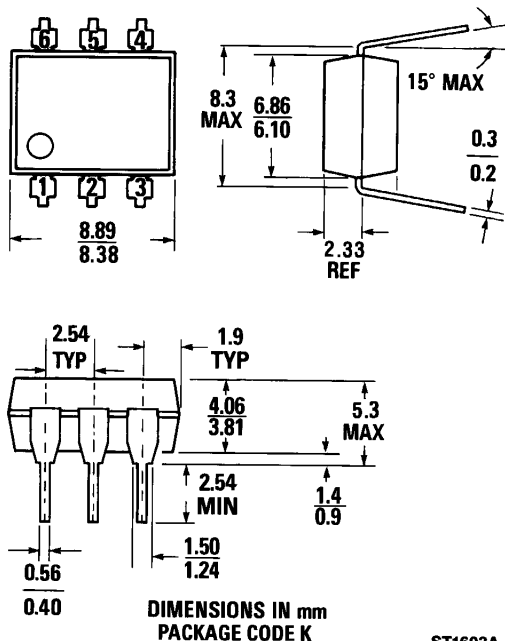
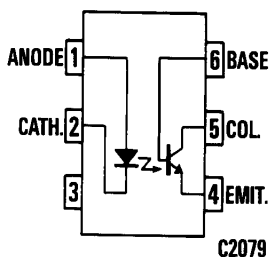


PACKAGE DIMENSIONS



ST1603A



Equivalent Circuit

DESCRIPTION

The MCT2E is a NPN silicon planar phototransistor optically coupled to a gallium arsenide infrared emitting diode.

FEATURES & APPLICATIONS

- Utility/economy isolator
- AC line/digital logic isolator
- Digital logic/digital logic isolator
- Telephone/telegraph line receiver
- Twisted pair line receiver
- High frequency power supply feedback control
- Relay contact monitor
- Power supply monitor
- UL recognized — File E90700

ABSOLUTE MAXIMUM RATINGS

Storage temperature	-55°C to 150°C	Power dissipation at 25°C ambient.	200 mW
Operating temperature	-55°C to 100°C	Derate linearly from 25°C.	2.6 mW/°C
Lead soldering temperature (10 sec)	260°C	OUTPUT TRANSISTOR	
INPUT DIODE		Power dissipation at 25°C ambient.	200 mW
Forward current.	60 mA	Derate linearly from 25°C.	2.6 mW/°C
Reverse voltage.	3.0 V	Total package power dissipation at 25°C ambient	
Peak forward current		(LED plus detector)	250 mW
(1 μs pulse, 300 pps)	3.0 A	Derate linearly from 25°C.	3.3 mW/°C
		Collector-Emitter Current (I _{CE})	50 mA



PHOTOTRANSISTOR OPTOCOUPLER

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

INDIVIDUAL COMPONENT CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
INPUT DIODE						
Forward voltage	V_F		1.25	1.50	V	$I_F=20\text{ mA}$
Reverse voltage	V_R	3.0	25		V	$I_R=10\text{ }\mu\text{A}$
Junction capacitance	C_J		50		pF	$V_F=0\text{ V}$, $F=1\text{ MHz}$
Reverse leakage current	I_R		.01	10	μA	$V_R=3.0\text{ V}$
OUTPUT TRANSISTOR						
DC forward current gain	h_{FE}	100	250			$V_{CE}=5\text{ V}$, $I_C=100\text{ }\mu\text{A}$
Collector to emitter breakdown volt.	BV_{CEO}	30	85		V	$I_C=1.0\text{ mA}$, $I_E=0$
Collector to base breakdown voltage	BV_{CBO}	70	165		V	$I_C=10\text{ }\mu\text{A}$, $I_E=0$
Emitter to collector breakdown voltage	BV_{ECO}	7	14		V	$I_E=100\text{ }\mu\text{A}$, $I_C=0$
Collector to emitter, leakage current	I_{CEO}		5	50	nA	$V_{CE}=10\text{ V}$, $I_E=0$
Collector to base leakage current	I_{CBO}		0.1	20	nA	$V_{CB}=10\text{ V}$, $I_E=0$
Capacitance collector to emitter	C_{CEO}		8		pF	$V_{CE}=0$
Capacitance collector to base	C_{CBO}		20		pF	$V_{CB}=10\text{ V}$
Capacitance emitter to base	C_{EBO}		10		pF	$V_{BE}=0$

