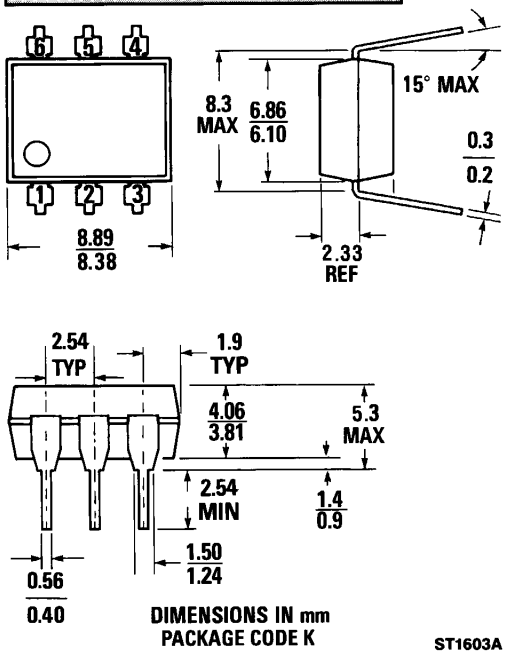
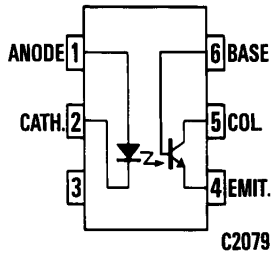
FAIRCHILD
SEMICONDUCTOR™

PHOTOTRANSISTOR OPTOCOUPLER

MCT270

PACKAGE DIMENSIONS





Equivalent Circuit

DESCRIPTION

The MCT270 is a phototransistor-type optically coupled isolator. A gallium arsenide infrared emitting diode is selectively coupled with an NPN silicon phototransistor.

FEATURES

- Minimum current transfer ratio of 50%
- Maximum turn-on, turn-off time 10μ seconds specified
- Underwriters Laboratory (UL) recognized File E90700

APPLICATIONS

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

ABSOLUTE MAXIMUM RATINGS

TOTAL PACKAGE

Storage temperature ..... −55°C to 150°C
Operating temperature ..... −55°C to 100°C
Lead tempertaure
(soldering , 10 sec) ..... 260°C
Total package power dissipation @ 25
(LED plus detector) ..... 260 mW
Derate linearly from 25°C ..... 3.5 mW/°C

INPUT DIODE

Forward DC current ..... 90 mA
Reverse voltage ..... 3 V
Peak forward current
(1 μs pulse, 300 pps) ..... 3.0 A
Power dissipation 25°C ambient ..... 135 mW
Derate linearly from 25°C ..... 1.8 mW/°C

OUTPUT TRANSISTOR

Power dissipation @ 25°C ..... 200 mW
Derate linearly from 25°C ..... 2.67 mW/°C

ELECTRO-OPTICAL CHARACTERISTICS (25°C Temperature Unless Otherwise Specified)

INDIVIDUAL COMPONENT CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
INPUT DIODE						
Forward voltage	V_F		1.3	1.50	V	I_F=20 mA
Forward voltage temp. coefficient	$\frac{\Delta V_F}{\Delta T_A}$		−1.8		mV/°C	
Reverse voltage	V_R	3.0	25		V	I_R=10 μA
Junction capacitance	C_J		50 65		pF pF	V_F=0 V, f=1 MHz V_F=1 V, f=1 MHz
Reverse leakage current	I_R		0.35	10	μA	V_R=3.0 V
OUTPUT TRANSISTOR						
DC forward current gain	h_{FE}	100	500			V_{CE}=5 V, I_C=100 μA
Breakdown voltage Collector to emitter	BV_{CEO}	30	45		V	I_C=1.0 mA, I_F=0
Collector to base	BV_{CBO}	70	130		V	I_C=10 μA, I_F=0
Emitter to base	BV_{EBO}	5	7		V	I_E=100 μA, I_F=0
Leakage current Collector to emitter	I_{CEO}		5	50	nA	V_{CE}=10 V, I_F=0
Collector to base	I_{CBO}			20	nA	V_{CB}=10 V, I_F=0
Capacitance Collector to emitter			8		pF	V_{CE}=0, f=1 MHz
Collector to base			20		pF	V_{CB}=5, f=1 MHz
Emitter to base			10		pF	V_{EB}=0, f=1 MHz

