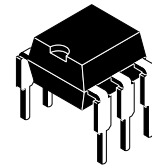


Optocoupler with Photodarlington Output

Description

The 4N32 and 4N33 consist of a photodarlington optically coupled to a gallium arsenide infrared-emitting diode in a 6-lead plastic dual inline package. The elements are mounted on one leadframe using a **coplanar technique**, providing a fixed distance between input and output for highest safety requirements.



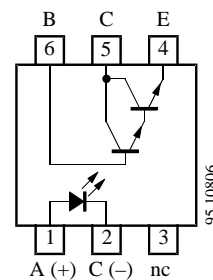
95 10532

Applications

Galvanically separated circuits, non-interacting switches

Features

- High isolation resistance
- Underwriters Laboratory (UL) 1577 recognized, file number E-76222
- Low coupling capacity typical 0.3 pF
- High **C**urrent **T**ransfer **R**atio (CTR)
- Low temperature coefficient of CTR
- Coupling System A



Order Instruction

Ordering Code	CTR Ranking	Remarks
4N32	> 500%	
4N33	> 500%	

Absolute Maximum Ratings

Input (Emitter)

Parameter	Test Conditions	Symbol	Value	Unit
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Forward surge current	$t_p \leq 10 \mu\text{s}$	I_{FSM}	3	A
Power dissipation	$T_{amb} \leq 25^\circ\text{C}$	P_V	100	mW
Junction temperature		T_j	125	$^\circ\text{C}$

Output (Detector)

Parameter	Test Conditions	Symbol	Value	Unit
Collector base voltage		V_{CBO}	50	V
Collector emitter voltage		V_{CEO}	30	V
Emitter collector voltage		V_{ECO}	5	V
Collector current		I_C	150	mA
Peak collector current	$t_p/T = 0.5, t_p \leq 10 \text{ ms}$	I_{CM}	200	mA
Power dissipation	$T_{amb} \leq 25^\circ\text{C}$	P_V	150	mW
Junction temperature		T_j	125	$^\circ\text{C}$

Coupler

Parameter	Test Conditions	Symbol	Value	Unit
Isolation test voltage (RMS)	$t = 1 \text{ min}$	V_{IO}	3.75	kV
Total power dissipation	$T_{amb} \leq 25^\circ\text{C}$	P_{tot}	250	mW
Ambient temperature range		T_{amb}	-55 to +100	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to +125	$^\circ\text{C}$
Soldering temperature	2 mm from case, $t \leq 10 \text{ s}$	T_{sd}	260	$^\circ\text{C}$



Electrical Characteristics ($T_{amb} = 25^{\circ}\text{C}$)

Input (Emitter)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Forward voltage	$I_F = 50 \text{ mA}$	V_F		1.25	1.5	V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$	C_j		50		pF

Output (Detector)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector base voltage	$I_C = 100 \text{ }\mu\text{A}$	V_{CBO}	50			V
Collector emitter voltage	$I_C = 1 \text{ mA}$	V_{CEO}	30			V
Emitter collector voltage	$I_C = 100 \text{ }\mu\text{A}$	V_{ECO}	5			V
Collector dark current	$V_{CE} = 10 \text{ V}, I_F = 0, E = 0$	I_{CEO}			100	nA

Coupler

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Isolation test voltage (RMS)	$f = 50 \text{ Hz}, t = 2 \text{ s}$	$V_{IO}^{1)}$	3.75			kV
Isolation resistance	$V_{IO} = 1000 \text{ V},$ 40% relative humidity	$R_{IO}^{1)}$		10^{12}		Ω
Collector emitter saturation voltage	$I_F = 8 \text{ mA}, I_C = 2 \text{ mA}$	V_{CEsat}			1	V
Cut-off frequency	$I_F = 2 \text{ mA}, V_{CE} = 10 \text{ V},$ $R_L = 100 \text{ }\Omega$	f_c		30		kHz
Coupling capacitance	$f = 1 \text{ MHz}$	C_k		0.3		pF

¹⁾ Related to standard climate 23/50 DIN 50014

Current Transfer Ratio (CTR)

