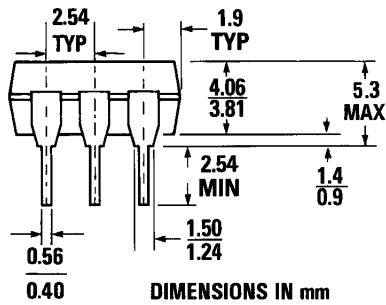
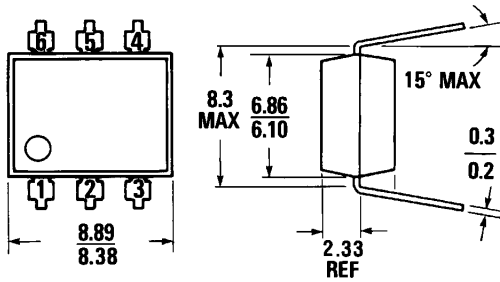
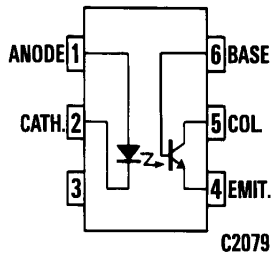


**PACKAGE DIMENSIONS**



ST1603A



Equivalent Circuit

**DESCRIPTION**

The MCT210 incorporates a NPN silicon planar phototransistor optically coupled to a gallium arsenide infrared emitting diode. The MCT210 has a specified minimum CTR of 50%, saturated, and 150%, unsaturated.

**FEATURES**

- TTL compatible 1-10 gate loads
- High CTR with transistor output MCT210—150% min.
- Specified CTR over temperature range
- Good logic load characteristics  
 $V_{OL} = 0.4 V @ 1.6 mA \text{ to } 16mA$   
 output sinking ( $I_{OL}$ )
- UL recognized (File #E90700)

**APPLICATIONS**

- Digital logic isolation
- Line receivers
- Feedback control circuits
- Monitoring circuits

<b>ABSOLUTE MAXIMUM RATINGS</b>	
<b>TOTAL PACKAGE</b>	
Storage temperature	-55°C to 150°C
Operating temperature	-55°C to 100°C
Lead temperature	
(soldering, 10 sec)	260°C
Total package power dissipation @ 25°C	
(LED plus detector)	260 mW
Derate linearly from 25°C	3.4 mW/°C
<b>INPUT DIODE</b>	
Forward current	60 mA
Reverse voltage	3.0 V
Peak forward current	
(1 $\mu s$ pulse, 300 pps)	3.0 A
Power dissipation 25°C to 70° ambient	90 mW
Derate linearly from +70°C	2.0 mW/°C
<b>OUTPUT TRANSISTOR</b>	
Power dissipation @ 25°C	200 mW
Derate linearly from 25°C	2.67 mW/°C



## PHOTOTRANSISTOR OPTOCOUPERS

### ELECTRO-OPTICAL CHARACTERISTICS (0° to +70°C Temperature Unless Otherwise Specified)

#### INDIVIDUAL COMPONENT CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
<b>INPUT DIODE</b>						
Forward voltage	$V_f$		1.25	1.50	V	$I_f=40\text{ mA}$
Forward voltage temp. coefficient	$\frac{\Delta V_f}{\Delta T_A}$		-1.8		mV/°C	
Reverse breakdown voltage	$BV_R$	6.0	15		V	$I_R=10\ \mu\text{A}$
Junction capacitance	$C_j$		50 65		pF pF	$V_f=0\text{ V}, f=1\text{ MHz}$ $V_f=1\text{ V}, f=1\text{ MHz}$
Reverse leakage current	$I_R$		.01	10	$\mu\text{A}$	$V_R=6.0\text{ V}$
<b>OUTPUT TRANSISTOR</b>						
DC forward current gain	$h_{FE}$		400			$V_{CE}=5\text{ V}, I_C=10\text{ mA}$
Breakdown voltage Collector to emitter	$BV_{CEO}$	30	45		V	$I_C=1.0\text{ mA}, I_F=0$
Collector to base	$BV_{CBO}$	30			V	$I_C=10\ \mu\text{A}, I_F=0$
Emitter to collector	$BV_{ECO}$	6	8		V	$I_E=100\ \mu\text{A}, I_F=0$
Leakage current Collector to emitter	$I_{CEO}$		5	50	nA	$V_{CE}=5\text{ V}, I_F=0,$ $T_A=+25^\circ\text{C}$
				30	$\mu\text{A}$	$V_{CE}=5\text{ V}, I_F=0$
Capacitance Collector to emitter			8		pF	$V_{CE}=0, f=1\text{ MHz}$
Collector to base			20		pF	$V_{CB}=5, f=1\text{ MHz}$
Emitter to base			10		pF	$V_{EB}=0, f=1\text{ MHz}$

