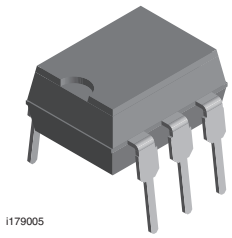
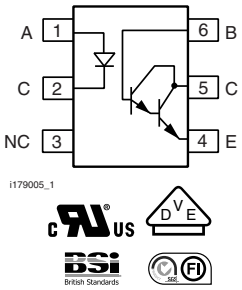
Optocoupler, Photodarlington Output, High Gain, with Base Connection





FEATURES

- Very high current transfer ratio, 500 % min.
- High isolation resistance, 10^{11} Ω typical
- Standard plastic DIP package
- Compliant to RoHS Directive to 2002/95/EC and in accordance WEEE 2002/96/EC

Pb-free

e3

RoHS COMPLIANT

AGENCY APPROVALS

- UL1577, file no. E52744 system code H
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 (pending), avialable with option 1
- BSI IEC60950; IEC60065
- FIMKO

DESCRIPTION

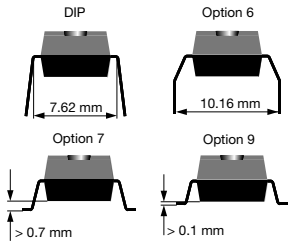
The 4N32 and 4N33 are optically coupled isolators with a gallium arsenide infrared LED and a solicon photodarlington sensor.

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.

ORDERING INFORMATION

4	N	3	#	-	X	0	#	#	T
PART NUMBER					PACKAGE OPTION				TAPE AND REEL



AGENCY CERTIFIED/PACKAGE	CTR (%)	
UL, BSI, FIMKO	**≥ 500**	**≥ 500**
DIP-6	4N32	4N33
DIP-6, 400 mil, option 6	4N32-X006	-
SMD-6, option 7	4N32-X007T (1)	4N33-X007T (1)
SMD-6, option 9	4N32-X009T (1)	4N33-X009T (1)
VDE, UL, BSI, FIMKO	**≥ 500**	**≥ 500**
DIP-6	4N32-X001	4N33-X001
SMD-6, option 7	4N32-X017T	4N33-X017T (1)

Notes

- Additional options may be possible, please contact sales office.

(1) Also available in tubes, do not put T on the end.

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	3	V
Forward current		I_F	60	mA
Power dissipation		P_{diss}	100	mW
Derate linearly	from 55 °C		1.33	mW/°C
OUTPUT				
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		I_C	100	mA
Power dissipation		P_{diss}	150	mW
Derate linearly			2	mW/°C
COUPLER				
Total dissipation		P_{tot}	250	mW
Derate linearly			3.3	mW/°C
Isolation test voltage (between emitter	1 s	V_{ISO}	5300	V_{RMS}
Leakage path			7	mm min.
Air path			7	mm min.
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	$\geq 10^{12}$	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	$\geq 10^{11}$	Ω
Storage temperature		T_{stg}	- 55 to + 150	°C
Operating temperature		T_{amb}	- 55 to + 100	°C
Lead soldering time (1)	at 260 °C		10	s

Notes

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

(1) Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 50 mA	V_F		1.25	1.5	V
Reverse current	V_R = 3 V	I_R		0.1	100	µA
Capacitance	V_R = 0 V	C_O		25		pF
OUTPUT						
Collector emitter breakdown voltage (1)	I_C = 100 µA, I_F = 0	BV_{CEO}	30			V
Collector base breakdown voltage (1)	I_C = 100 µA, I_F = 0	BV_{CBO}	50			V
Emitter base breakdown voltage (1)	I_C = 100 µA, I_F = 0	BV_{EBO}	8			V
Emitter collector breakdown voltage (1)	I_C = 100 µA, I_F = 0	BV_{ECO}	5	10		V
Collector emitter leakage current	V_{CE} = 10 V, I_F = 0	I_{CEO}		1	100	nA
	I_C = 0.5 mA, V_{CE} = 5 V	h_{FE}	13			
COUPLER						
Collector emitter saturation voltage		V_{CEsat}		1		V
Coupling capacitance				1.5		pF

Notes

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

(1) Indicates JEDEC registered values.