Parameter	Test Conditions	Type	Symbol	Min.	Typ.	Max.	Unit
I_C/I_F	$V_{CE} = 10 \text{ V}, I_F = 10 \text{ mA},$ $t_p/T = 0.01, t_p = 0.3 \text{ ms}$	4N32, 4N33	CTR	5			

Switching Characteristics

Parameter	Test Conditions	Symbol	Typ.	Unit
Turn-on time	$V_S = 10\text{ V}$, $I_C = 50\text{ mA}$, $R_L = 100\ \Omega$ (see figure 1)	t_{on}	50	μs
Turn-off time		t_{off}	40	μs

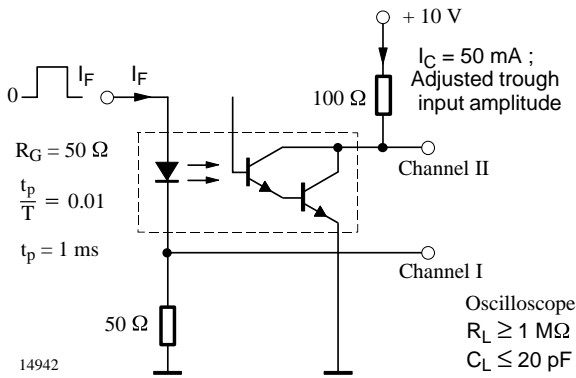
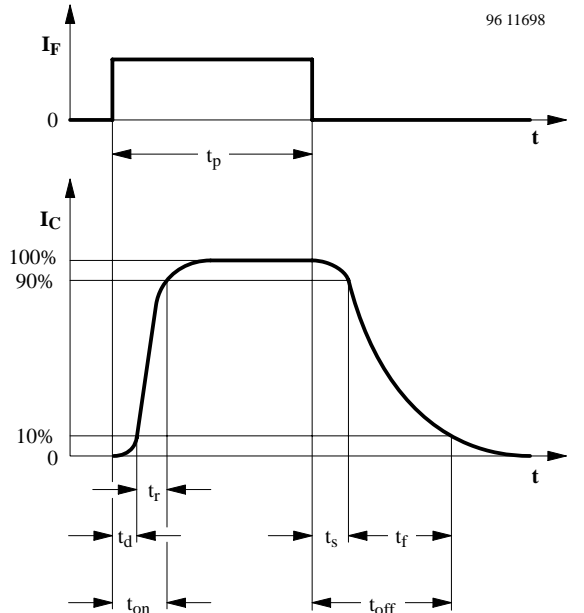


Figure 1. Test circuit, non-saturated operation

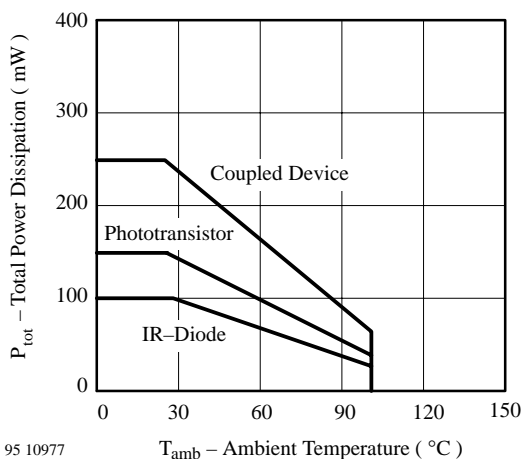


t_p pulse duration
 t_{on} turn-on time
 t_d delay time
 t_r rise time
 $t_{on} (= t_d + t_r)$

t_s storage time
 t_f fall time
 $t_{off} (= t_s + t_f)$ turn-off time

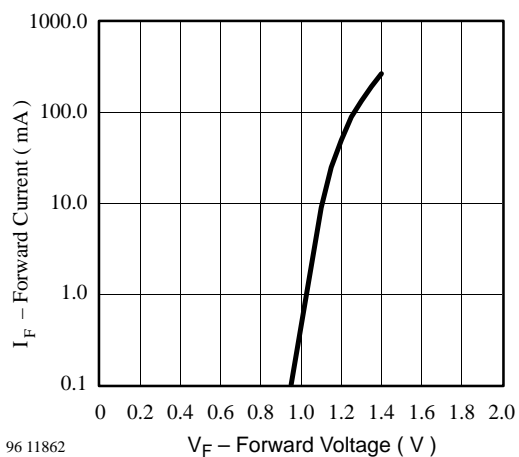
Figure 2. Switching times

Typical Characteristics ($T_{amb} = 25^\circ\text{C}$, unless otherwise specified)



