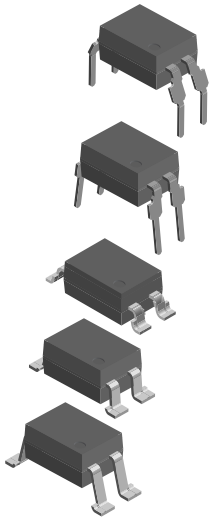
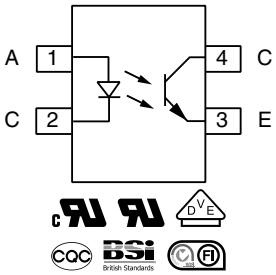
Optocoupler, Phototransistor Output, High Reliability, 5300 V_{RMS}, Low Input Current





FEATURES

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

Pb-free
e3
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

DESCRIPTION

The 110 °C rated VO618A feature a high current transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared diode emitter, 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 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

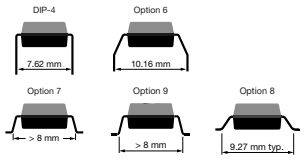
- AC adapters
- SMPS
- PLC
- Factory automation
- Game consoles

AGENCY APPROVALS

- UL1577, file no. E52744
- cUL tested to CSA 22.2 bulletin 5A
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- BSI IEC 60950; IEC 60065
- FIMKO EN 60065, EN 60950-1
- CQC GB8898-2001

ORDERING INFORMATION

V	O	6	1	8	A	-	#	X	0	#	#	T
PART NUMBER							CTR BIN	PACKAGE OPTION				TAPE AND REEL



AGENCY CERTIFIED/PACKAGE	CTR (%)			
	1 mA			
UL, cUL, BSI, FIMKO	**50 to 600**	**63 to 125**	**100 to 200**	**160 to 320**
DIP-4	VO618A	VO618A-2	VO618A-3	VO618A-4
SMD-4, option 9	-	VO618A-2X009T	-	-
VDE, UL, cUL, BSI, FIMKO	**50 to 600**	**63 to 125**	**100 to 200**	**160 to 320**
DIP-4, 400 mil, option 6	-	-	-	VO618A-4X016
SMD-4, option 7	-	VO618A-2X017T	VO618A-3X017T	VO618A-4X017T
SMD-4, option 8	-	-	VO618A-3X018T	-

Note

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

For technical questions, contact: optocoupleranswers@vishay.com
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ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Forward surge current	$t_p \leq 10$ µs	I_{FSM}	1.5	A
LED power dissipation	at 25 °C	P_{diss}	70	mW
OUTPUT				
Collector emitter voltage		V_{CEO}	80	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
Collector peak current	$t_p/T = 0.5$, $t_p \leq 10$ ms	I_{CM}	100	mA
Ouput power dissipation	at 25 °C	P_{diss}	150	mW
COUPLER				
Isolation test voltage (RMS)	t = 1 min	V_{ISO}	5300	V_{RMS}
Total power dissipation		P_{tot}	200	mW
Operation temperature		T_{amb}	-55 to +110	°C
Storage temperature range		T_{stg}	-55 to +150	°C
Soldering temperature	2 mm from case, ≤ 10 s	T_{sld}	260	°C

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.