#### TRANSFER CHARACTERISTICS

DC CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Current transfer ratio, collector to emitter MCT210 (a)	$I_{CE}/I_F$	50	70		%	$V_{CE}=0.4\text{ V}, I_F=3.2\text{ mA}$ to 32 mA
		150	225		%	$V_{CE}=5.0\text{ V}, I_F=10\text{ mA}$
Current transfer ratio, collector to base	$I_{CB}/I_F$		0.6		%	$V_{CB}=5.0\text{ V}, I_F=10\text{ mA}$
Saturation voltage collector to emitter	$V_{CE(SAT)}$		0.2	0.4	V	$I_C=16\text{ mA}, I_F=32\text{ mA}$

**ELECTRO-OPTICAL CHARACTERISTICS**

(0° to +70°C Temperature Unless Otherwise Specified) (Cont'd)

**TRANSFER CHARACTERISTICS (Cont'd)**

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
<b>SWITCHING TIMES</b>						
Non-saturated						
Rise time	$t_r$		4		$\mu\text{S}$	$R_L = 100 \Omega$ , $I_C = 2 \text{ mA}$ , $V_{CC} = 5 \text{ V}$
Fall time	$t_f$		5		$\mu\text{S}$	See Figs. 15 and 16
Saturated						
Rise time	$t_r$		2.5		$\mu\text{S}$	$R_L = 560 \Omega$ , $I_F = 16 \text{ mA}$
Fall time	$t_f$		25		$\mu\text{S}$	See Figs. 15 and 16
Propagation delay						
High to low	$T_{PD(HL)}$		2		$\mu\text{S}$	$R_L = 2.7\text{K}$ , $I_F = 16 \text{ mA}$
Low to high	$T_{PD(LH)}$		10		$\mu\text{S}$	See Figs. 15 and 16

**ISOLATION CHARACTERISTICS**

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Steady state isolation	$V_{ISO}$	7500			VAC-PEAK	$I_{IO} \leq 1 \mu\text{A}$ , 1 minute
		5300			VAC-RMS	$I_{IO} \leq 1 \mu\text{A}$ , 1 minute
Isolation resistance	$R_{ISO}$	$10^{11}$	$5 \times 10^{12}$		ohms	$V_{IO} = 500 \text{ VDC}$ , $T_A = +25^\circ\text{C}$
Isolation capacitance	$C_{ISO}$		1.0		pF	$f = 1 \text{ MHz}$

**TYPICAL ELECTRICAL CHARACTERISTIC CURVES**

(25°C Free Air Temperature Unless Otherwise Specified)

