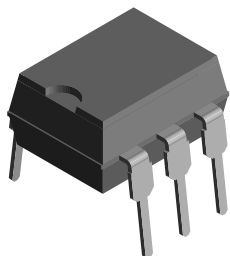
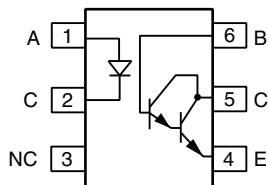




## Optocoupler, Photodarlington Output, High Gain, With Base Connection



1179004-3



1179005\_2



### FEATURES

- Isolation test voltage, 5300 V<sub>RMS</sub>
- Coupling capacitance, 0.5 pF
- Fast rise time, 10 μs
- Fast fall time, 35 μs
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

**RoHS**  
COMPLIANT

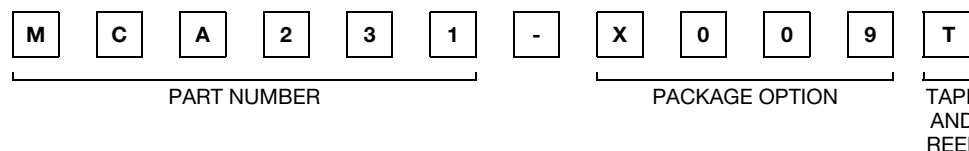
### DESCRIPTION

The MCA231 is an industry standard optocoupler, consisting of a gallium arsenide infrared LED and a silicon photodarlington. These optocouplers are constructed with a high voltage insulation packaging process which offers 7.5 kV withstand test capability.

### AGENCY APPROVALS

- UL1577, file no. E52744 system code H, double protection
- CSA 93751
- BSI IEC 60950; IEC 60065

### ORDERING INFORMATION



AGENCY CERTIFIED/PACKAGE	CTR (%)
	10 mA
UL, BSI, VDE	> 200
DIP-6	MCA231
SMD-6, option 9	MCA231-X009T <sup>(1)</sup>

#### Note

- For additional information on the available options refer to option information
- <sup>(1)</sup> Also available in tubes, do not put T on the end

### ABSOLUTE MAXIMUM RATINGS (T<sub>amb</sub> = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	PART	SYMBOL	VALUE	UNIT
<b>INPUT</b>					
Reverse voltage			V <sub>R</sub>	6	V
Forward continuous current			I <sub>F</sub>	60	mA
Power dissipation			P <sub>diss</sub>	135	mW
Derate linearly from 25 °C				1.8	mW/°C
<b>OUTPUT</b>					
Collector emitter breakdown voltage		MCA231	BV <sub>CEO</sub>	30	V
Emitter collector breakdown voltage			BV <sub>ECO</sub>	7	V
Collector base breakdown voltage		MCA231	BV <sub>CBO</sub>	30	V
Power dissipation			P <sub>diss</sub>	210	mW
Derate linearly from 25 °C				2.8	mW/°C



ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)					
PARAMETER	TEST CONDITION	PART	SYMBOL	VALUE	UNIT
Coupler					
Total package dissipation (LED plus detector)			$P_{tot}$	260	mW
Derate linearly from 25 °C				3.5	mW/°C
Storage temperature			$T_{stg}$	-55 to +150	°C
Operating temperature			$T_{amb}$	-55 to +100	°C
Lead soldering time at 260 °C				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 CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input							
Forward voltage	$I_F = 50\text{ mA}$		$V_F$	-	1.1	1.5	V
Reverse current	$V_R = 3\text{ V}$		$I_R$	-	-	10	$\mu\text{A}$
Junction capacitance	$V_R = 3\text{ V}$		$C_j$	-	50	-	pF
Output							
Collector emitter breakdown voltage	$I_C = 100\text{ }\mu\text{A}$ , $I_F = 0\text{ mA}$	MCA231	$BV_{CEO}$	30	-	-	V
Emitter collector breakdown voltage	$I_E = 10\text{ }\mu\text{A}$ , $I_F = 0\text{ mA}$		$BV_{ECO}$	7	-	-	V
Collector base breakdown voltage	$I_C = 10\text{ }\mu\text{A}$ , $I_F = 0\text{ mA}$	MCA231	$BV_{CBO}$	30	-	-	V
Collector emitter leakage current			$I_{CEO}$	-	-	100	nA
Coupler							
Collector emitter saturation voltage	$I_C = 2\text{ mA}$ , $I_F = 16\text{ mA}$		$V_{CEsat}$	-	-	0.8	V
	$I_C = I_F = 50\text{ mA}$		$V_{CEsat}$	-	-	1	V
	$I_C = 2\text{ mA}$ , $I_F = 1\text{ mA}$		$V_{CEsat}$	-	-	1	V
	$I_C = 10\text{ mA}$ , $I_F = 5\text{ mA}$		$V_{CEsat}$	-	-	1	V
	$I_C = 50\text{ mA}$ , $I_F = 10\text{ mA}$		$V_{CEsat}$	-	-	1.2	V
Capacitance (input to output)			$C_{iO}$	-	0.5	-	pF

