303-675-2140 or 1-800-441-2447

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, 6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 81-3-3521-8315

Mfax™: RMFAX0@email.sps.mot.com – TOUCHTONE 602-244-6609
– US & Canada ONLY 1-800-774-1848

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park, 51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

INTERNET: <http://www.mot.com/SPS/>