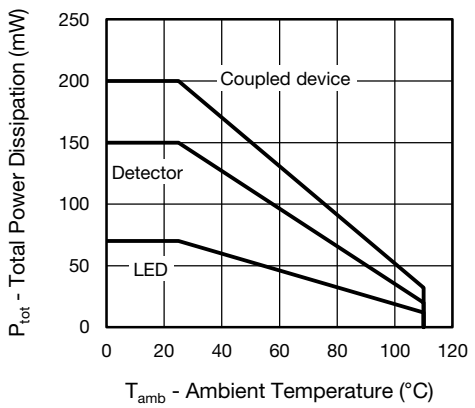

Fig. 1 - Total Power Dissipation vs. Ambient Temperature

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ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 5 mA	V_F	1	1.1	1.65	V
Reverse current	V_R = 6 V	I_R		0.01	10	µA
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j		13		pF
OUTPUT						
Collector emitter leakage current	V_{CE} = 10 V	I_{CEO}		10	200	nA
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz	C_{CE}		5.2		pF
Collector emitter breakdown voltage	I_C = 1 mA	BV_{CEO}	80			V
Emitter collector breakdown voltage	I_E = 100 µA	BV_{ECO}	7			V
COUPLER						
Collector emitter saturation voltage	I_F = 1 mA, I_C = 2.5 mA	V_{CEsat}		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.

CURRENT TRANSFER RATIO (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
I_C/I_F	I_F = 1 mA, V_{CE} = 5 V	VO618A	CTR	50		600	%
		VO618A-2	CTR	63		125	%
		VO618A-3	CTR	100		200	%
		VO618A-4	CTR	160		320	%

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**CTR BIN**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
NON-SATURATED							
Rise and fall time	I_F = 1 mA, V_{CC} = 5 V, R_L = 75 Ω		t_r, t_f		2		µs
Turn-on time	I_F = 1 mA, V_{CC} = 5 V, R_L = 75 Ω		t_{on}		3		µs
Turn-off time			t_{off}		2.3		µs
Cut-off frequency	I_F = 1 mA, V_{CC} = 5 V, R_L = 75 Ω		f_{ctr}		100		kHz
SATURATED							
Turn-on time	I_F = 1 mA		t_{on}		4.2		µs
Turn-off time	I_F = 1 mA		t_{off}		23		µs
Rise time	I_F = 1 mA		t_r		3		µs
Fall time	I_F = 1 mA		t_f		14		µs

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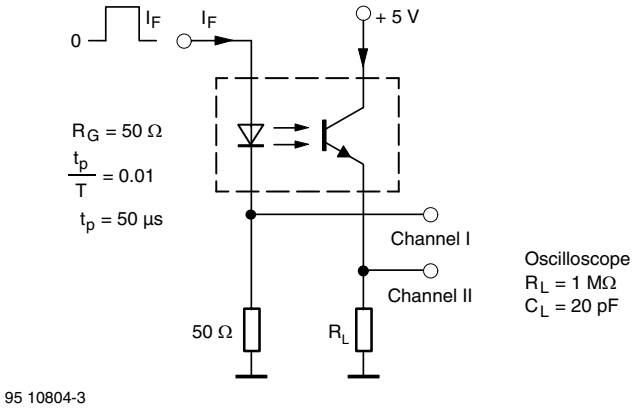

