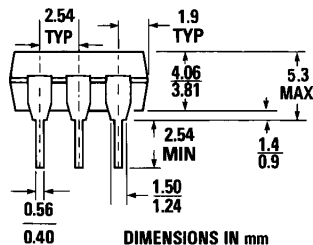
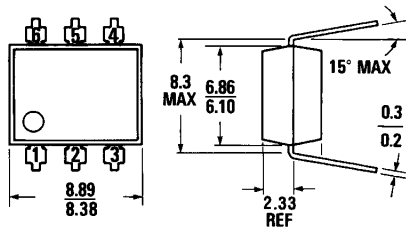


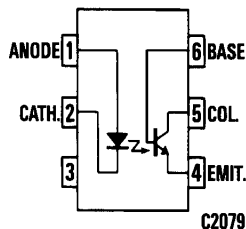
4N25 4N27
4N26 4N28

PACKAGE DIMENSIONS



DIMENSIONS IN mm
PACKAGE CODE K

ST1603A



Equivalent Circuit

DESCRIPTION

The 4N25, 4N26, 4N27, and 4N28 series of optocouplers have an NPN silicon planar phototransistor optically coupled to a gallium arsenide diode.

FEATURES & APPLICATIONS

- 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
- Small package size and low cost
- Excellent frequency response
- UL recognized—File E90700

ABSOLUTE MAXIMUM RATINGS

TOTAL PACKAGE

- *Storage temperature -55°C to 150°C
- *Operating temperature at junction -55°C to 100°C
- *Lead temperature (soldering, 10 sec) 260°C
- *Total package power dissipation at 25°C ambient (LED plus detector) 250 mW
- *Derate linearly from 25°C 3.3 mW/°C

INPUT DIODE

- *Forward DC current continuous 80 mA
- *Reverse voltage 3.0 V
- *Peak forward current
(300 μ s, 2% duty cycle) 3.0 A
- *Power dissipation at 25°C ambient 150 mW
- *Derate linearly from 25°C 2.0 mW/°C

OUTPUT TRANSISTOR

- *Collector emitter voltage (BV_{CE0}) 30 V
- *Collector base voltage (BV_{CBO}) 70 V
- *Emitter collector voltage (BV_{ECO}) 7 V
- *Power dissipation at 25°C ambient 150 mW
- *Derate linearly from 25°C 2.0 mW/°C

*Indicates JEDEC Registered Data.

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

INDIVIDUAL COMPONENT CHARACTERISTICS

CHARACTERISTICS	SYMBOL	MIN.	TYP.	GUAR. MAX.	UNITS	TEST CONDITIONS
INPUT DIODE						
*Forward voltage	V_f		1.20	1.50	V	$I_f = 10 \text{ mA}$
Capacitance	C		150		pF	$V_f = 0 \text{ V}, f = 1 \text{ MHz}$
*Reverse leakage current			.05	100	μA	$V_R = 3.0 \text{ V}, R_L = 1.0 \text{ M}\Omega$
DETECTOR						
DC forward current gain	h_{FE}		250			$V_{CE} = 5 \text{ V}, I_C = 500 \mu\text{A}$
*Collector to emitter breakdown voltage	BV_{CEO}	30	65		V	$I_C = 1.0 \text{ mA}, I_B = 0$
*Collector to base breakdown voltage	BV_{CBO}	70	165		V	$I_C = 100 \mu\text{A}, I_E = 0$
*Emitter to collector breakdown voltage	BV_{ECO}	7	14		V	$I_E = 100 \mu\text{A}, I_B = 0$
*Collector to emitter leakage current (4N25, 4N26, 4N27)	I_{CEO}		3.5	50	nA	$V_{CE} = 10 \text{ V}$ Base Open
*Collector to emitter leakage current (4N28)				100	nA	
*Collector to base leakage current	I_{CBO}		0.1	20	nA	$V_{CB} = 10 \text{ V}$ Emitter Open

TRANSFER CHARACTERISTICS

DC CHARACTERISTICS	SYMBOL	MIN.	TYP.	GUAR. MAX.	UNITS	TEST CONDITIONS
*Collector output current (a) (4N25, 4N26) (4N27, 4N28)	I_C	2.0 1.0	5.0 3.0	— —	mA	$V_{CE} = 10 \text{ V}, I_f = 10 \text{ mA}, I_B = 0$
*Collector-emitter saturation	$V_{CE(SAT)}$		0.2	0.5	V	$I_C = 2.0 \text{ mA}, I_f = 50 \text{ mA}$

TRANSFER CHARACTERISTICS

AC CHARACTERISTICS	SYMBOL	TYP.	UNITS	TEST CONDITIONS
Non-saturated Collector Delay time	t_d	0.5	μS	$R_L = 100 \Omega, I_C = 2 \text{ mA}, V_{CC} = 10 \text{ V}$ (Fig. 10 and 11)
Rise time	t_r	2.5	μS	
Fall time	t_f	2.6	μS	
Non-saturated Collector Delay time	t_d	2.0	μS	$R_L = 1\text{k}\Omega, I_C = 2 \text{ mA}, V_{CC} = 10 \text{ V}$ (Fig. 10 and 11)
Rise time	t_r	15	μS	
Fall time	t_f	15	μS	

*Indicates JEDEC Registered Data.

