RoHS

HALOGEN

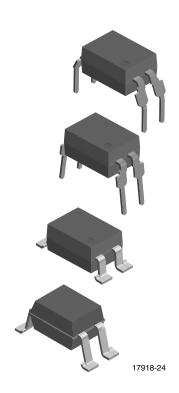
FREE

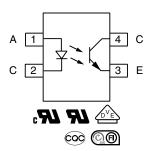
GREEN (5-2008)



# Vishay Semiconductors

# Optocoupler, Phototransistor Output, High Reliability, 5300 V<sub>RMS</sub>





#### **LINKS TO ADDITIONAL RESOURCES**











#### **FEATURES**

- Operating temperature from -55 °C to +110 °C
- · Good CTR linearity depending on forward current
- Isolation voltage, 5300 V<sub>RMS</sub>
- High collector emitter voltage, V<sub>CEO</sub> = 80 V
- Low saturation voltage
- · Fast switching times
- Low CTR degradation
- Low coupling capacitance
- End stackable, 0.100" (2.54 mm) spacing
- High common mode interference immunity
- Material categorization: for definitions of compliance please see <a href="https://www.vishav.com/doc?99912"><u>www.vishav.com/doc?99912</u></a>

#### **DESCRIPTION**

The 110 °C rated VO617A feature a high current transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared emitting diode, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 package.

The coupling devices are designed for signal transmission between two electrically separated circuits.

The couplers are end-stackable with 2.54 mm spacing.

Creepage and clearance distances of > 8.0 mm are achieved with option 6 and option 8. This version complies with IEC 60950 (DIN VDE 0805) for reinforced insulation up to an operation voltage of 400  $V_{RMS}$  or DC. Specifications subject to change.

### **APPLICATIONS**

- AC adapters
- SMPS
- PLC
- Factory automation

#### AGENCY APPROVALS

Safety application model number covering all products in this data sheet is VO617A. This model number should be used when consulting safety agency documents.

- UL / cUL 1577
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- BSI
- CQC GB4943.1-2011
- CQC GB8898-2011
- FIMKO



ORDERING INFORMATION								
V O 6 1 PART NU	1 7 A - # X 0 # # T  PART NUMBER  CTR BIN  PACKAGE OPTION  TAPE AND REEL  Option 7  Option 8							
AGENCY CERTIFIED /								
PACKAGE				5 r	nΑ			
UL, cUL, BSI, FIMKO	50 to 600	40 to 80	63 to 125	100 to 200	160 to 320	80 to 160	130 to 260	200 to 400
DIP-4	VO617A	VO617A-1	VO617A-2	VO617A-3	VO617A-4	VO617A-7	VO617A-8	VO617A-9
DIP-4, 400 mil, option 6	-	-	-	VO617A- 3X006	VO617A- 4X006	-	-	-
SMD-4, option 7	-	- V0617A- V0617A- V0617A- 2X007T 3X007T 4X007T					-	
VDE, UL, cUL, BSI, FIMKO	50 to 600	40 to 80	63 to 125	100 to 200	160 to 320	80 to 160	130 to 260	200 to 400
DIP-4, 400 mil, option 6	-	-	-	VO617A- 3X016	VO617A- 4X016	VO617A- 7X016	VO617A- 8X016	VO617A- 9X016
SMD-4, option 7	-	VO617A- 1X017T	VO617A- 2X017T	VO617A- 3X017T	VO617A- 4X017T	VO617A- 7X017T	VO617A- 8X017T	VO617A- 9X017T
SMD-4, 400 mil, option 8	VO617A- X018T	-	-	VO617A- 3X018T	VO617A- 4X018T	-	-	-