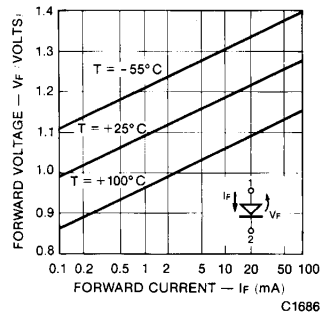


Fig. 1. Forward Voltage vs. Forward Current

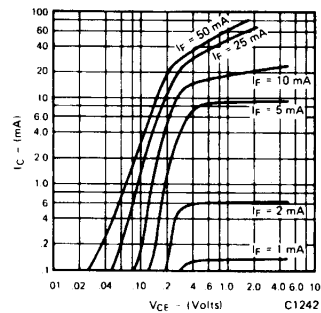


Fig. 2. Collector Current vs. Collector to Emitter Voltage

**TYPICAL ELECTRICAL CHARACTERISTIC CURVES**  
(25°C Free Air Temperature Unless Otherwise Specified) (Cont'd)

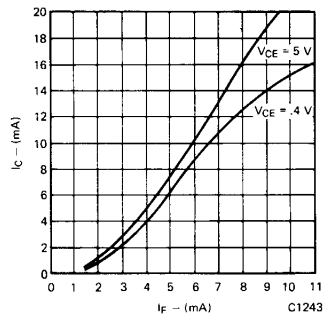


Fig. 3. Collector Current vs. Forward Current

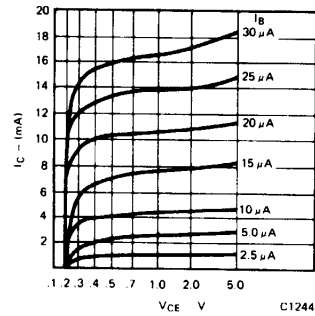


Fig. 4. Collector Current vs. Collector to Emitter Voltage

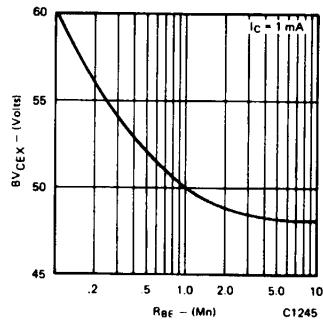


Fig. 5. Collector to Emitter Breakdown Voltage vs. Base to Emitter Resistance

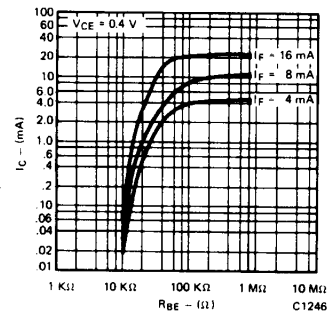


Fig. 6. Saturated CTR vs. Base to Emitter Resistance

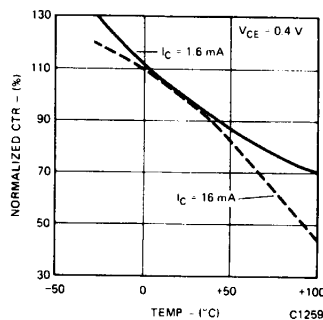


Fig. 7. Current Transfer Ratio (saturated) vs. Temperature

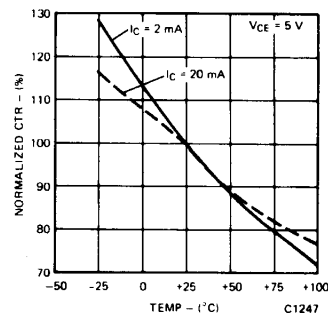


Fig. 8. Current Transfer Ratio (unsaturated) vs. Temperature

**TYPICAL ELECTRICAL CHARACTERISTIC CURVES**  
(25°C Free Air Temperature Unless Otherwise Specified) (Cont'd)

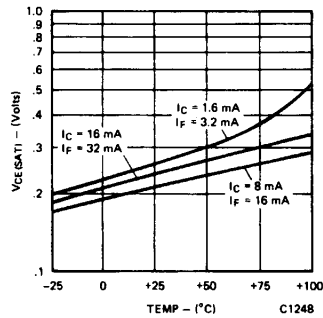


Fig. 9. Collector to Emitter Saturation Voltage vs. Temperature

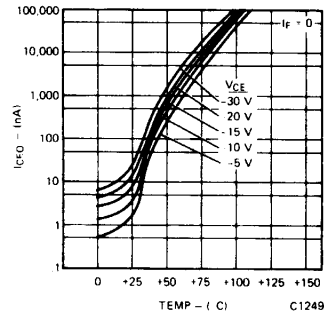


Fig. 10. Collector to Emitter Leakage Current vs. Temperature

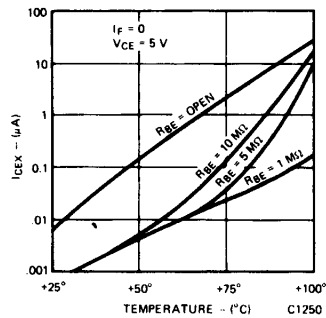


Fig. 11. Collector to Emitter Leakage Current vs. Temperature

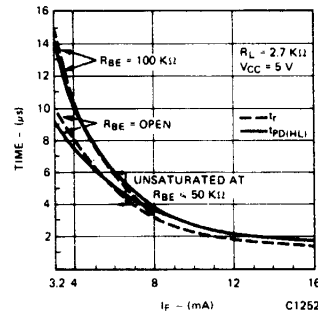


Fig. 12. Switch-on Time vs.  $I_F$  Drive (saturated)

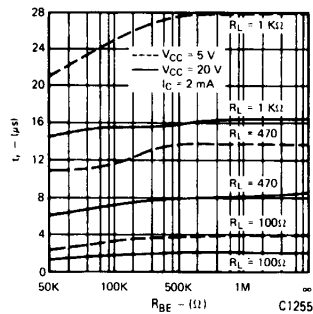


Fig. 13. Rise Time vs. Base to Emitter Resistance (non-saturated)

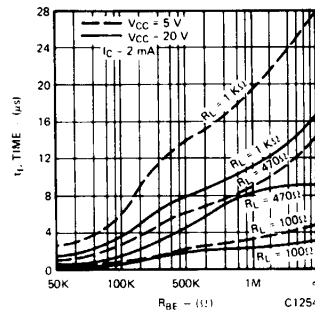


Fig. 14. Fall Time vs. Base to Emitter Resistance (non-saturated)