Fig. 2 - Test Circuit, Non-Saturated Operation

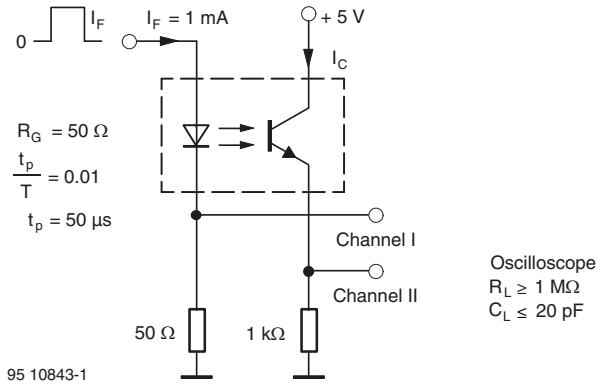

Fig. 3 - Test Circuit, Saturated Operation

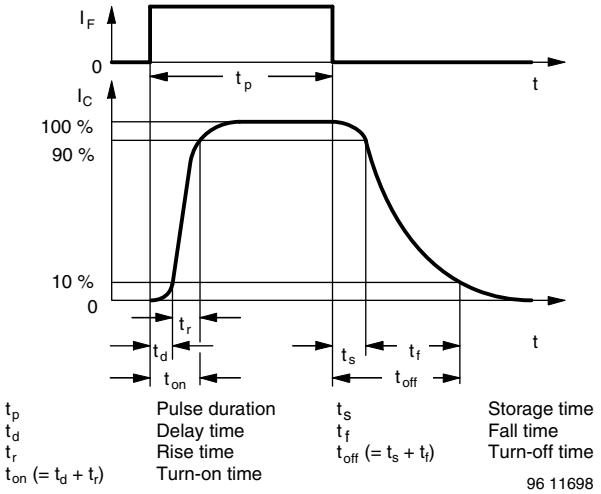

Fig. 4 - Switching Times

SAFETY AND INSULATION RATINGS				
PARAMETER		**SYMBOL**	**VALUE**	**UNIT**
MAXIMUM SAFETY RATINGS				
Output safety power		P_{SO}	265	mW
Input safety current		I_{si}	130	mA
Safety temperature		T_S	150	°C
Comparative tracking index		CTI	175	
INSULATION RATED PARAMETERS				
Maximum withstanding isolation voltage		V_{ISO}	5300	V_{RMS}
Maximum transient isolation voltage		V_{IOTM}	8000	V_{peak}
Maximum repetitive peak isolation voltage		V_{IORM}	890	V_{peak}
Insulation resistance	T_{amb} = 25 °C, V_{DC} = 500 V	R_{IO}	$\geq 10^{12}$	Ω
Isolation resistance	T_{amb} = 100 °C, V_{DC} = 500 V	R_{IO}	$\geq 10^{11}$	Ω
Climatic classification (according to IEC 68 part 1)			55/110/21	
Environment (pollution degree in accordance to DIN VDE 0109)			2	
Internal and external creepage	Standard DIP-4, option 7 and option 9		≥ 7	mm
	400 mil DIP-4 and option 8		≥ 8	mm
Clearance	Standard DIP-4, option 7 and option 9		≥ 7	mm
	400 mil DIP-4 and option 8		≥ 8	mm
Insulation thickness		DTI	0.4	mm

Note

- 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.