**Note**

- 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

CURRENT TRANSFER RATIO ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
DC current transfer ratio	$V_{CE} = 5\text{ V}$ , $I_F = 10\text{ mA}$	$CTR_{DC}$	200	-	-	%

SWITCHING CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Switching times	$R_L = 100\text{ }\Omega$ , $V_{CE} = 10\text{ V}$	$t_{on}$	-	10	-	$\mu\text{s}$
		$t_{off}$	-	30	-	$\mu\text{s}$



SAFETY AND INSULATION RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification	According to IEC 68 part 1		55 / 100 / 21	
Comparative tracking index		CTI	175	
Maximum rated withstanding isolation voltage	t = 1 min	$V_{ISO}$	4420	$V_{RMS}$
Maximum transient isolation voltage		$V_{IOTM}$	10 000	V
Maximum repetitive peak isolation voltage		$V_{IORM}$	890	V
Isolation resistance	$V_{IO} = 500\text{ V}, T_{amb} = 25\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Output safety power		$P_{SO}$	400	mW
Input safety current		$I_{SI}$	275	mA
Input safety temperature		$T_{SI}$	175	$^{\circ}\text{C}$
Creepage distance			$\geq 7$	mm
Clearance distance			$\geq 7$	mm
Insulation thickness		DTI	$\geq 0.4$	mm

**Note**

- As per IEC 60747-5-5, § 7.4.3.8.2, 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** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

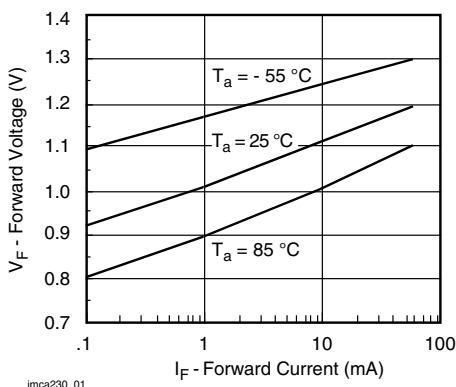


Fig. 1 Forward Voltage vs. Forward Current

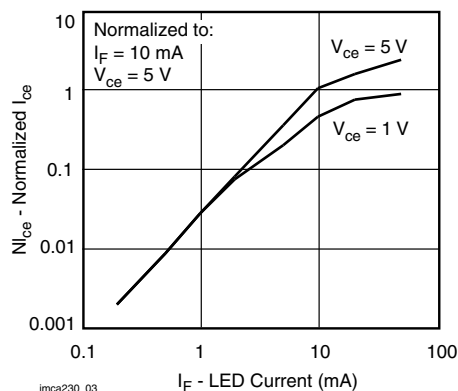


Fig. 2 - Normalized Non-Saturated and Saturated Collector Emitter Current vs. LED Current