CURRENT TRANSFER RATIO						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Current transfer ratio	V_{CE} = 10 V, I_F = 10 mA	CTR	500			%

SWITCHING CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn-on time	V_{CC} = 10 V, I_C = 50 mA	t_{on}			5	µs
Turn-off time	I_F = 200 mA, R_L = 180 Ω	t_{off}			100	µs

SAFETY AND INSULATION RATINGS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Climatic classification (according to IEC 68 part 1)				55/100/21		
Comparative tracking index		CTI	175		399	
V_{IOTM}			8000			V
V_{IORM}			890			V
P_{SO}					700	mW
I_{SI}					400	mA
T_{SI}					175	°C
Creepage distance	Standard DIP-6		7			mm
Clearance distance	Standard DIP-6		7			mm
Creepage distance	400 mil DIP-6		8			mm
Clearance distance	400 mil DIP-6		8			mm
Insulation thickness, reinforced rated	per IEC 60950 2.10.5.1		0.4			mm

Note

- As per IEC 60747-5-2, § 7.4.3.8.1, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

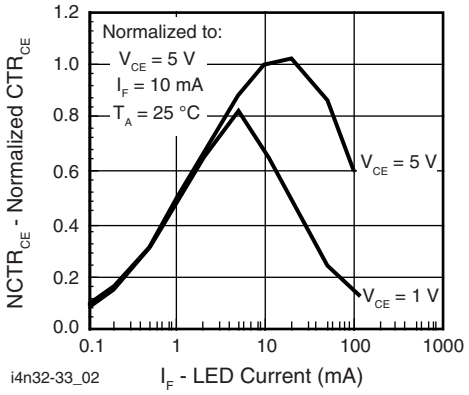


Fig. 1 - Normalized Non-Saturated and Saturated CTR_{CE} vs. LED Current

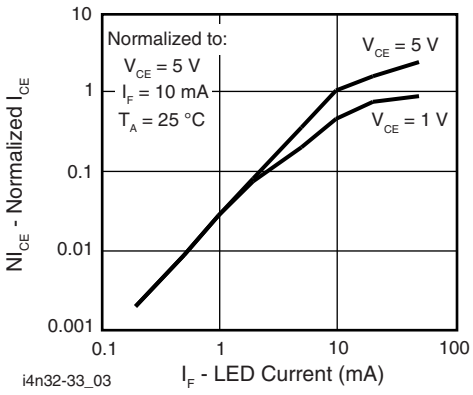


Fig. 2 - Normalized Non-Saturated and Saturated Collector Emitter Current vs. LED Current

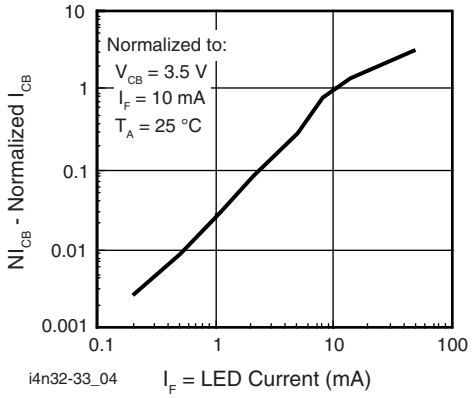


Fig. 3 - Normalized Collector Base Photocurrent vs. LED Current

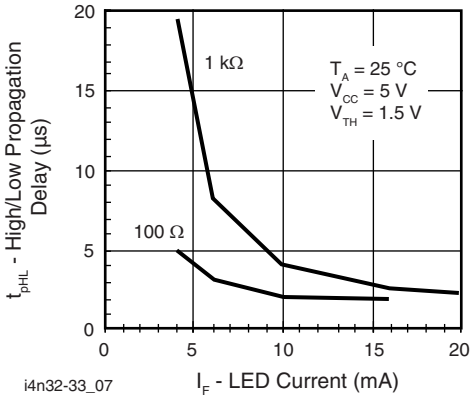


Fig. 6 - High to Low Propagation Delay vs. Collector Load Resistance and LED Current

