

## Optocoupler, Phototransistor Output, Low Input Current, SSOP-4, Half Pitch, Mini-Flat Package



22628-1



### DESCRIPTION

The VOS618A series has a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a 4-pin 50 mil lead pitch mini-flat package.

It features a high current transfer ratio at low input current, low coupling capacitance, and high isolation voltage.

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

### FEATURES

- High CTR with low input current
- Low profile package (half pitch)
- High collector emitter voltage,  $V_{CEO} = 80\text{ V}$
- Isolation test voltage =  $3750\text{ V}_{RMS}$
- Low coupling capacitance
- High common mode transient immunity
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### APPLICATIONS

- Telecom
- Industrial controls
- Battery powered equipment
- Office machines
- Programmable controllers

### AGENCY APPROVALS

Safety application model number covering all products in this datasheet is VOS618A. This model number should be used when consulting safety agency documents.

- UL1577, file no. E52744
- cUL
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- FIMKO EN 60065, EN 60950-1
- CQC GB4943.1-2011 and GB8898-2011 (suitable for installation altitude below 2000 m)

ORDERING INFORMATION						
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AGENCY CERTIFIED/PACKAGE	CTR (%)					
	1 mA					
UL, cUL, FIMKO, CQC	50 to 600	63 to 125	100 to 200	80 to 160	130 to 260	
SSOP-4, 50 mil pitch	VOS618AT	VOS618A-2T	VOS618A-3T	VOS618A-7T	VOS618A-8T	
UL, cUL, FIMKO, CQC, VDE (option 1)	50 to 600	63 to 125	100 to 200	80 to 160	130 to 260	
SSOP-4, 50 mil pitch	VOS618A-X001T	VOS618A-2X001T	VOS618A-3X001T	VOS618A-7X001T	VOS618A-8X001T	

#### Note

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

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		$V_R$	6	V
Power dissipation		$P_{diss}$	70	mW
Forward current		$I_F$	50	mA
<b>OUTPUT</b>				
Collector emitter voltage		$V_{CEO}$	80	V
Emitter collector voltage		$V_{ECO}$	7	V
Collector current		$I_C$	50	mA
	$t_p/T = 0.5, t_p < 10\text{ ms}$	$I_C$	100	mA
Power dissipation		$P_{diss}$	150	mW
<b>COUPLER</b>				
Isolation test voltage between emitter and detector	$t = 1\text{ min}$	$V_{ISO}$	3750	$V_{RMS}$
Total power dissipation		$P_{tot}$	170	mW
Storage temperature range		$T_{stg}$	-55 to +150	$^{\circ}\text{C}$
Ambient temperature range		$T_{amb}$	-55 to +110	$^{\circ}\text{C}$
Junction temperature		$T_j$	125	$^{\circ}\text{C}$
Soldering temperature <sup>(1)</sup>	$t = 10\text{ s}$	$T_{sld}$	260	$^{\circ}\text{C}$

**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.
- <sup>(1)</sup> Refer to reflow profile for soldering conditions for surface mounted devices.