TRANSFER CHARACTERISTICS

DC CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
DC collector current transfer ratio	CTR_{CE}	20	60		%	$V_{CE}=10\text{ V}$, $I_F=10\text{ mA}$, Note 1
DC base current transfer ratio	CTR_{CB}		.35		%	$V_{CB}=10\text{ V}$, $I_F=10\text{ mA}$
Collector-emitter, saturation voltage	$V_{CE}(\text{sat})$		0.24	0.4	V	$I_C=2.0\text{ mA}$, $I_F=16\text{ mA}$

TRANSFER CHARACTERISTICS

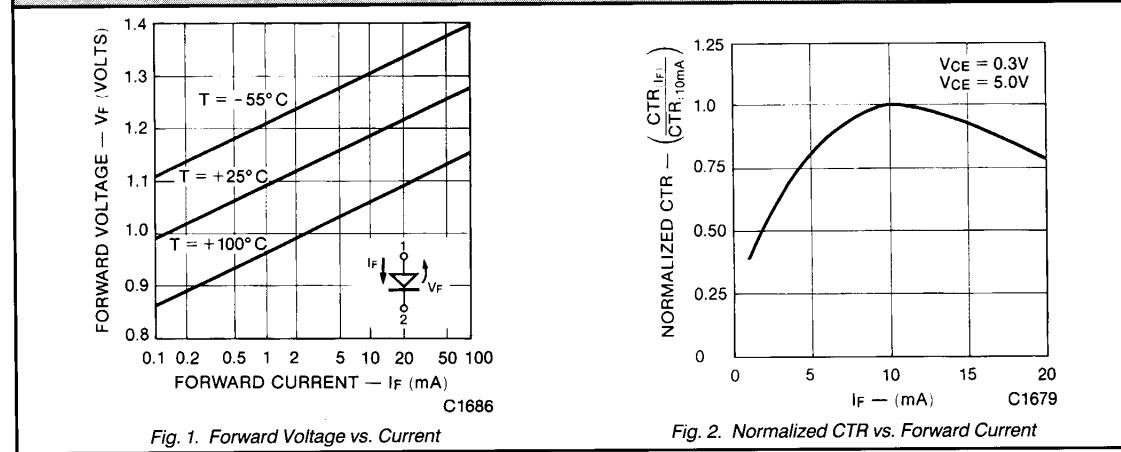
CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
SWITCHING TIMES						
Non-saturated collector						
Delay time	t_d		0.5		μS	$R_L=100\text{ }\Omega$, $I_C=2\text{ mA}$, $V_{CC}=10\text{ V}$
Rise time	t_r		2.5		μS	Fig. 10
Storage time	t_s		0.1		μS	
Fall time	t_f		2.6		μS	
Saturated collector						
Delay time	t_d		2.0		μS	$R_L=1\text{ K}\Omega$, $I_C=2\text{ mA}$, $V_{CC}=10\text{ V}$
Rise time	t_r		15		μS	
Storage time	t_s		0.1		μS	
Fall time	t_f		15		μS	

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

TRANSFER CHARACTERISTICS (Cont'd)					
		SYMBOL	TYP.	UNITS	TEST CONDITIONS
SWITCHING TIMES (Cont'd)					
Saturated					
t on (from 5 V to 0.8 V)		$t_{on} (SAT)$	5	μs	$R_L = 2 K\Omega, I_F = 15 mA, V_{CC} = 5 V$
t off (from SAT to 2.0 V)		$t_{off} (SAT)$	25		$R_B = open$
Saturated					
t on (from 5 V to 0.8 V)		$t_{on} (SAT)$	5	μs	$R_L = 2 K\Omega, I_F = 20 mA, V_{CC} = 5 V$
t off (from SAT to 2.0 V)		$t_{off} (SAT)$	18		$R_B = 100 K\Omega$
Non-saturated					
Base	Rise time	t_r	175	ns	$R_L = 1 K\Omega, V_{CE} = 10 V$
	Fall time	t_f	175	ns	
Bandwidth (see note 2)		B_w	150	KHz	$I_C = 2 mA, V_{CE} = 10 V, R_L = 100\Omega$