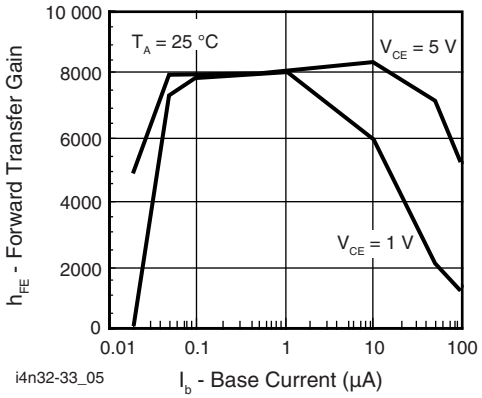


Fig. 4 - Non-Saturated and Saturated h_{FE} vs. Base Current

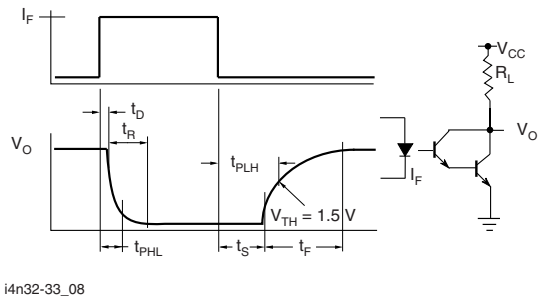


Fig. 7 - Switching Waveform and Switching Schematic

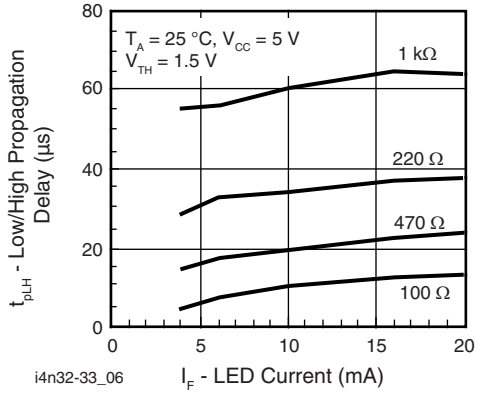
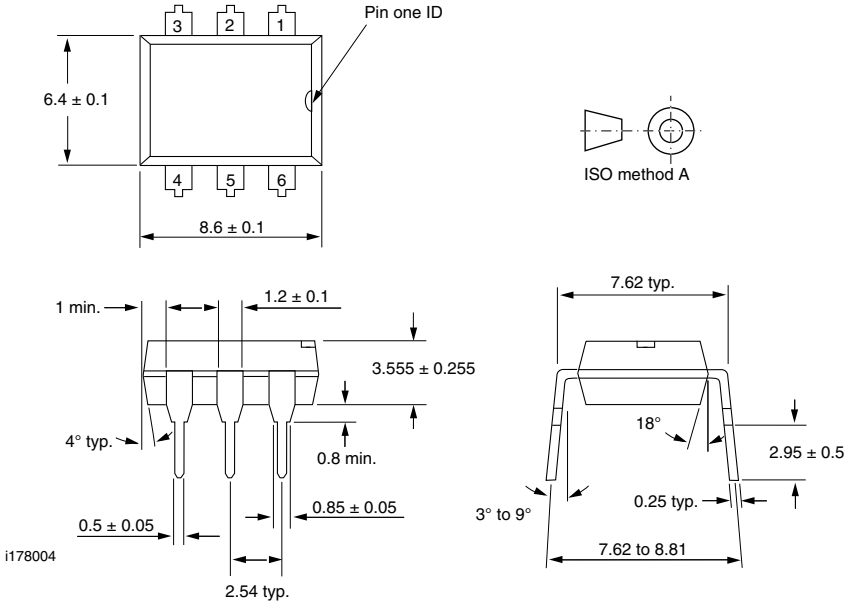
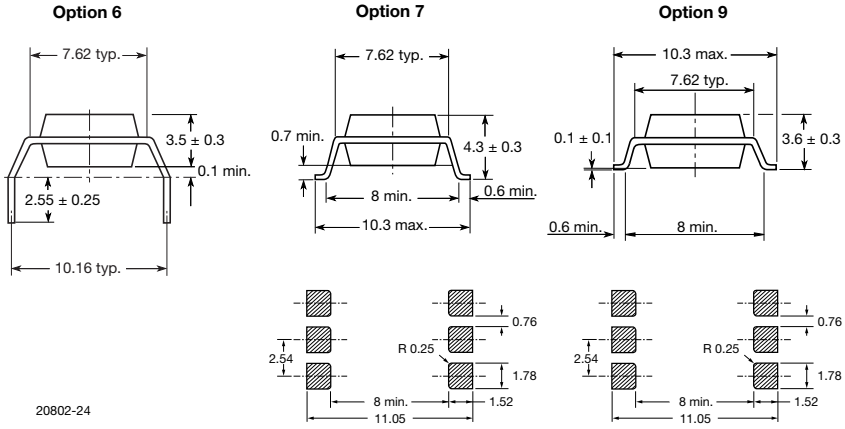


Fig. 5 - Low to High Propagation Delay vs. Collector Load Resistance and LED Current

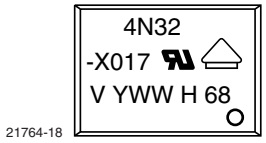
PACKAGE DIMENSIONS in millimeters

DIP-6 Package Dimensions





PACKAGE MARKING



Notes

- Example marking for 4N32-X017T.
- Only options 1, and 7 reflected in the package marking.
- The VDE logo is only marked on option 1 parts.
- Tape and reel suffix (T) is not part of the package marking.

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