TRANSFER CHARACTERISTICS

DC CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Current transfer ratio, collector to emitter	CTR_{CE}	50	115		%	I_F=10 mA; V_{CE}=10 V
Current transfer ratio, collector to base	CTR_{CB}	0.045	0.15		%	I_F=16 mA; V_{CB}=10 V
Saturation voltage	$V_{CE(SAT)}$		.21	.40	V	I_F=10 mA; I_C=2 mA

TRANSFER CHARACTERISTICS

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
SWITCHING TIMES						
Non-saturated Turn-on time	t_{on}		6.0	10	μs	R_L=100Ω; I_C=2 mA; V_{CC}=5 V
Turn-off time	t_{off}		5.5	10	μs	See Figs. 10, 11
Saturated Turn-on time	t_{on}		3.9		μs	I_F=16 mA; R_L=1.9 KΩ
Turn-off time	t_{off}		48		μs	See Figs. 10, 11
(Approximates a typical TTL interface) Turn-on time	t_{on}		3.9		μs	I_F=16 mA; R_L=4.7 KΩ
Turn-off time (Approximates a typical low power TTL interface)	t_{off}		110		μs	See Figs. 10, 11

ELECTRO-OPTICAL CHARACTERISTICS
(25°C Temperature Unless Otherwise Specified) (Cont'd)

ISOLATION CHARACTERISTICS

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Steady state isolation	V_{iso}	7500			VAC-PEAK	$I_{I-O} \leq 1\ \mu A$, 1 minute
		5300			VAC-rms	$I_{I-O} \leq 1\ \mu A$, 1 minute
Isolation resistance	R_{iso}	10^{11}			ohms	V_{I-O}=500 VDC
Isolation capacitance	C_{iso}		0.5		pF	f=1 MHz

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
(25°C Free Air Temperature Unless Otherwise Specified)

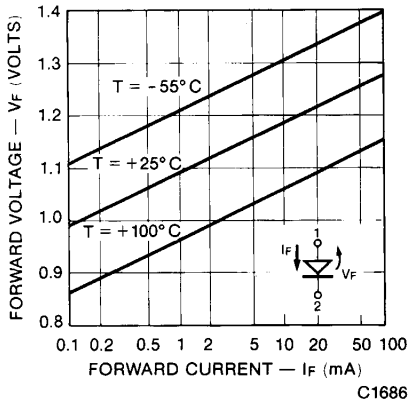


Fig. 1. Forward Voltage vs. Current

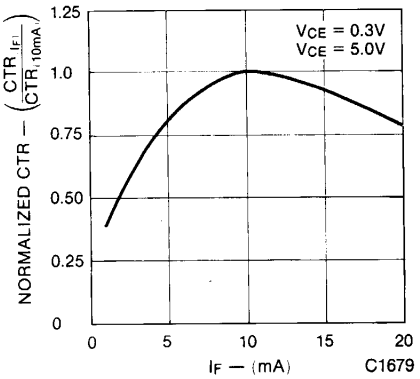


Fig. 2. Normalized CTR vs. Forward Current

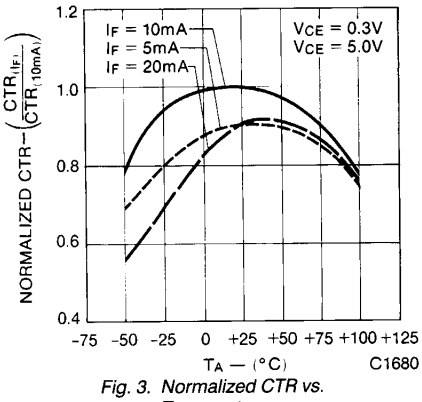


Fig. 3. Normalized CTR vs. Temperature

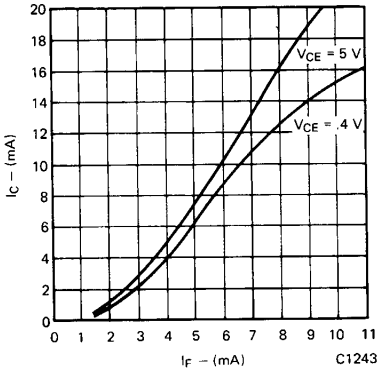


Fig. 4. Collector Current vs. Forward Current

TYPICAL ELECTRICAL CHARACTERISTIC CURVES

(25°C Free Air Temperature Unless Otherwise Specified) (Cont'd)

