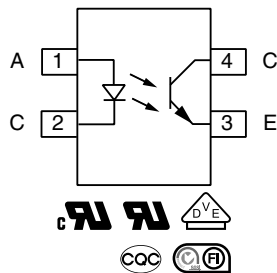
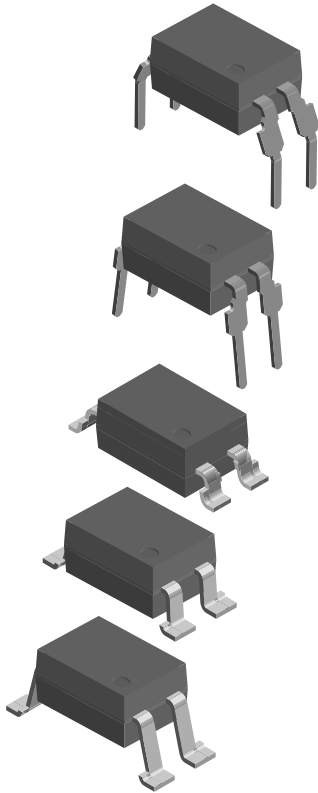


# Optocoupler, Phototransistor Output, High Reliability, 5300 V<sub>RMS</sub>, Low Input Current



## 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 4 pin DIP 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<sub>RMS</sub> or DC. Specifications subject to change.

## FEATURES

- Operating temperature from -55 °C to +110 °C
- Good CTR linearity depending on forward current
- Isolation test 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
- 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](http://www.vishay.com/doc?99912)



## APPLICATIONS

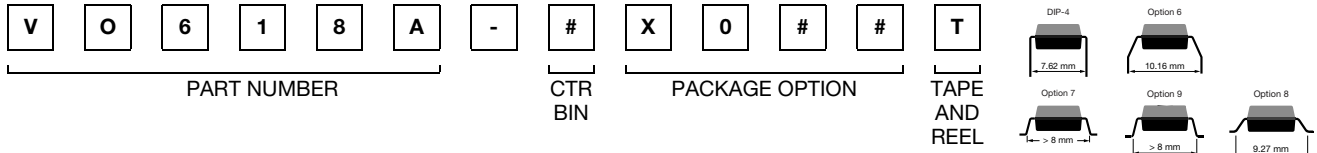
- AC adapters
- SMPS
- PLC
- Factory automation
- Game consoles

## AGENCY APPROVALS

- [UL 1577](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\), available with option 1](#)
- [BSI](#)
- [FIMKO](#)

## LINKS TO ADDITIONAL RESOURCES



**ORDERING INFORMATION**


AGENCY CERTIFIED / PACKAGE	CTR (%)			
	1 mA			
<b>UL, cUL, BSI, FIMKO</b>	<b>50 to 600</b>	<b>63 to 125</b>	<b>100 to 200</b>	<b>160 to 320</b>
DIP-4	VO618A	VO618A-2	VO618A-3	VO618A-4
SMD-4, option 9	-	VO618A-2X009T	VO618A-3X009T	VO618A-4X009T
<b>UL, cUL, BSI, FIMKO, VDE (option 1)</b>	<b>50 to 600</b>	<b>63 to 125</b>	<b>100 to 200</b>	<b>160 to 320</b>
DIP-4, 400 mil, option 6	-	-	-	VO618A-4X016
SMD-4, option 7	-	VO618A-2X017T	VO618A-3X017T	VO618A-4X017T
SMD-4, 400 mil, option 8	-	-	VO618A-3X018T	-
SMD-4, option 9	-	-	VO618A-3X019T	VO618A-4X019T

**Note**

- Additional options may be possible, please contact sales office

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		$V_R$	6	V
Forward current		$I_F$	60	mA
Forward surge current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	1.5	A
LED power dissipation	at 25 °C	$P_{diss}$	70	mW
<b>OUTPUT</b>				
Collector emitter voltage		$V_{CEO}$	80	V
Emitter collector voltage		$V_{ECO}$	7	V
Collector current		$I_C$	50	mA
Collector peak current	$t_p/T = 0.5, t_p \leq 10\text{ ms}$	$I_{CM}$	100	mA
Output power dissipation	at 25 °C	$P_{diss}$	150	mW
<b>COUPLER</b>				
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, $\leq 10\text{ s}$	$T_{sld}$	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.