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

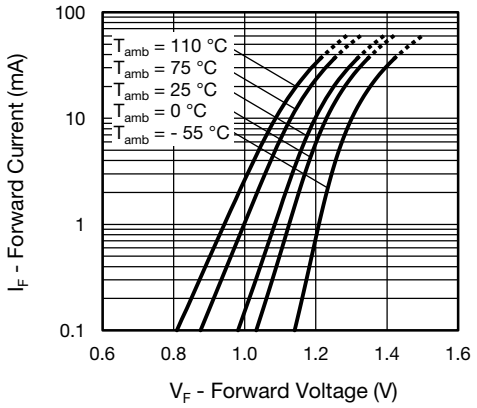

Fig. 5 - Forward Voltage vs. Forward Current

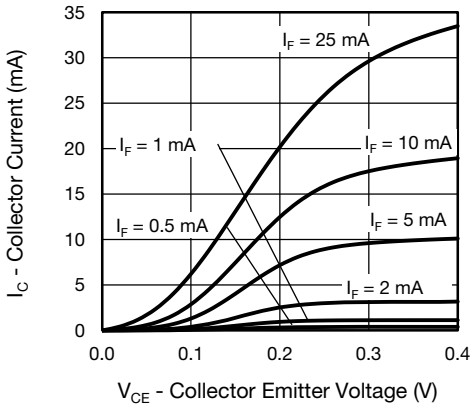

Fig. 8 - Collector Current vs. Collector Emitter Voltage

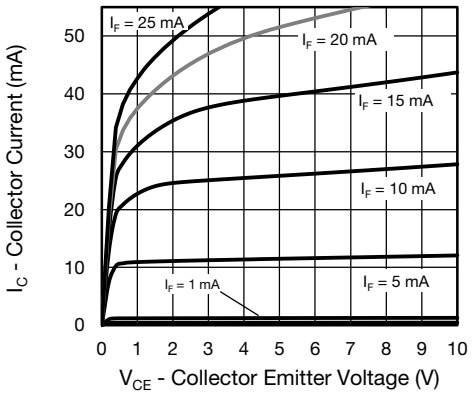

Fig. 6 - Collector Current vs. Collector Emitter Voltage

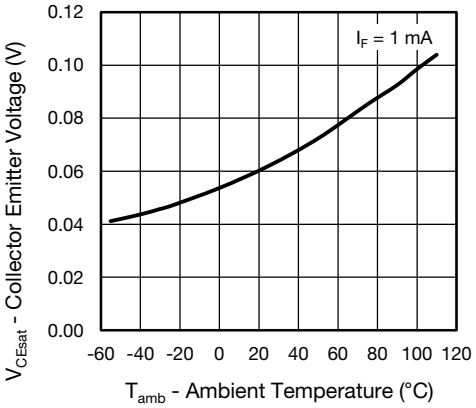

Fig. 9 - Collector Emitter Voltage vs. Ambient Temperature

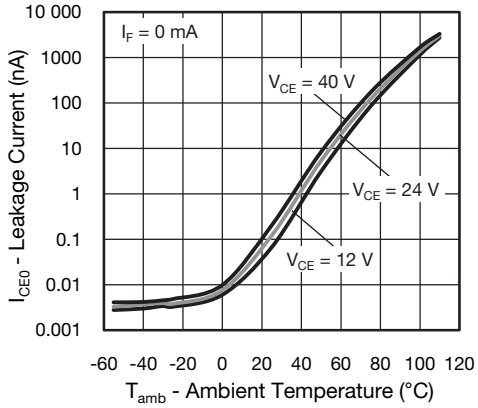

Fig. 7 - Collector Emitter Current vs. Ambient Temperature

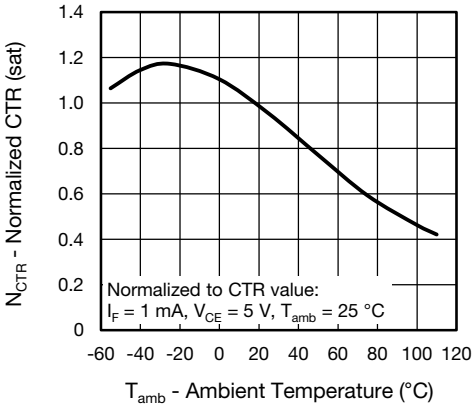

Fig. 10 - Normalized Current Transfer Ratio vs. Ambient Temperature (sat.)

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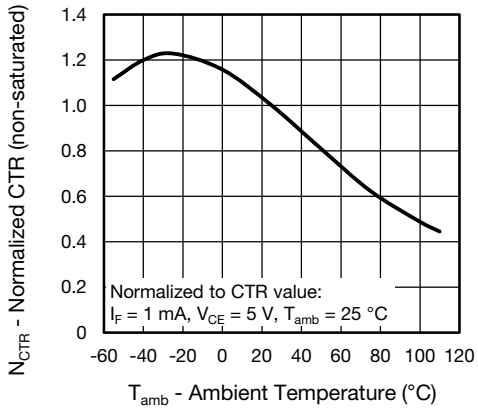

Fig. 11 - Normalized Current Transfer Ratio vs. Ambient Temperature (non-sat.)

