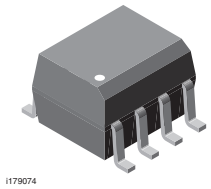
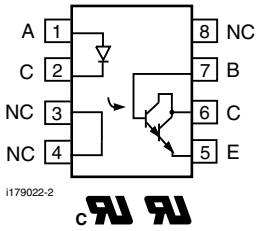
Optocoupler, Photodarlington Output, Low Input Current, High Gain, with Base Connection





FEATURES

- Isolation test voltage, 4000 V_{RMS}
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96EC

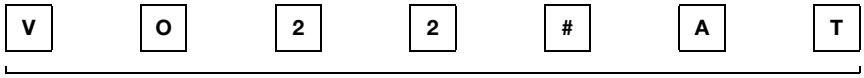
AGENCY APPROVALS

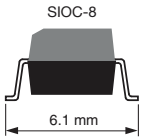
- UL1577, file no. E52744 system code Y
- cUL - file no. E52744, equivalent to CSA bulletin 5A

DESCRIPTION

The VO221AT, VO222AT, VO223AT are high current transfer ratio (CTR) optocouplers with a gallium arsenide infrared LED emitter and a silicon NPN photodarlington transistor detector.
The device has a CTR tested at 1 mA LED current. This low drive current permits easy interfacing from CMOS to LSTTL or TTL.

ORDERING INFORMATION





AGENCY CERTIFIED/PACKAGE	CTR (%)		
UL, cUL	**> 100**	**> 200**	**> 500**
SOIC-8	VO221AT	VO222AT	VO223AT

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Peak reverse voltage		V_R	6	V
Peak forward current	1 µs, 300 pps	I_{FM}	1	A
Forward continuous current		I_F	60	mA
Power dissipation		P_{diss}	90	mW
Derate linearly from 25 °C			1.2	mW/°C
OUTPUT				
Collector emitter breakdown voltage		BV_{CEO}	30	V
Emitter collector breakdown voltage		BV_{ECO}	5	V
Collector base breakdown voltage		BV_{CBO}	70	V
$I_{Cmax.\ DC}$		$I_{Cmax.\ DC}$	50	mA
$I_{Cmax.}$	t < 1 ms	$I_{Cmax.}$	100	mA
Power dissipation		P_{diss}	150	mW

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
COUPLER				
Derate linearly from 25 °C			2	mW/°C
Isolation test voltage	t = 1 s	V_{ISO}	4000	V_{RMS}
Total package dissipation (at 25 °C ambient) (LED and detector)		P_{tot}	240	mW
Derate linearly from 25 °C			3.2	mW/°C
Storage temperature		T_{stg}	- 40 to + 150	°C
Operating temperature		T_{amb}	- 40 to + 100	°C
Soldering time at 260 °C		T_{sld}	10	s

Note

- 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.

ELECTRICAL CHARACTERISTCS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 1 mA	V_F		1	1.5	V
Reverse current	V_R = 6 V	I_R		0.1	100	µA
Capacitance	V_R = 0 V, f = 1 MHz	C_O		25		pF
OUTPUT						
Collector emitter breakdown voltage	I_C = 100 µA	BV_{CEO}	30			V
Emitter collector breakdown voltage	I_C = 10 µA	BV_{ECO}	5			V
Collector base breakdown voltage	I_C = 10 µA	BV_{CBO}	70			V
Collector emitter leackage current	V_{CE} = 20 V	I_{CEO}			40	nA
Collector base current		ICBO			1	nA
Emitter base current		I_{EBO}			1	nA
Collector emitter capacitance	V_{CE} = 10 V	C_{CE}		3.4		pF
Saturation voltage, collector emitter	I_{CE} = 0.5 mA	V_{CEsat}			1	V
COUPLER						
Capacitance (input to output)		C_{IO}		0.5		pF

Note

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

CURRENT TRANSFER RATIO							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Current transfer ratio	I_F = 1 mA, V_{CE} = 5 V	VO221AT	CTR_{DC}	100			%
		VO222AT	CTR_{DC}	200			%
		VO223AT	CTR_{DC}	500			%

SWITCHING CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn-on time	V_{CC} = 10 V, R_L = 100 Ω, I_F = 5 mA	t_{on}		3		µs
Turn-off time	V_{CC} = 10 V, R_L = 100 Ω, I_F = 5 mA	t_{off}		3		µs