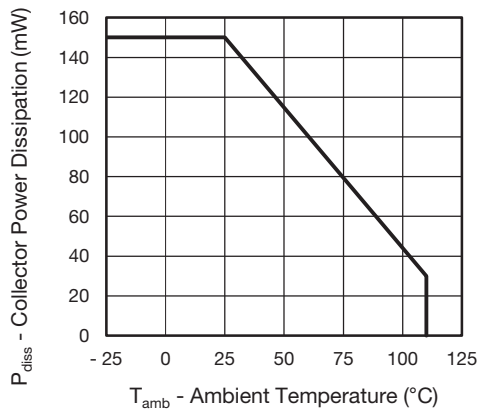


Fig. 1 - Power Dissipation vs. Ambient Temperature

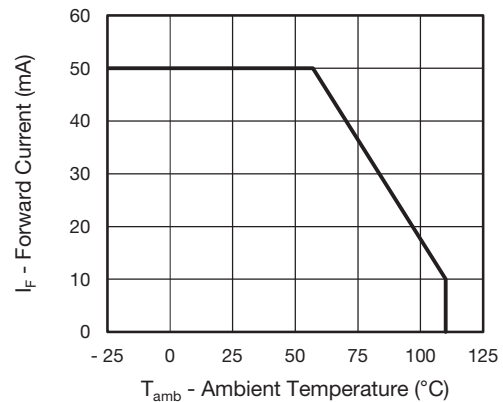


Fig. 2 - Forward Current vs. Ambient Temperature

<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	$I_F = 50\text{ mA}$	$V_F$		1.1	1.5	V
Reverse current	$V_R = 6\text{ V}$	$I_R$		0.01	10	$\mu\text{A}$
Input capacitance	$V_F = 0\text{ V}$ , $f = 1\text{ MHz}$	$C_I$		8		pF
<b>OUTPUT</b>						
Collector emitter leakage current	$V_{CE} = 10\text{ V}$	$I_{CEO}$		0.7	100	nA
Collector emitter breakdown voltage	$I_C = 100\text{ }\mu\text{A}$	$BV_{CEO}$	80			V
Emitter collector breakdown voltage	$I_E = 10\text{ }\mu\text{A}$	$BV_{ECO}$	7			V
Collector emitter capacitance	$V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$	$C_{CE}$		6		pF
<b>COUPLER</b>						
Collector emitter saturation voltage	$I_F = 1\text{ mA}$ , $I_C = 0.25\text{ mA}$	$V_{CEsat}$		0.12	0.4	V
Cut-off frequency	$I_F = 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 100\text{ }\Omega$	$f_{ctr}$		119		kHz
Coupling capacitance	$f = 1\text{ MHz}$	$C_C$		0.3		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.

<b>CURRENT TRANSFER RATIO</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
$I_C/I_F$	$I_F = 1\text{ mA}$ , $V_{CE} = 5\text{ V}$	VOS618A	CTR	50		600	%
		VOS618A-2	CTR	63		125	%
		VOS618A-3	CTR	100		200	%
		VOS618A-7	CTR	80		160	%
		VOS618A-8	CTR	130		260	%

<b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>NON-SATURATED</b>						
Turn on time	$V_{CC} = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$	$t_{on}$		5		$\mu\text{s}$
Rise time		$t_r$		5		$\mu\text{s}$
Turn off time		$t_{off}$		8		$\mu\text{s}$
Fall time		$t_f$		7		$\mu\text{s}$
<b>SATURATED</b>						
Rise and fall time	$I_F = 1.6\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 1.9\text{ k}\Omega$	$t_r$		10		$\mu\text{s}$
Fall time		$t_f$		11		$\mu\text{s}$
Turn on time		$t_{on}$		14		$\mu\text{s}$
Turn off time		$t_{off}$		12		$\mu\text{s}$



Fig. 3 - Test Circuit



Fig. 4 - Test Circuit and Waveforms

SAFETY AND INSULATION RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification (according to IEC 68 part 1)			55/110/21	
Comparative tracking index		CTI	175	
Maximum rated withstanding isolation voltage	40 % to 80 % RH, AC test of t = 1 min	$V_{ISO}$	3750	$V_{RMS}$
Maximum transient isolation voltage		$V_{IOTM}$	6000	$V_{peak}$
Maximum repetitive peak isolation voltage		$V_{IORM}$	565	$V_{peak}$
Isolation resistance	$T_{amb} = 25\text{ }^{\circ}\text{C}, V_{DC} = 500\text{ V}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$T_{amb} = 100\text{ }^{\circ}\text{C}, V_{DC} = 500\text{ V}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Output safety power		$P_{SO}$	300	mW
Input safety current		$I_{SI}$	200	mA
Input safety temperature		$T_{SI}$	150	$^{\circ}\text{C}$
Creepage distance			$\geq 5$	mm
Clearance distance			$\geq 5$	mm
Insulation thickness		DTI	$\geq 0.4$	mm
Environment (pollution degree in accordance to DIN VDE 0109)			2	

**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. 5 - Forward Voltage vs. Forward Current



Fig. 6 - Collector Current vs. Collector Emitter Voltage



Fig. 7 - Collector Emitter Current vs. Ambient Temperature

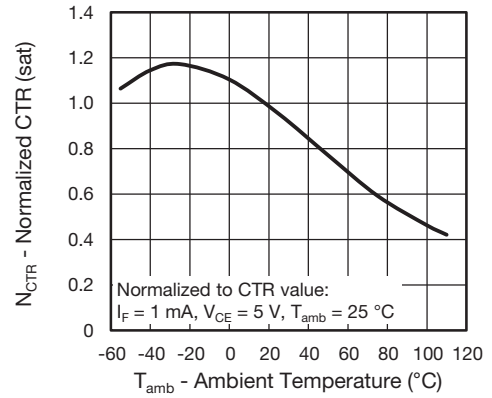


Fig. 10 - Normalized Current Transfer Ratio vs. Ambient Temperature (saturated)