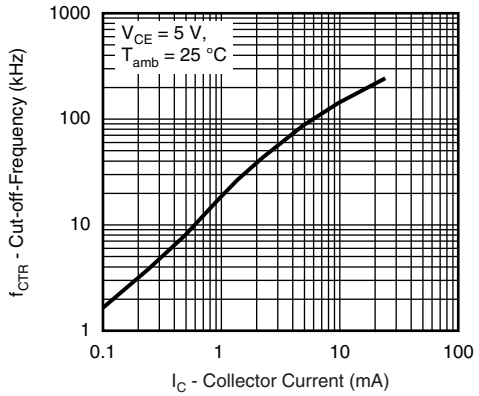

Fig. 14 - Cut-Off Frequency vs. Collector Current

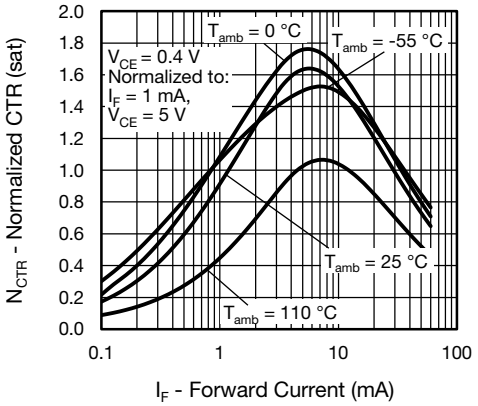

Fig. 12 - Current Transfer Ratio vs. Forward Current (sat.)

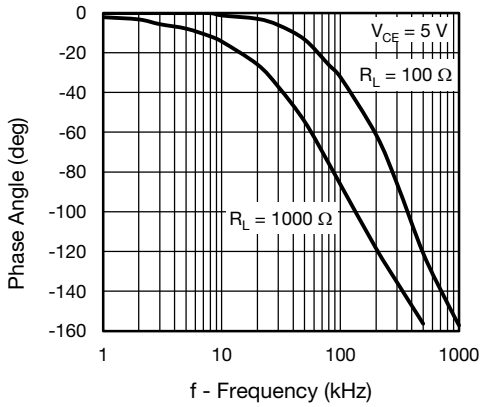

Fig. 15 - Phase Angle vs. Frequency

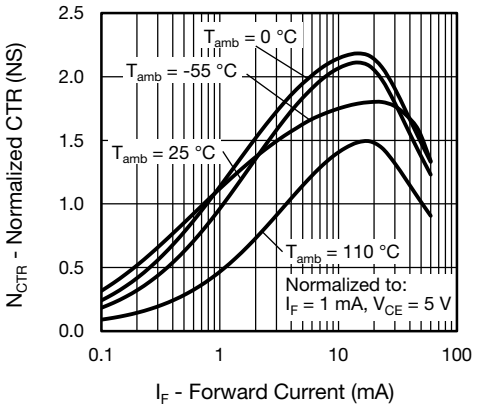

Fig. 13 - Current Transfer Ratio vs. Forward Current (non-sat.)