(a) Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2.0\%$

(b) For this test LED pins 1 and 2 are common and Phototransistor pins 4, 5 and 6 are common.

(c) If adjusted to yield $I_C = 2 \text{ mA}$ and $I_L = 0.7 \text{ mA RMS}$; Bandwidth referenced to 10 kHz.

ELECTRO-OPTICAL CHARACTERISTICS

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

TRANSFER CHARACTERISTICS (Cont'd)

AC CHARACTERISTICS	SYMBOL	MIN.	TYP.	GUAR. MAX.	UNITS	TEST CONDITIONS
Saturated t_{on} (from 5 V to 0.8 V)	t_{on} (SAT)		5		μs	$R_L = 2k\Omega$, $I_F = 15$ mA, $V_{CC} = 5$ V
t_{off} (from SAT to 2.0 V)	t_{off} (SAT)		25		μs	$R_B = \text{Open}$ (Fig. 10)
Saturated t_{on} (from 5 V to 0.8 V)	t_{on} (SAT)		5		μs	$R_L = 2k\Omega$, $I_F = 20$ mA, $V_{CC} = 5$ V
t_{off} (from SAT to 2.0 V)	t_{off} (SAT)		18		μs	$R_B = 100k\Omega$ (Fig. 10)
Non-saturated Base—Collector photo diode Rise time	t_r		175		ns	$R_L = 1k\Omega$, $V_{CB} = 10$ V
Fall time	t_f		175		ns	
Isolation voltage (b) (4N25, 4N26, 4N27, 4N28) *(4N26, 4N27) *(4N28)	V_{ISO}	5300 1500 500	— — —	— — —	V V V	$I_{IO} \leq 1 \mu A$ RMS, $t = 1$ minute Peak Peak
Isolation resistance (b)			10^{11}		Ω	$V = 500$ VDC
Isolation capacitance (b)			1.3		pF	$V = 0$, $f = 1.0$ MHz
Bandwidth (c) (also see note 2)	B_w		300		kHz	$I_C = 2.0$ mA, $R_L = 100 \Omega$ (Fig. 12)

*Indicates JEDEC Registered Data.

(a) Pulse Test: Pulse Width=300 μs , Duty Cycle $\leq 2.0\%$

(b) For this test LED pins 1 and 2 are common and Phototransistor pins 4, 5 and 6 are common.

(c) If adjusted to yield $I_C = 2$ mA and $i_C = 0.7$ mA RMS; Bandwidth referenced to 10 kHz.

TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

(25°C Free Air Temperature Unless Otherwise Specified)