ISOLATION CHARACTERISTICS						
CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Steady state isolation voltage	V_{iso}	7500			VAC-PEAK	$I_{iO} \leq 1 \mu A, 1 \text{ minute}$
		5300			VAC-rms	$I_{iO} \leq 1 \mu A, 1 \text{ minute}$
Isolation resistance		10^{11}	10^{12}		Ω	$V_{iO} = 500 V$
Isolation capacitance			.5		pF	$F = 1 \text{ MHz}$

TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES (25°C Free Air Temperature Unless Otherwise Specified)



TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

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

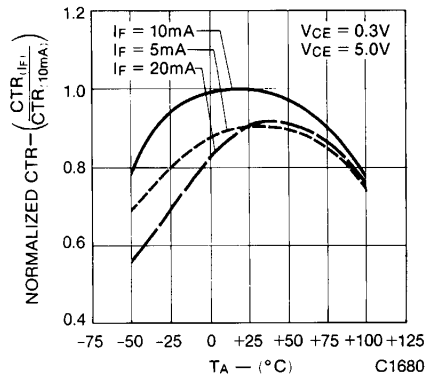


Fig. 3. Normalized CTR vs. Temperature

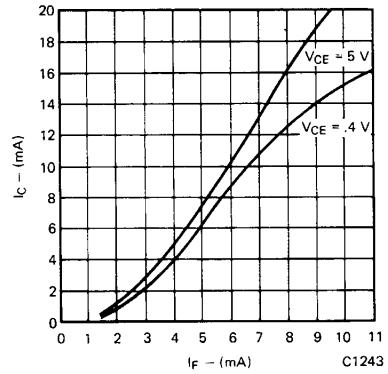


Fig. 4. Collector Current vs. Forward Current

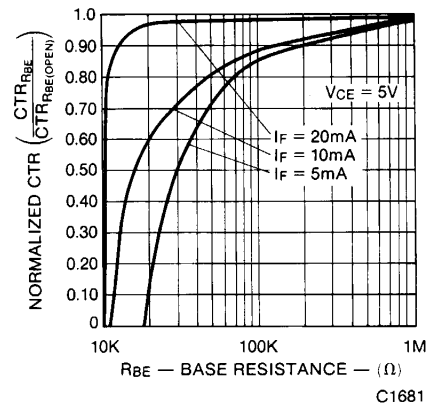


Fig. 5. CTR vs. R_{BE} (Unsaturated)

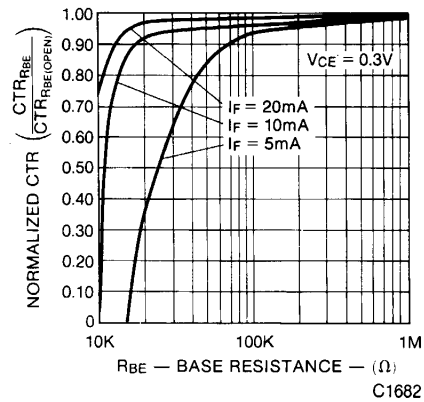


Fig. 6. CTR vs. R_{BE} (Saturated)