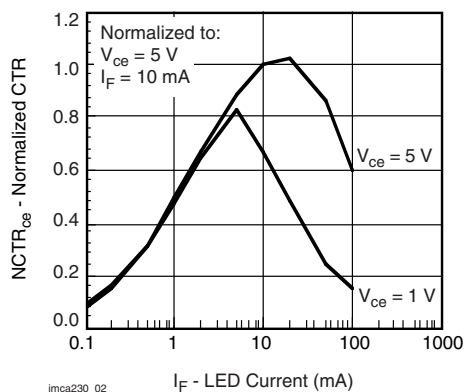


Fig. 1 - Normalized Non-Saturated and Saturated CTR vs. LED Current

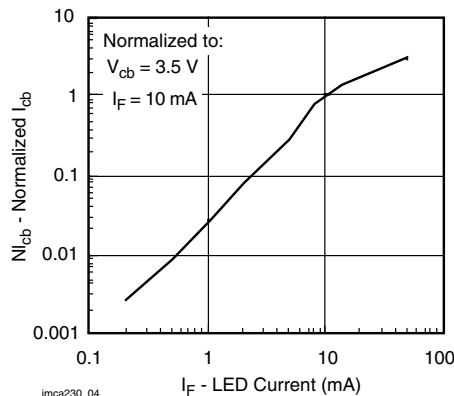


Fig. 3 - Normalized Collector Base Photocurrent vs. LED Current

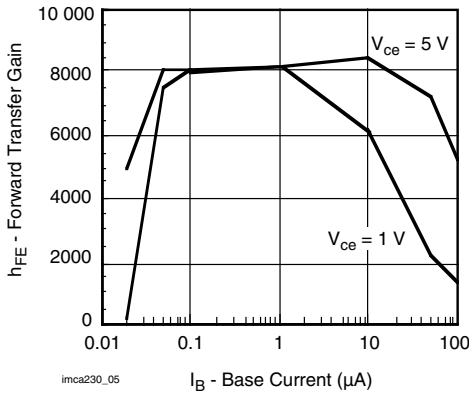


Fig. 4 - Non Saturated and Saturated  $h_{FE}$  vs. Base Current

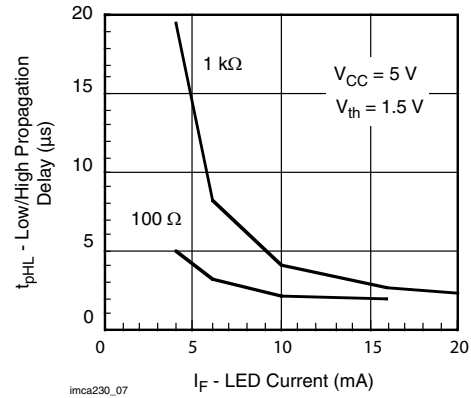


Fig. 6 - High to low Propagation Delay vs. Collector Load Resistance and LED Current

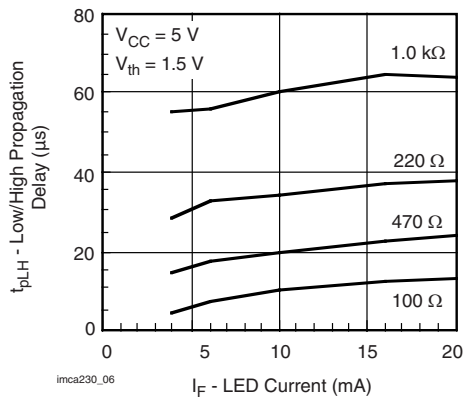


Fig. 5 - Low to High Propagation Delay vs. Collector Load Resistance and LED Current