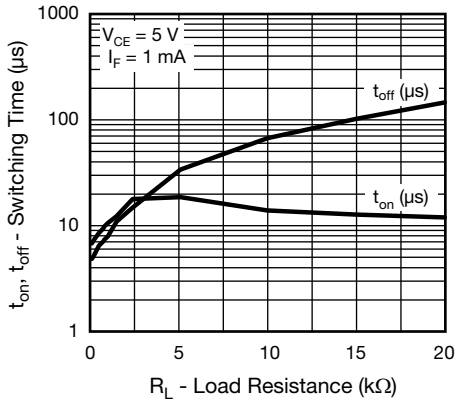

Fig. 16 - Switching Time vs. Load Resistance

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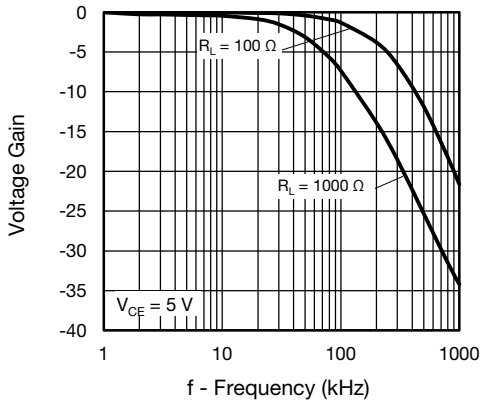
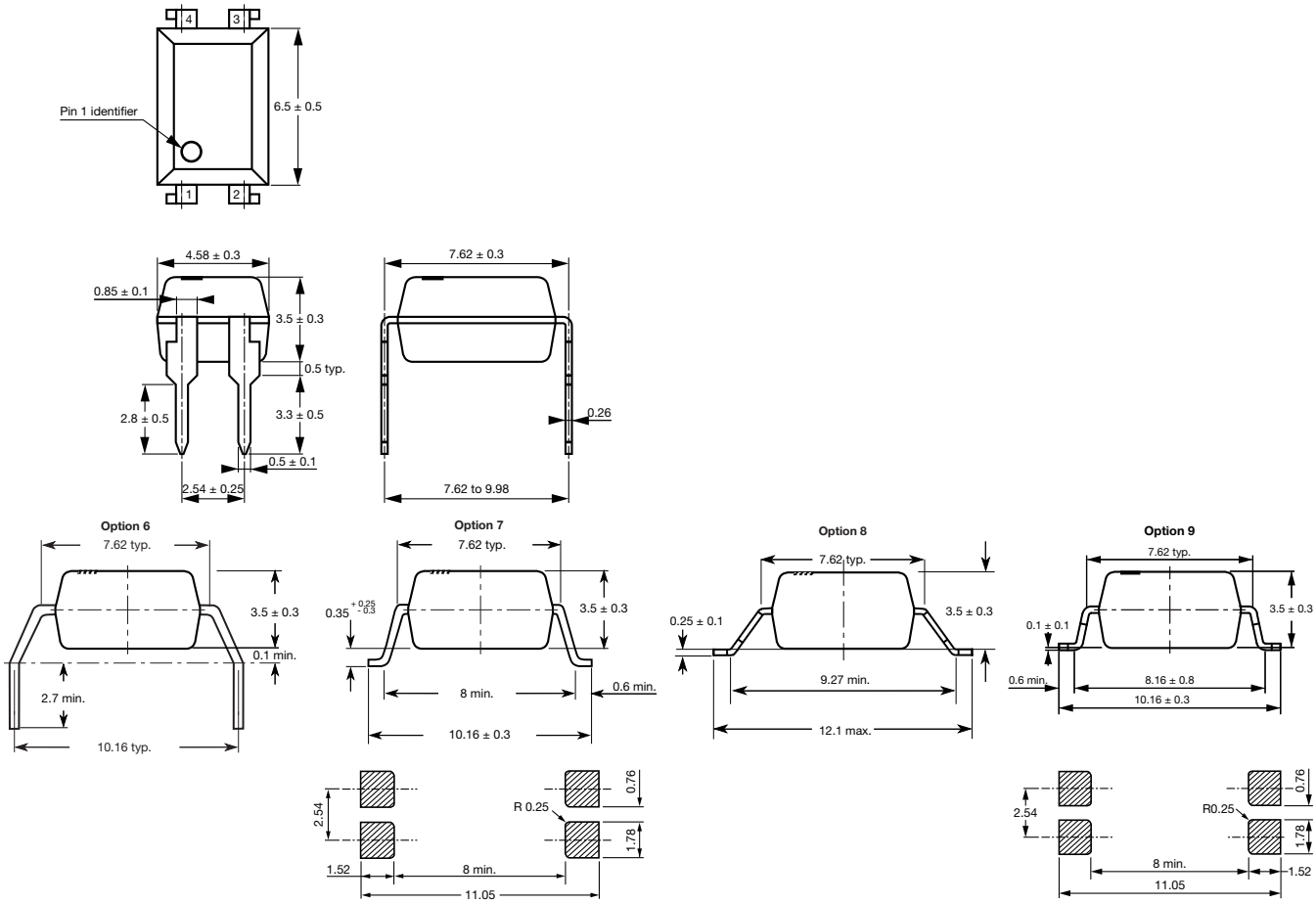


Fig. 17 - Voltage Gain vs. Frequency

PACKAGE DIMENSIONS in millimeters



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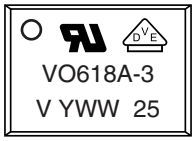
PACKAGE MARKING (Example of VO618A-3X017T)