#### Note

Additional options may be possible, please contact sales office

<b>ABSOLUTE MAXIMUM RATINGS</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	CONDITIONS	SYMBOL	VALUE	UNIT			
INPUT		_	·				
Reverse voltage		$V_{R}$	6	V			
Forward current		I <sub>F</sub>	60	mA			
Forward surge current	t <sub>p</sub> ≤ 10 μs	I <sub>FSM</sub>	1.5	Α			
LED power dissipation		P <sub>diss</sub>	70	mW			
OUTPUT	OUTPUT						
Collector emitter voltage		V <sub>CEO</sub>	80	V			
Emitter collector voltage		V <sub>ECO</sub>	7	V			
Collector current		I <sub>C</sub>	50	mA			
Collector peak current	$t_p/T = 0.5, t_p \le 10 \text{ ms}$	I <sub>CM</sub>	100	mA			
Ouput power dissipation		P <sub>diss</sub>	150	mW			
COUPLER		_	·				
Total power dissipation		P <sub>tot</sub>	200	mW			
Operation temperature		T <sub>amb</sub>	-55 to +110	°C			
Storage temperature range		T <sub>stg</sub>	-55 to +150	°C			
Soldering temperature	2 mm from case, ≤ 10 s	T <sub>sld</sub>	260	°C			

#### 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





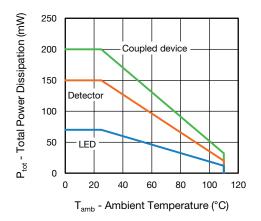


Fig. 1 - Total Power Dissipation vs. Ambient Temperature

<b>ELECTRICAL CHARACTERISTICS</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT							
Forward voltage	$I_F = 60 \text{ mA}$	-	$V_{F}$	1	1.35	1.65	V
Reverse current	V <sub>R</sub> = 6 V	-	I <sub>R</sub>	-	0.01	10	μΑ
Junction capacitance	V <sub>R</sub> = 0 V, f = 1 MHz	-	C <sub>j</sub>	-	13	-	pF
OUTPUT		•			•		
		VO617A-1		-	2	50	
		VO617A-2	•	-	2	50	
		VO617A-3		-	5	100	
Collector emitter leakage current	$V_{CE} = 10 \text{ V}$	VO617A-4	I <sub>CEO</sub>	-	5	100	nA
		VO617A-7		-	5	100	
		VO617A-8		-	5	100	
		VO617A-9		-	5	100	
Collector emitter capacitance	V <sub>CE</sub> = 5 V, f = 1 MHz	-	C <sub>CE</sub>	-	5.2	-	pF
Collector emitter breakdown voltage	I <sub>C</sub> = 1 mA	-	BV <sub>CEO</sub>	80	-	-	V
Emitter collector breakdown voltage	I <sub>E</sub> = 100 μA	-	BV <sub>ECO</sub>	7	-	-	V
COUPLER		•			•		
Collector emitter saturation voltage	$I_F = 5 \text{ mA}, I_C = 1.0 \text{ mA}$	-	V <sub>CEsat</sub>	-	0.25	0.4	V
Coupling capacitance	f = 1 MHz	-	$C_C$	-	0.4	-	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



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# Vishay Semiconductors

CURRENT TRANSFER RATIO (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
		VO617A	CTR	50	40 -	600	%
I <sub>C</sub> /I <sub>F</sub>		VO617A-1	CTR	40	-	80	%
		VO617A-2	CTR	63	-	125	%
	$I_{\rm F} = 5  \text{mA},  V_{\rm CF} = 5  \text{V}$	VO617A-3	CTR	100	-	200	%
	IF = 3 IIIA, VCE = 3 V	VO617A-4	CTR		320	%	
		VO617A-7	CTR	80	40 - 63 - 100 - 160 - 80 -	160	%
		VO617A-8	CTR	130	-	260	%
		VO617A-9	CTR	200	-	400	%