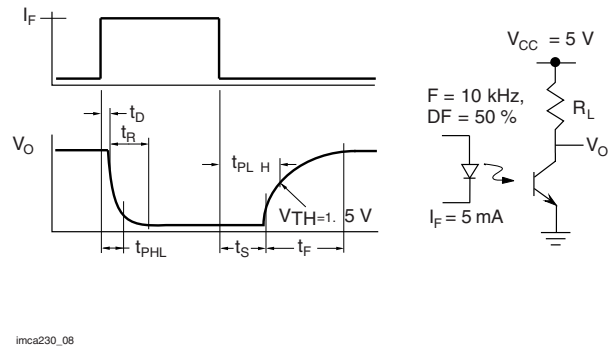
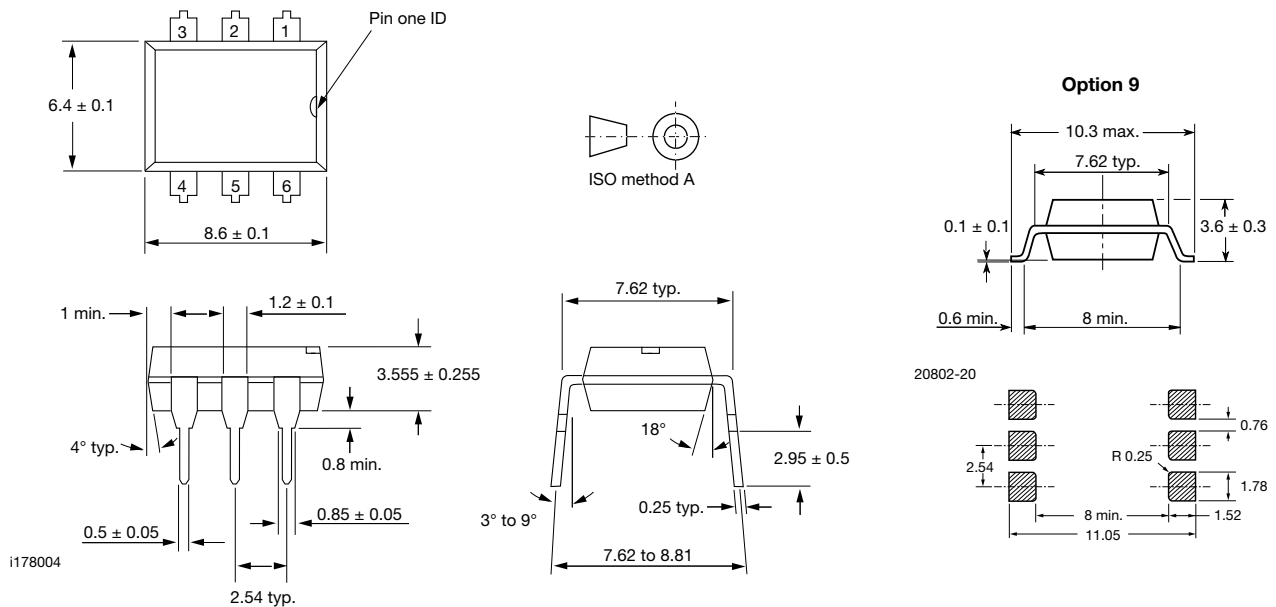


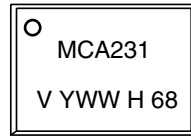
Fig. 7 - Switching Timing Waveform and Schematic

**PACKAGE DIMENSIONS** in millimeters





**PACKAGE MARKING**



21764-99

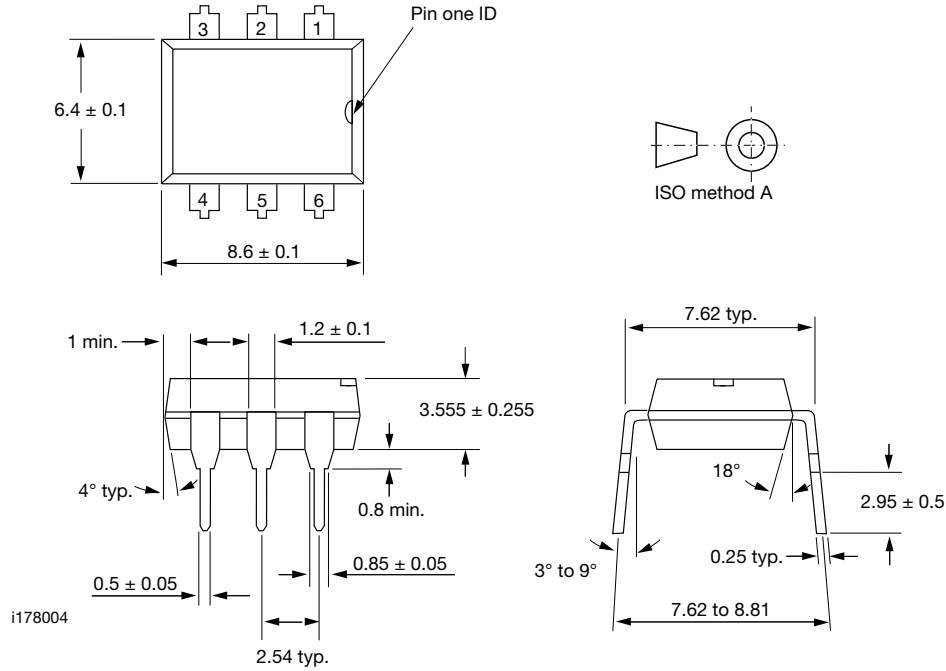
**Note**

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



# DIP-6A

## PACKAGE DIMENSIONS in inches (millimeters)



### Note

The information in this document provides generic information but for specific information on a product the appropriate product datasheet should be used.



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