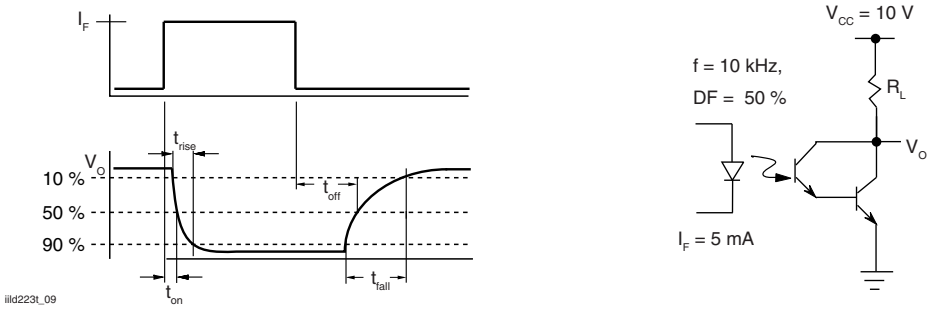


Fig. 1 - Switching Test Circuit

SAFETY AND INSULATION RATINGS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Climatic classification (according to IEC 68 part 1)				40/100/21		
Polution degree				2		
Comparative tracking index		CTI	175		399	
Isolation test voltage	1 s	V_{ISO}	4000			V_{RMS}
Peak transient overvoltage		V_{IOTM}	6000			V
Peak insulation voltage		V_{IORM}	560			V
Resistance (input to output)		R_{IO}		100		GW
Safety rating - power output		P_{SO}			350	mW
Safety rating - input current		I_{SI}			150	mA
Safety rating - temperature		T_{SI}			165	°C
External creepage distance			4			mm
External clearance distance			4			mm
Internal creepage distance			3.3			mm
Insulation thickness			0.2			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)

