


## FEATURES

- Very High Current Transfer Ratio, 500% Min.
- High Isolation Resistance,  $10^{11}$  W Typical
- Standard Plastic DIP Package
- Underwriters Lab File #E52744
-  VDE Approvals #0884 (Available with Option 1)

## DESCRIPTION

The 4N32 and 4N33 are optically coupled isolators with a Gallium Arsenide infrared LED and a silicon photodarlington sensor. Switching can be achieved while maintaining a high degree of isolation between driving and load circuits. These optocouplers can be used to replace reed and mercury relays with advantages of long life, high speed switching and elimination of magnetic fields.

## Maximum Ratings

### Emitter

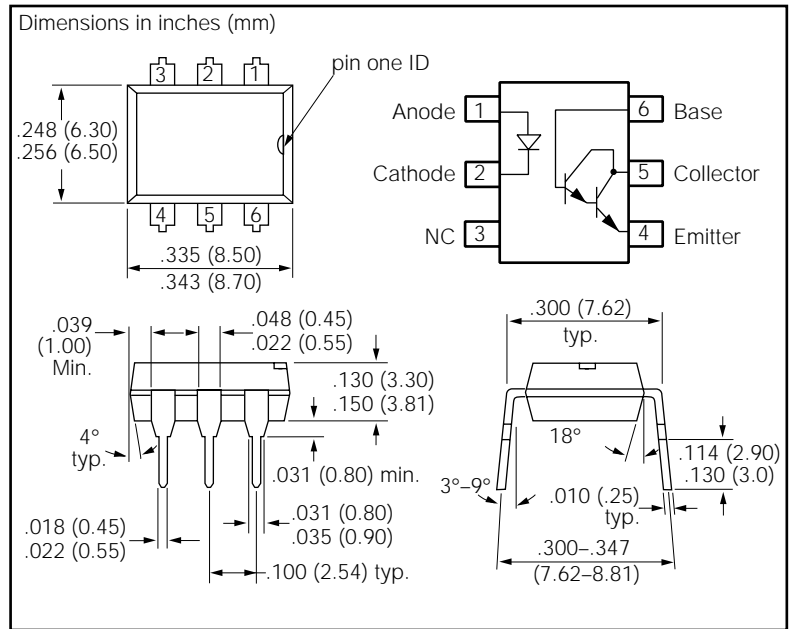
Peak Reverse Voltage ..... 3 V  
 Continuous Forward Current ..... 60 mA  
 Power Dissipation at 25°C ..... 100 mW  
 Derate Linearly from 55°C ..... 1.33 mW/°C

### Detector

Collector-Emitter Breakdown Voltage,  $BV_{CEO}$  ..... 30 V  
 Emitter-Base Breakdown Voltage,  $BV_{EBO}$  ..... 8 V  
 Collector-Base Breakdown Voltage,  
 $BV_{CBO}$  ..... 50 V  
 Emitter-Collector Breakdown Voltage,  
 $BV_{ECO}$  ..... 5 V  
 Collector (load) Current ..... 125 mA  
 Power Dissipation at 25°C Ambient ..... 150 mW  
 Derate Linearly from 25°C ..... 2.0 mW/°C

### Package

Total Dissipation at 25°C Ambient ..... 250 mW  
 Derate Linearly from 25°C ..... 3.3 mW/°C  
 Isolation Test Voltage ..... 5300 VAC<sub>RMS</sub>  
 (between emitter and detector,  
 Standard Climate: 23°C/50%RH,  
 DIN 50014)  
 Leakage Path ..... 7 mm min.  
 Air Path ..... 7 mm min.  
 Isolation Resistance  
 $V_{IO}=500$  V/25°C .....  $\geq 10^{12}$   $\Omega$   
 $V_{IO}=500$  V/100°C .....  $\geq 10^{11}$   $\Omega$   
 Storage Temperature ..... -55°C to +150°C  
 Operating Temperature ..... -55°C to +100°C  
 Lead Soldering Time at 260°C ..... 10 sec.



## Electrical Characteristics $T_A=25^\circ$

Parameter	Min.	Typ.	Max.	Unit	Condition
<b>Emitter</b>					
Forward Voltage		1.25	1.5	V	$I_F=50$ mA
Reverse Current		0.1	100	$\mu$ A	$V_R=3.0$ V
Capacitance		25		pF	$V_R=0$ V
<b>Detector</b>					
$BV_{CEO}^*$	30			V	$I_C=100$ $\mu$ A, $I_F=0$
$BV_{CBO}^*$	50				
$BV_{EBO}^*$	8				
$BV_{ECO}^*$	5	10			$I_E=100$ $\mu$ A, $I_F=0$
$I_{CEO}$		1.0	100	nA	$V_{CE}=10$ V, $I_F=0$
$H_{FE}$		13K			$I_C=0.5$ mA, $V_{CE}=5$ V
<b>Package</b>					
Current Transfer Ratio	500			%	$I_F=10$ mA, $V_{CE}=10$ V
$V_{CEsat}$		1.0		V	$I_C=2$ mA, $I_F=8$ mA
Coupling Capacitance		1.5		pF	
Turn On Time			5	$\mu$ s	$V_{CC}=10$ V, $I_C=50$ mA
Turn Off Time			100		$I_F=200$ mA, $R_L=180$ $\Omega$