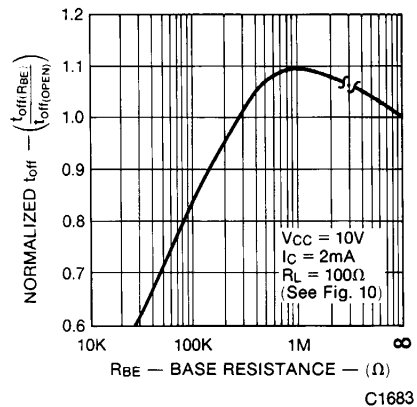


Fig. 7. Normalized T_{OFF} vs. R_{BE}

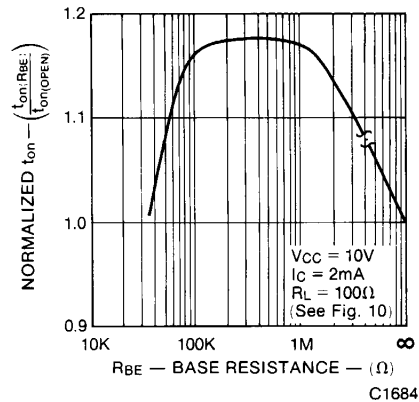
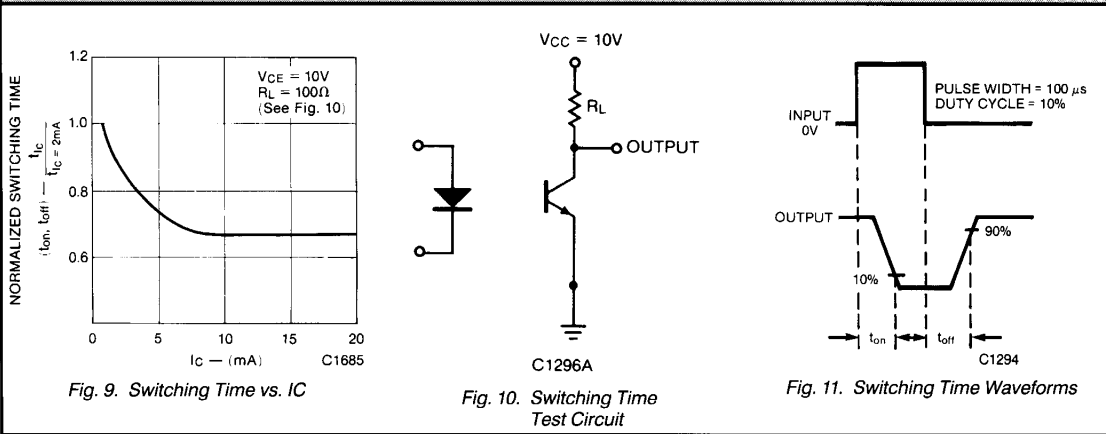


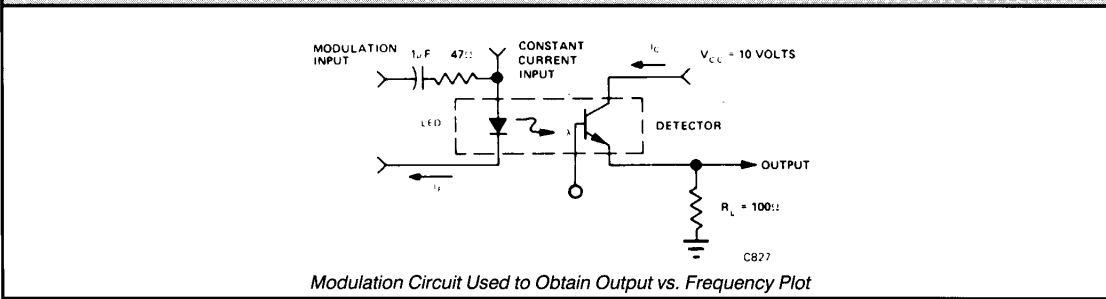
Fig. 8. Normalized T_{ON} vs. R_{BE}

TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

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



OPERATING SCHEMATICS



NOTES

1. The current transfer ratio (I_c/I_f) is the ratio of the detector collector current to the LED input current with V_{CE} at 10 volts.
2. The frequency at which i_c is 3 dB down from the 1 kHz value.
3. Rise time (t_r) is the time required for the collector current to increase from 10% of its final value, to 90%.
 Fall time (t_f) is the time required for the collector current to decrease from 90% of its initial value, to 10%.