<b>SWITCHING CHARACTERISTICS</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	CTR BIN	SYMBOL	MIN.	TYP.	MAX.	UNIT
NON-SATURATED							
Rise and fall time	$I_F = 5 \text{ mA}, V_{CC} = 5 \text{ V}, R_L = 75 \Omega$	-	t <sub>r</sub> , t <sub>f</sub>	-	2	-	μs
Turn-on time	$I_F = 5$ mA, $V_{CC} = 5$ V, $R_1 = 75$ Ω	-	t <sub>on</sub>	=	3	-	μs
Turn-off time	$I_F = 5 \text{ IIA}, V_{CC} = 5 \text{ V}, R_L = 75 \Omega$	-	t <sub>off</sub>	-	2.3	-	μs
Cut-off frequency	$I_F$ = 5 mA, $V_{CC}$ = 5 V, $R_L$ = 75 $\Omega$	-	f <sub>ctr</sub>	-	190	-	kHz
SATURATED	SATURATED						
Turn-on time	I <sub>F</sub> = 5 mA	-	t <sub>on</sub>	-	6	-	μs
Turn-off time	I <sub>F</sub> = 5 mA	-	t <sub>off</sub>	-	25	-	μs
Rise time	I <sub>F</sub> = 5 mA	-	t <sub>r</sub>	-	4.6	-	μs
Fall time	I <sub>F</sub> = 5 mA	-	t <sub>f</sub>	-	15	-	μs

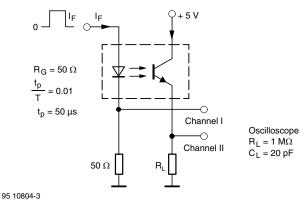


Fig. 2 - Test Circuit, Non-Saturated Operation

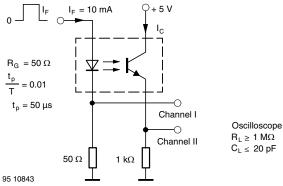


Fig. 3 - Test Circuit, Saturated Operation

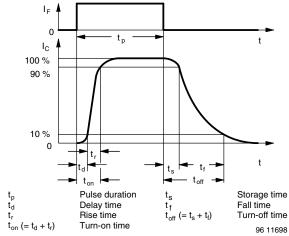


Fig. 4 - Switching Times



SAFETY AND INSULATION RATING	GS				
PARAMETER	CONDITION	SYMBOL	VALUE	UNIT	
Climatic classification	According to IEC 68 part 1		55 / 115 / 21		
Pollution degree	According to DIN VDE 0109		2		
Comparative tracking index	Insulation group IIIa	CTI	175		
Maximum rated withstanding isolation voltage	According to UL1577, t = 1 min	V <sub>ISO</sub>	5300	$V_{RMS}$	
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V <sub>IOTM</sub>	8000	V <sub>peak</sub>	
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V <sub>IORM</sub>	890	V <sub>peak</sub>	
Isolation resistance	$T_{amb} = 115  ^{\circ}\text{C},  V_{IO} = 500  \text{V}$	R <sub>IO</sub>	≥ 10 <sup>11</sup>	Ω	
isolation resistance	T <sub>amb</sub> = 175 °C, V <sub>IO</sub> = 500 V	R <sub>IO</sub>	≥ 10 <sup>9</sup>	Ω	
Output safety power		P <sub>SO</sub>	700	mW	
Input safety current		I <sub>SI</sub>	400	mA	
Input safety temperature		T <sub>S</sub>	175	°C	
Creepage distance	DIP-4		≥ 7	mm	
Clearance distance	DIP-4		≥ 7	mm	
Creepage distance	DIP-4, 400 mil, option 6		≥ 8	mm	
Clearance distance	DIP-4, 400 mil, option 6		≥ 8	mm	
Creepage distance	SMD-4, option 7		≥ 7	mm	
Clearance distance	SMD-4, option 7		≥ 7	mm	
Creepage distance	SMD-4, 400 mil, option 8		≥ 8	mm	
Clearance distance	SMD-4, 400 mil, option 8		≥ 8	mm	
Insulation thickness		DTI	≥ 0.4	mm	