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

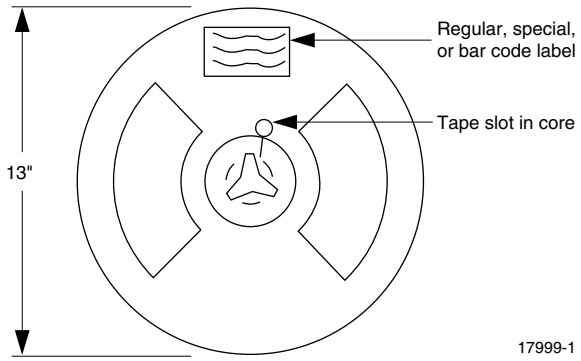


Fig. 18 - Tape and Reel Shipping Medium (1000 units per reel)

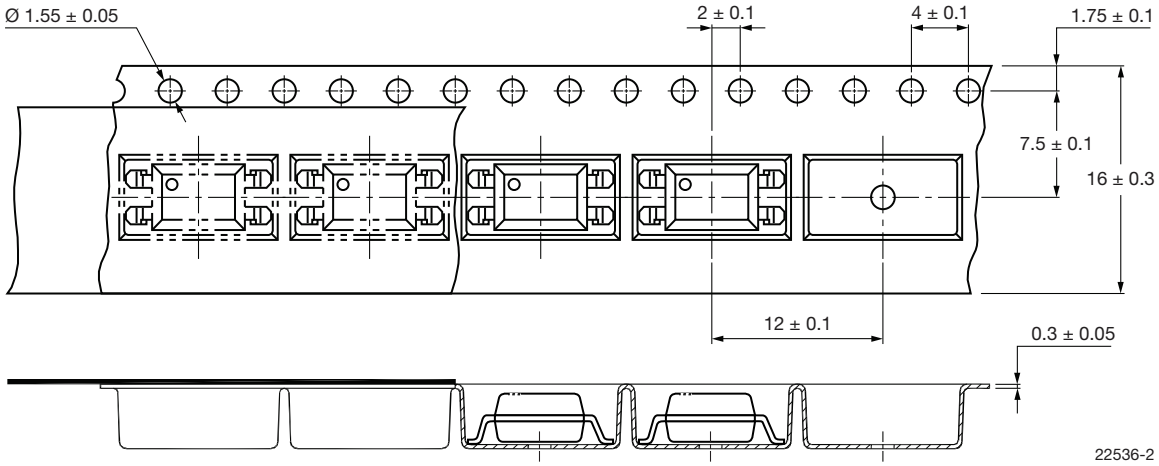


Fig. 19 - Tape and Packing for Option 7 and Option 9

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TAPE AND REEL

Option 8

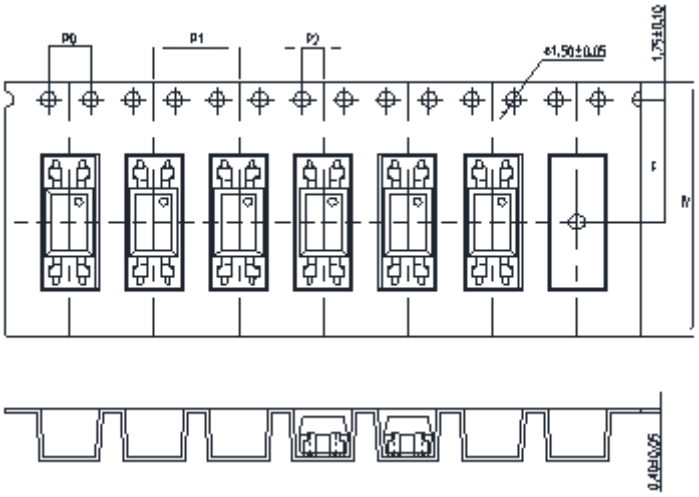

Fig. 20 - Default Orientation, 2000 units/reel

DESCRIPTION	SYMBOL	DIMENSIONS in mm (inch)
Tape width	W	24 ± 0.3 (0.63)
Pitch of spocket holes	P0	4 ± 0.1 (0.15)
Distance of compartment	F	11.5 ± 0.1 (0.295)
	P2	2 ± 0.1 (0.079)
Distance of compartment to compartment	P1	8 ± 0.1 (0.472)