95 10977

Figure 3. Total Power Dissipation vs. Ambient Temperature



96 11862

Figure 4. Forward Current vs. Forward Voltage

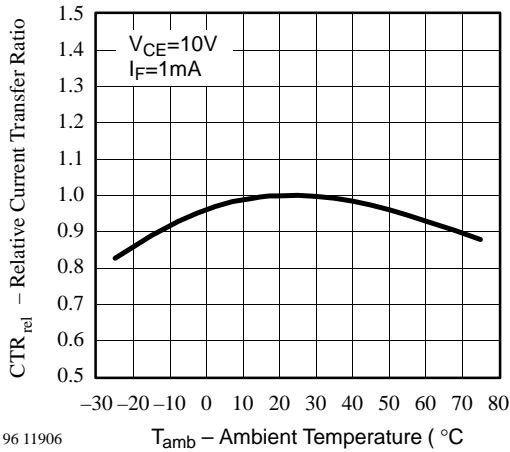


Figure 5. Relative Current Transfer Ratio vs. Ambient Temperature

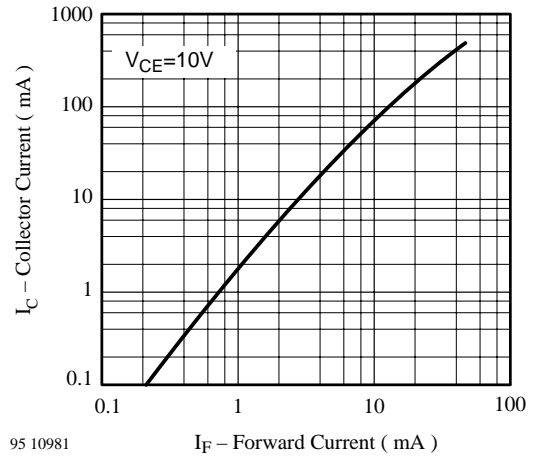


Figure 8. Collector Current vs. Forward Current

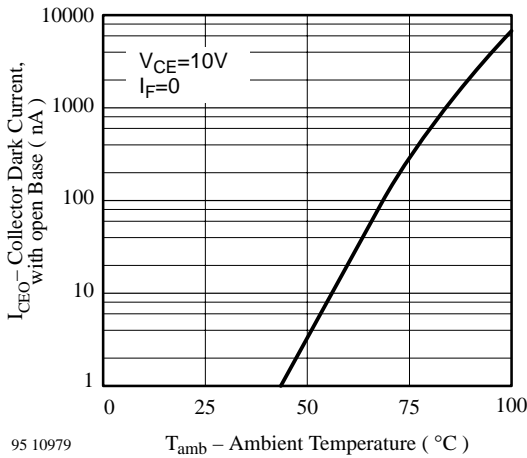


Figure 6. Collector Dark Current vs. Ambient Temperature

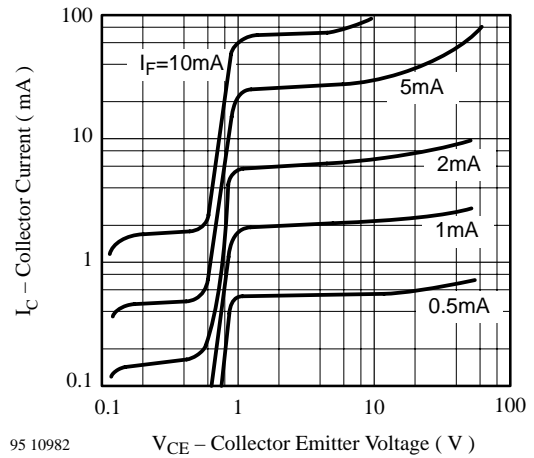