Fig. 8 - Collector Current vs. Collector Emitter Voltage



Fig. 11 - Normalized Current Transfer Ratio vs. Ambient Temperature (non-saturated)



Fig. 9 - Collector Emitter Voltage vs. Ambient Temperature

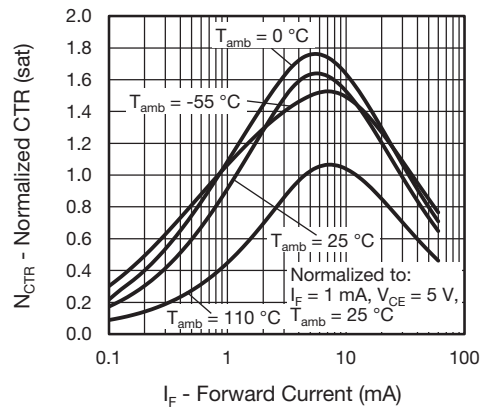


Fig. 12 - Current Transfer Ratio vs. Forward Current (saturated)



Fig. 13 - Current Transfer Ratio vs. Forward Current (non-saturated)



Fig. 16 - Switching Time vs. Load Resistance



Fig. 14 - Cut-off Frequency (- 3 dB) vs. Collector Current

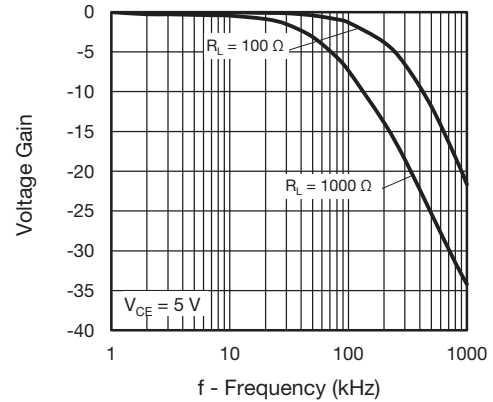


Fig. 17 - Voltage Gain vs. Frequency



Fig. 15 - Phase Angle vs. Frequency

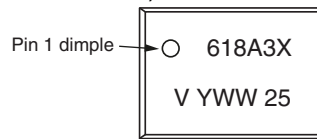


**PACKAGE DIMENSIONS** in millimeters



22629-2

**PACKAGE MARKING** (example of VOS618A-3X001T)



**Notes**

- Option 1 is reflected with letter “X”.
- Tape and reel suffix (T) is not part of the package marking.

**TAPE AND REEL DIMENSIONS** in millimeters

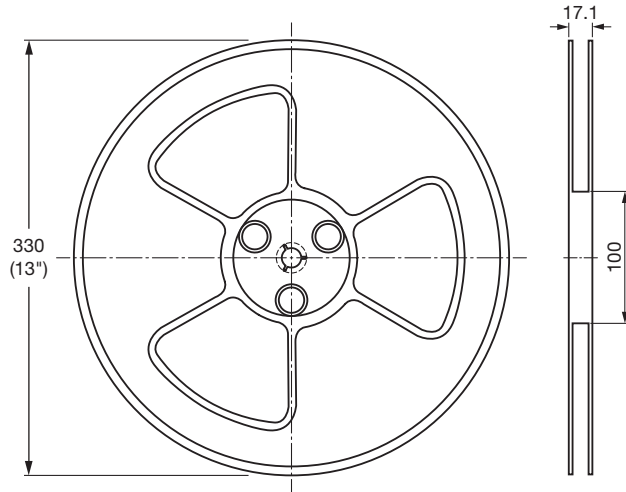


Fig. 18 - Reel Dimensions (3000 units per reel)



Fig. 19 - Tape Dimensions

**SOLDER PROFILE**

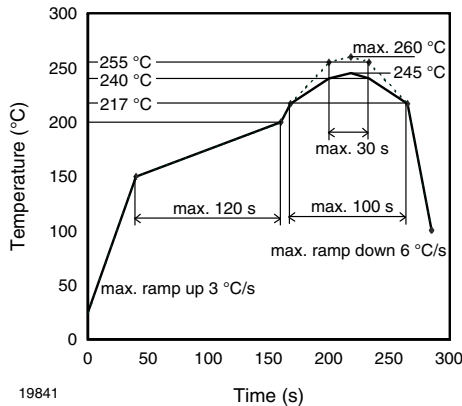


Fig. 20 - Lead (Pb)-free Reflow Solder Profile according to J-STD-020

**HANDLING AND STORAGE CONDITIONS**

ESD level: HBM class 2

Floor life: unlimited

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

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





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