### Note

<sup>•</sup> As per DIN EN 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<sub>amb</sub> = 25 °C, unless otherwise specified)

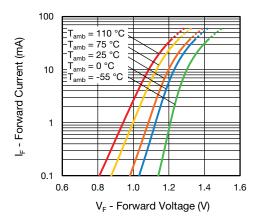


Fig. 5 - Forward Voltage vs. Forward Current

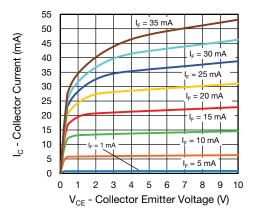


Fig. 6 - Collector Current vs. Collector Emitter Voltage

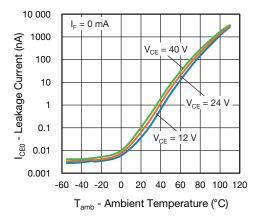


Fig. 7 - Leakage Current vs. Ambient Temperature

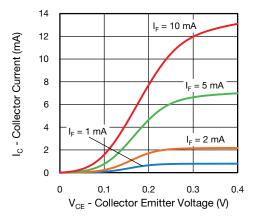


Fig. 8 - Collector Current vs. Collector Emitter Voltage

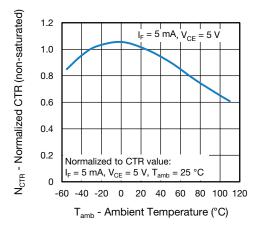


Fig. 9 - Normalized Current Transfer Ratio (non-sat.) vs.
Ambient Temperature

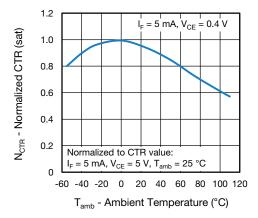


Fig. 10 - Normalized Current Transfer Ratio (sat.) vs.
Ambient Temperature





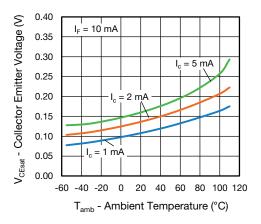


Fig. 11 - Collector Emitter Voltage vs. Ambient Temperature

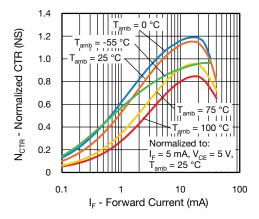


Fig. 12 - Normalized CTR (non-sat.) vs. Forward Current

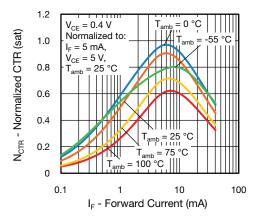


Fig. 13 - Normalized CTR (sat.) vs. Forward Current

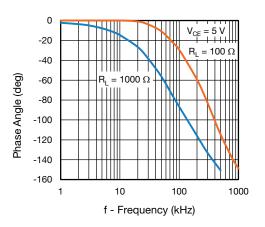


Fig. 14 - Phase Angle vs. Frequency

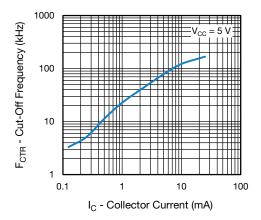


Fig. 15 - Cut-Off Frequency vs. Collector Current

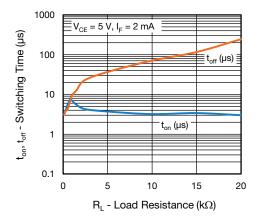
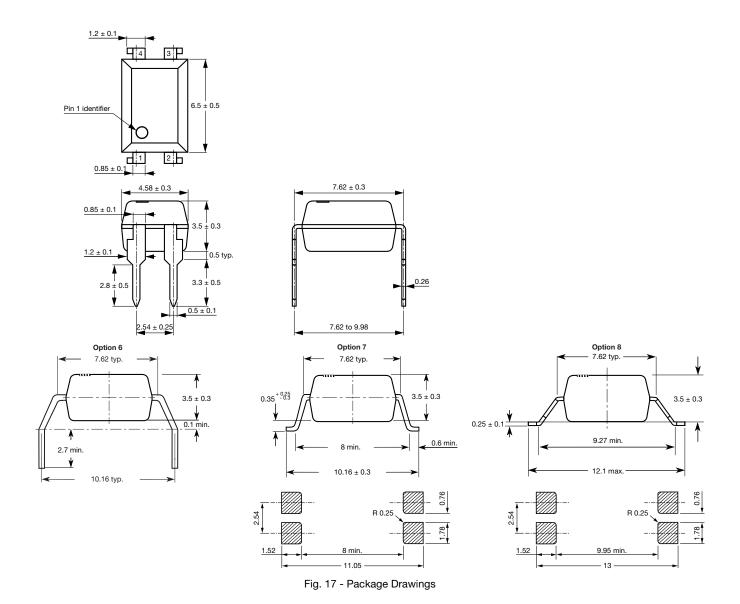


Fig. 16 - Switching Time vs. Load Resistance