SOLDER PROFILES

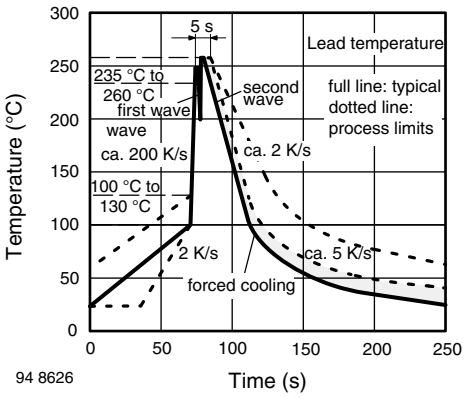

Fig. 21 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP-8 Devices

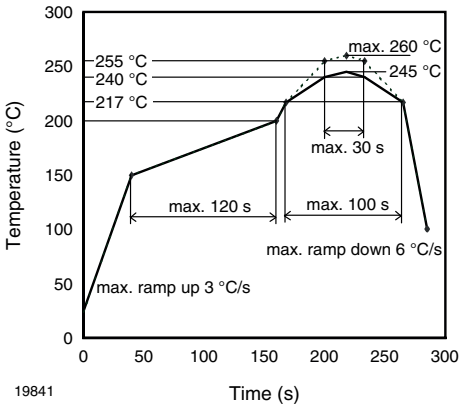

Fig. 22 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD-8 Devices

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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Footprint and Schematic Information for VO618A

The footprint and schematic symbols for the following parts can be accessed using the associated links. They are available in Eagle, Altium, KiCad, OrCAD / Allegro, Pulsonix, and PADS.

Note that the 3D models for these parts can be found on the Vishay product page.

PART NUMBER	FOOTPRINT / SCHEMATIC
VO618A	www.snapeda.com/parts/VO618A/Vishay/view-part
VO618A-2	www.snapeda.com/parts/VO618A-2/Vishay/view-part
VO618A-2X009T	www.snapeda.com/parts/VO618A-2X009T/Vishay/view-part
VO618A-2X017T	www.snapeda.com/parts/VO618A-2X017T/Vishay/view-part
VO618A-3	www.snapeda.com/parts/VO618A-3/Vishay/view-part
VO618A-3X017T	www.snapeda.com/parts/VO618A-3X017T/Vishay/view-part
VO618A-3X018T	www.snapeda.com/parts/VO618A-3X018T/Vishay/view-part
VO618A-4	www.snapeda.com/parts/VO618A-4/Vishay/view-part
VO618A-4X016	www.snapeda.com/parts/VO618A-4X016/Vishay/view-part
VO618A-4X017T	www.snapeda.com/parts/VO618A-4X017T/Vishay/view-part

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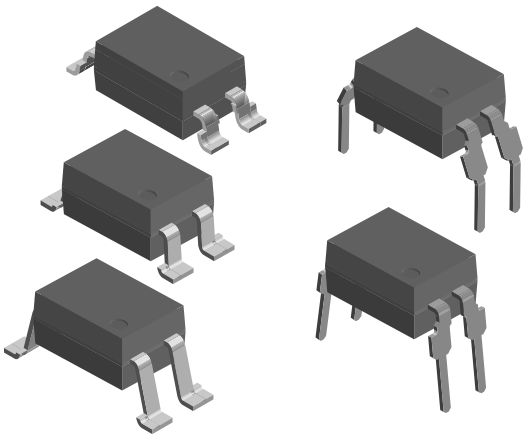

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