Figure 9. Collector Current vs. Collector Emitter Voltage

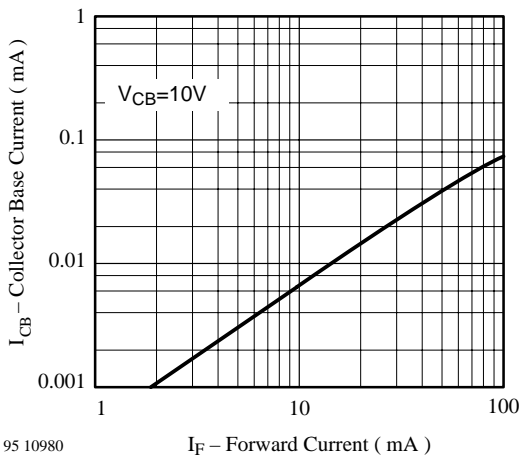


Figure 7. Collector Base Current vs. Forward Current

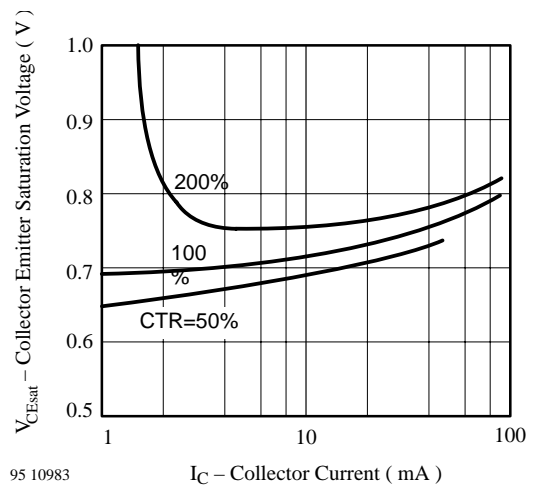


Figure 10. Collector Emitter Saturation Voltage vs. Collector Current

4N32/ 4N33

Vishay Telefunken

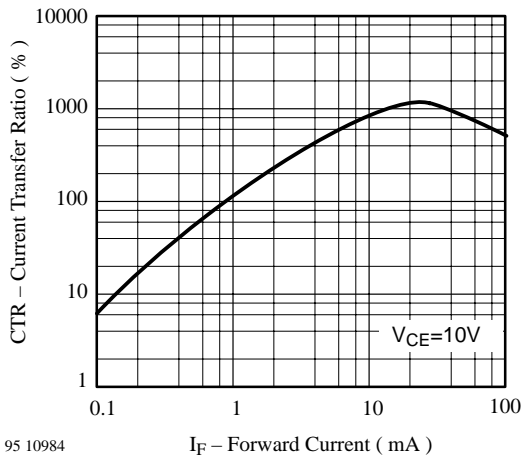


Figure 11. Current Transfer Ratio vs. Forward Current

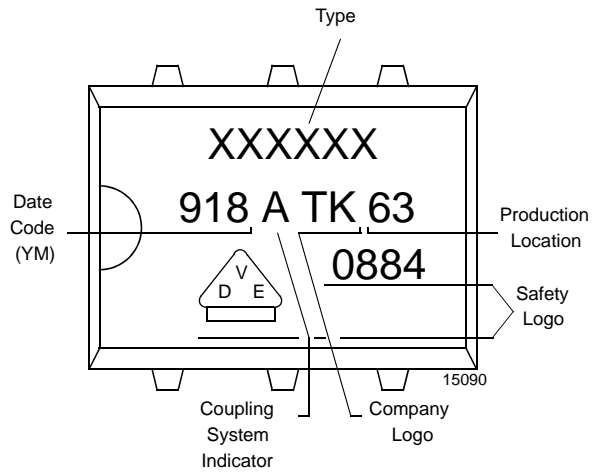


Figure 12. Marking example

Dimensions of 4N32/ 4N33 in mm