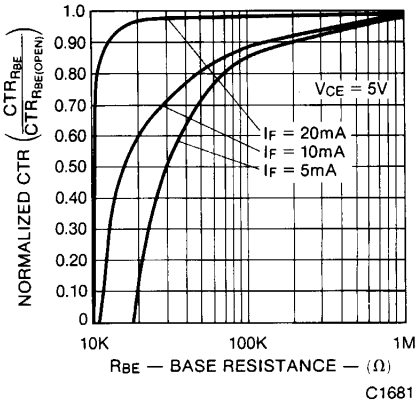


Fig. 5. CTR vs. RBE (Unsaturated)

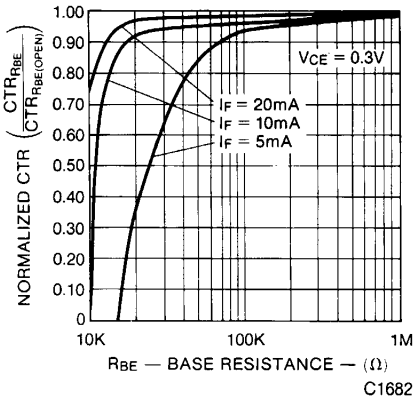


Fig. 6. CTR vs. RBE (Saturated)

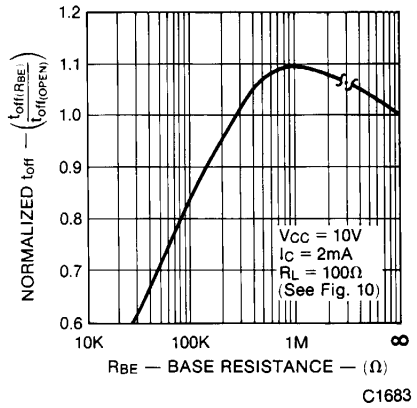


Fig. 7. Normalized T_{OFF} vs. RBE

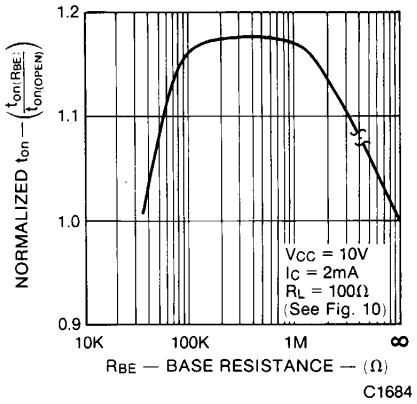


Fig. 8. Normalized T_{ON} vs. RBE

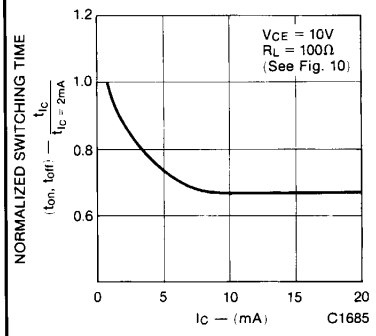


Fig. 9. Switching Time vs. IC

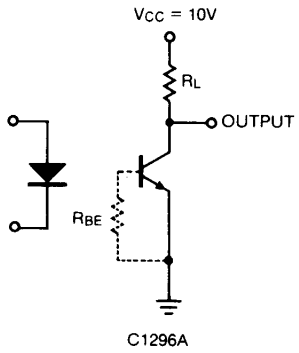


Fig. 10. Switching Time Test Circuit

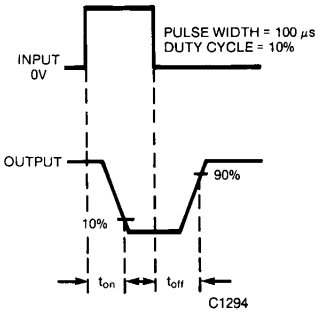


Fig. 11. Switching Time Waveforms

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.