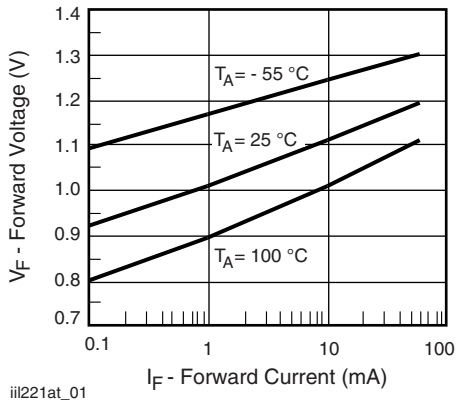


Fig. 1 - Forward Voltage vs. Forward Current

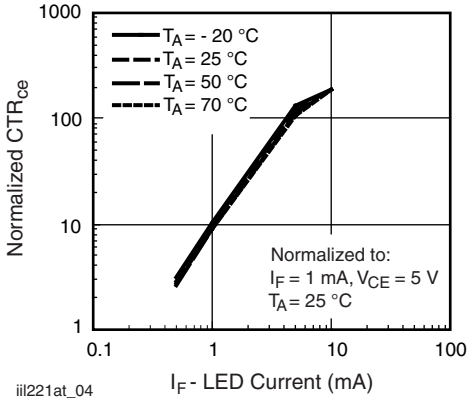


Fig. 4 - Normalized CTR_{CE} vs. LED Current

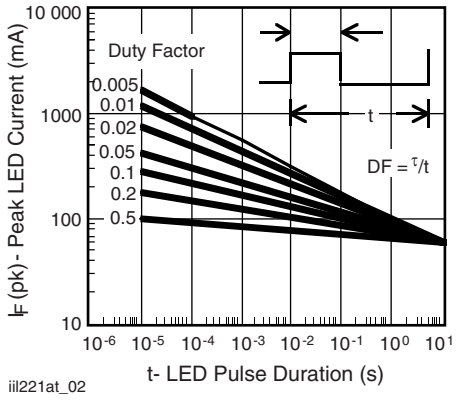


Fig. 2 - Peak LED Current vs. Duty Factor, τ

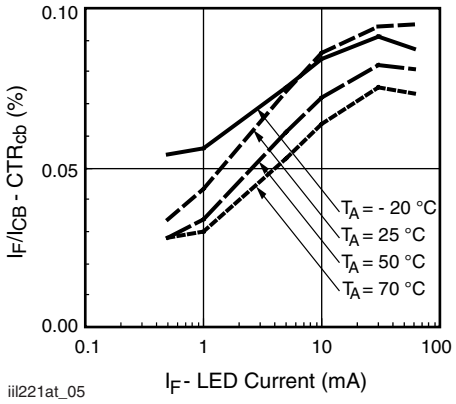


Fig. 5 - CTR_{CB} vs. LED Current

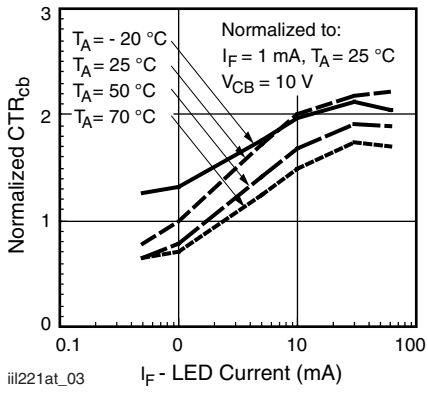


Fig. 3 - Normalized CTR_{cb} vs. I_F

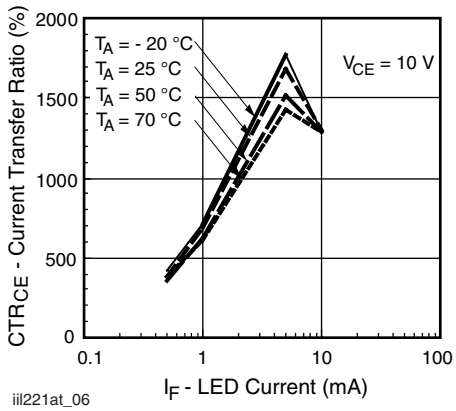


Fig. 6 - CTR vs. LED Current

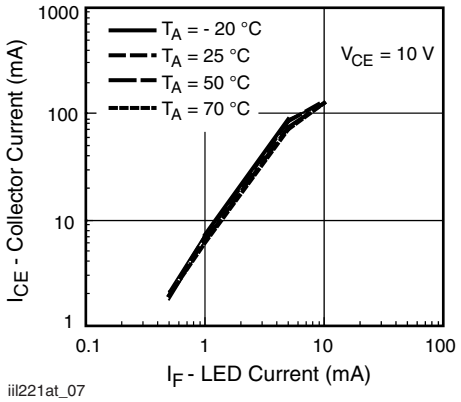


Fig. 7 - Collector Current vs. LED Current

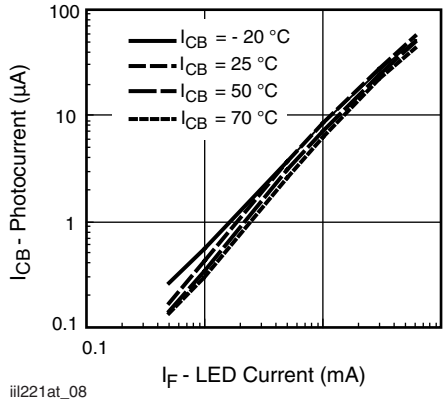


Fig. 8 - Photocurrent vs. LED Current

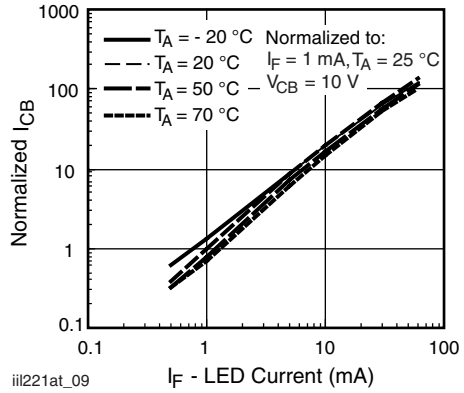
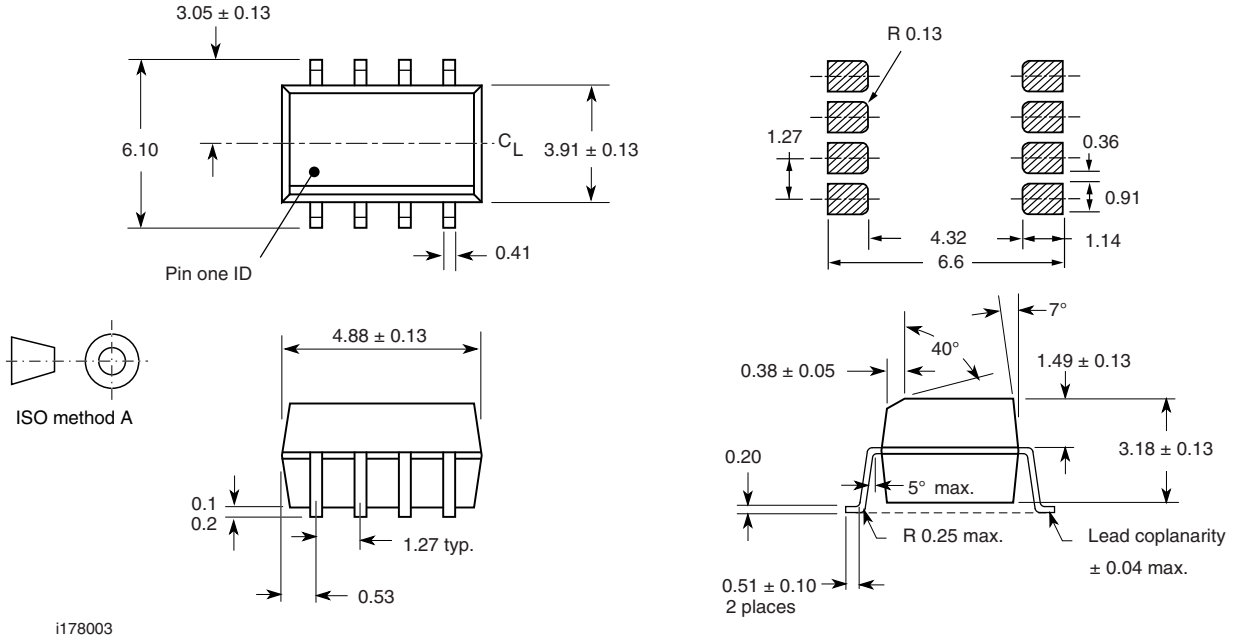
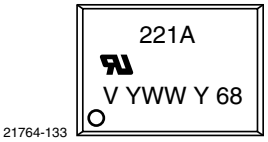


Fig. 9 - Normalized I_{CB} vs. I_F

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING (example)



Note

- Tape and reel suffix (T) is not part of the package marking.

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