## **PACKAGE DIMENSIONS** (in millimeters)



### **PACKAGE MARKING**



Fig. 18 - Example of VO617A-3X017T

### Notes

- The VDE logo is only marked on option 1 parts. Option information is not marked on the part
- Tape and reel suffix (T) is not part of the package marking



### **PACKING INFORMATION**

DEVICE PER TUBE			
TYPE	UNITS/TUBE	TUBES/BOX	UNITS/BOX
DIP-4	100	40	4000

DEVICE PER TAPE AND REEL					
TYPE	UNITS/REEL				
SMD-4, option 7	1000				
SMD-4, 400 mil, option 8	2000				

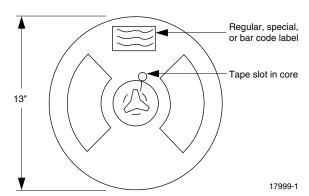


Fig. 19 - Tape and Reel Shipping Medium

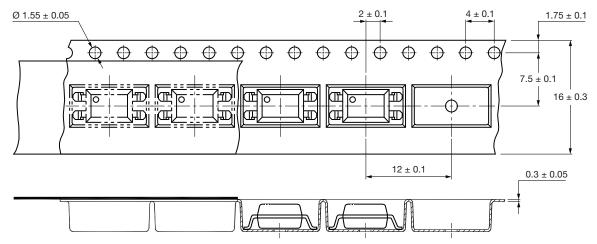
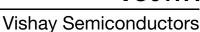


Fig. 20 - Tape and Packing for Option 7 (1000 units per reel)





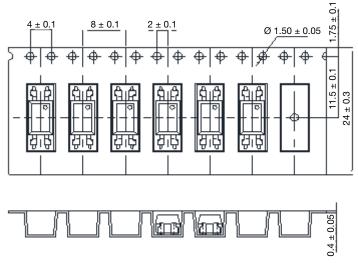


Fig. 21 - Tape and Reel Packaging for Option 8 (2000 units per reel)

#### **SOLDER PROFILES**

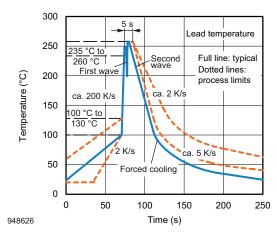


Fig. 22 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP Devices

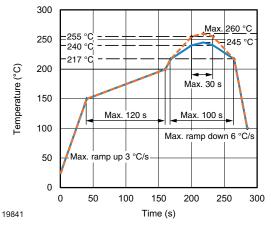


Fig. 23 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

## HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2 Floor life: unlimited

Conditions:  $T_{amb}$  < 30 °C, RH < 85 %

Moisture sensitivity level 1, according to J-STD-020



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Vishay

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