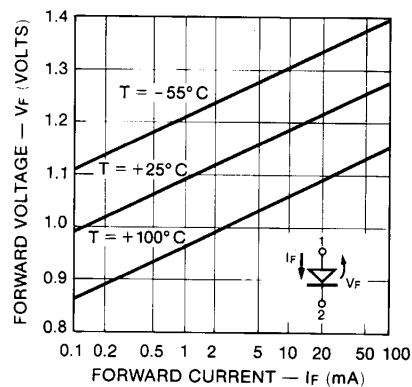


Fig. 1. Forward Voltage vs. Current

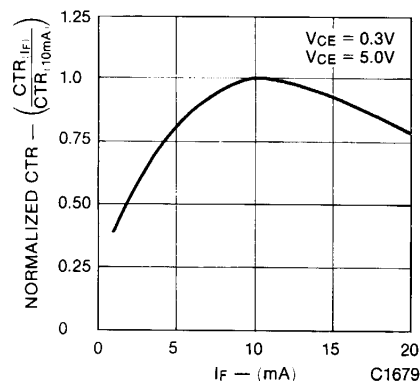


Fig. 2. Normalized CTR vs. Forward Current

TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

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

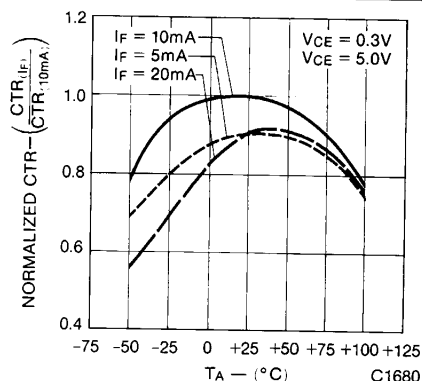


Fig. 3. Normalized CTR vs. Temperature

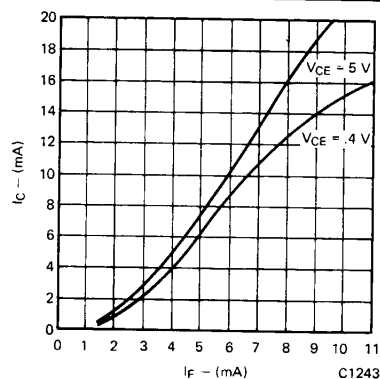


Fig. 4. Collector Current vs. Forward Current

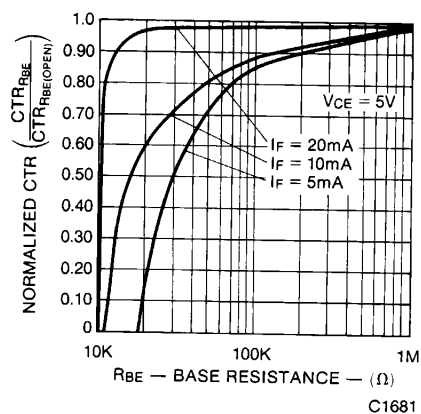


Fig. 5. CTR vs. R_{BE} (Unsaturated)

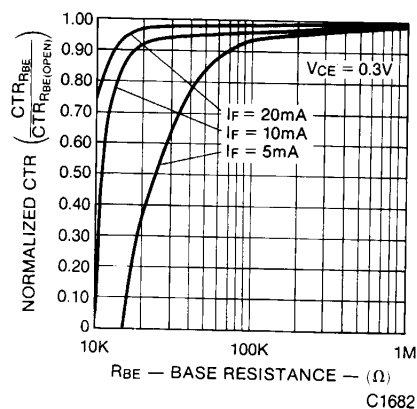


Fig. 6. CTR vs. R_{BE} (Saturated)

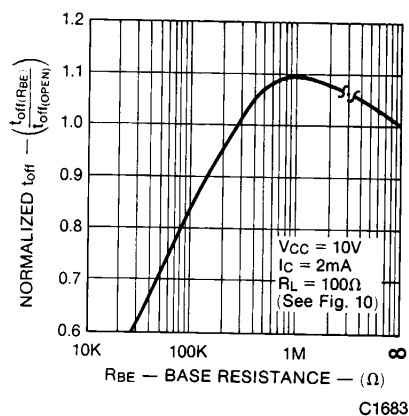


Fig. 7. Normalized T_{OFF} vs. R_{BE}

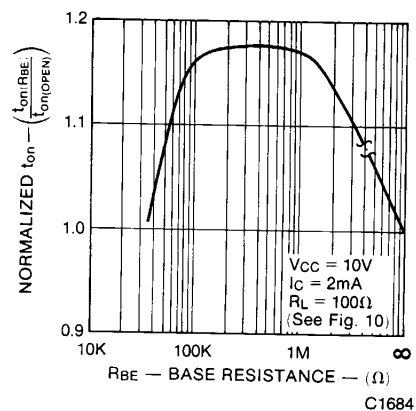
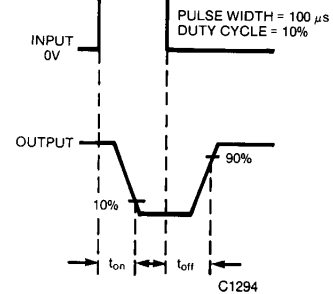
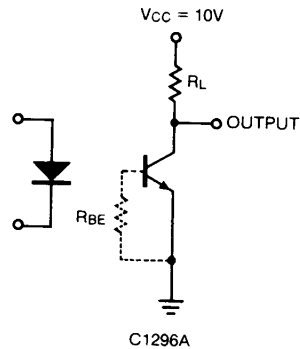
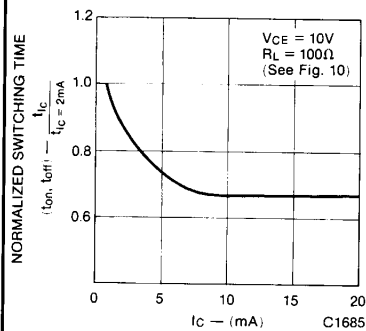
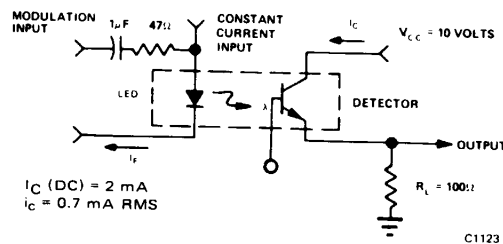


Fig. 8. Normalized T_{ON} vs. R_{BE}

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 3dB down from the 10 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%.