\*Indicates JEDEC registered values

Figure 1. Forward voltage versus forward current

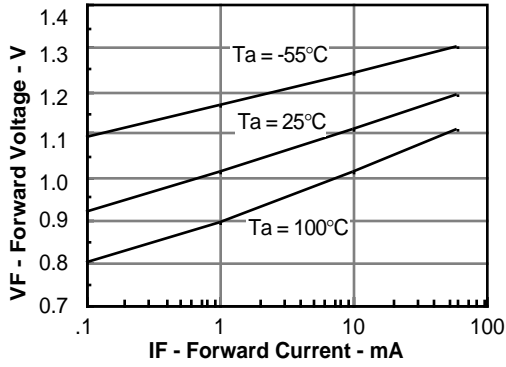


Figure 2. Normalized non-saturated and saturated CTRce versus LED current

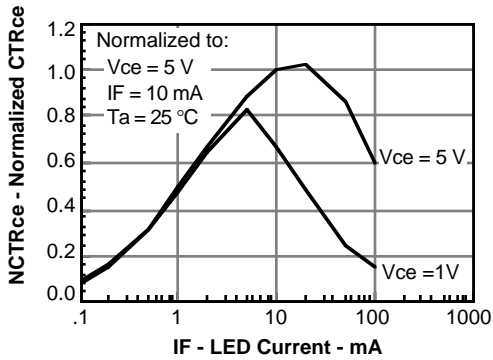


Figure 3. Normalized non-saturated and saturated collector-emitter current versus LED current

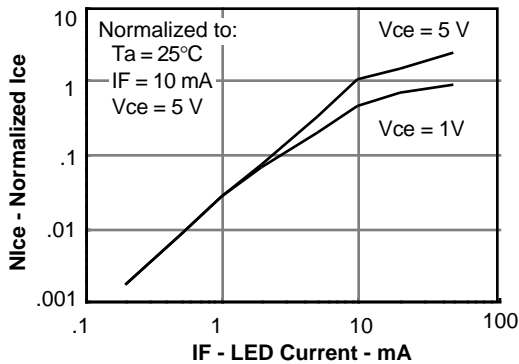


Figure 4. Normalized collector-base photocurrent versus LED current

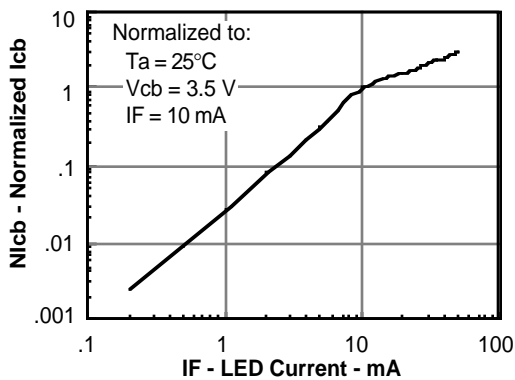


Figure 5. Non-saturated and saturated HFE versus base current

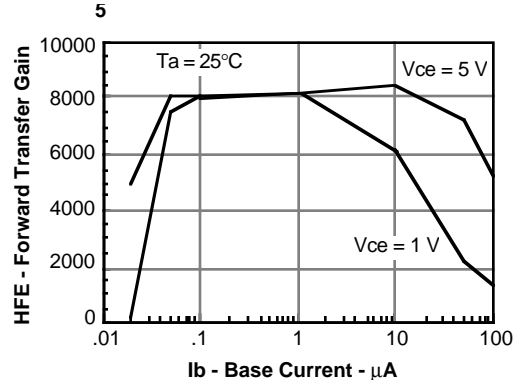


Figure 6. Low to high propagation delay versus collector load resistance and LED current

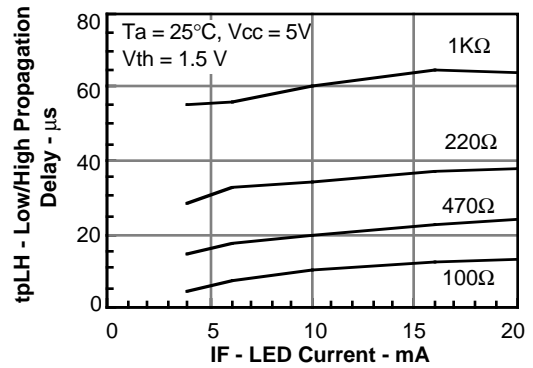


Figure 7. High to low propagation delay versus collector load resistance and LED current

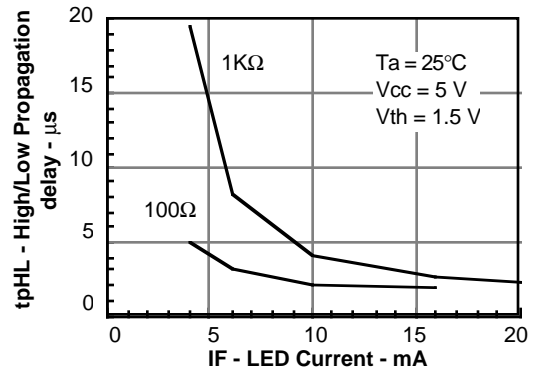


Figure 8. Switching waveform and switching schematic