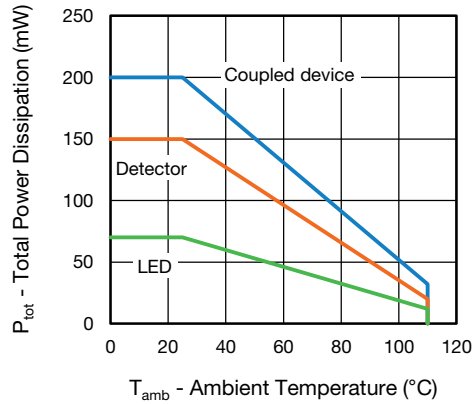


Fig. 1 - Total Power Dissipation vs. Ambient Temperature

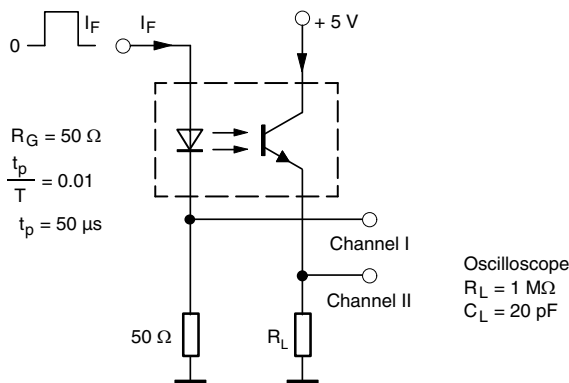
<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	$I_F = 5\text{ mA}$	$V_F$	1	1.1	1.65	V
Reverse current	$V_R = 6\text{ V}$	$I_R$	-	0.01	10	$\mu\text{A}$
Junction capacitance	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$	$C_j$	-	13		pF
<b>OUTPUT</b>						
Collector emitter leakage current	$V_{CE} = 10\text{ V}$	$I_{CEO}$	-	10	200	nA
Collector emitter capacitance	$V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$	$C_{CE}$	-	5.2	-	pF
Collector emitter breakdown voltage	$I_C = 1\text{ mA}$	$BV_{CEO}$	80	-	-	V
Emitter collector breakdown voltage	$I_E = 100\text{ }\mu\text{A}$	$BV_{ECO}$	7	-	-	V
<b>COUPLER</b>						
Collector emitter saturation voltage	$I_F = 1\text{ mA}$ , $I_C = 0.25\text{ mA}$	$V_{CEsat}$	-	0.25	0.4	V
Coupling capacitance	$f = 1\text{ MHz}$	$C_C$	-	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.

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

<b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	CTR BIN	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>NON-SATURATED</b>							
Rise and fall time	$I_F = 1\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 75\text{ }\Omega$		$t_r, t_f$	-	2	-	$\mu\text{s}$
Turn-on time	$I_F = 1\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 75\text{ }\Omega$		$t_{on}$	-	3	-	$\mu\text{s}$
Turn-off time			$t_{off}$	-	2.3	-	$\mu\text{s}$
Cut-off frequency	$I_F = 1\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 75\text{ }\Omega$		$f_{ctr}$	-	100	-	kHz
<b>SATURATED</b>							
Turn-on time	$I_F = 1\text{ mA}$		$t_{on}$	-	4.2	-	$\mu\text{s}$
Turn-off time	$I_F = 1\text{ mA}$		$t_{off}$	-	23	-	$\mu\text{s}$
Rise time	$I_F = 1\text{ mA}$		$t_r$	-	3	-	$\mu\text{s}$
Fall time	$I_F = 1\text{ mA}$		$t_f$	-	14	-	$\mu\text{s}$



95 10804-3

Fig. 2 - Test Circuit, Non-Saturated Operation

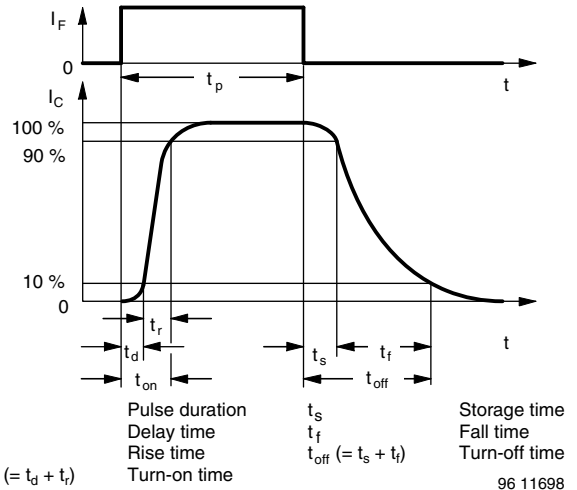
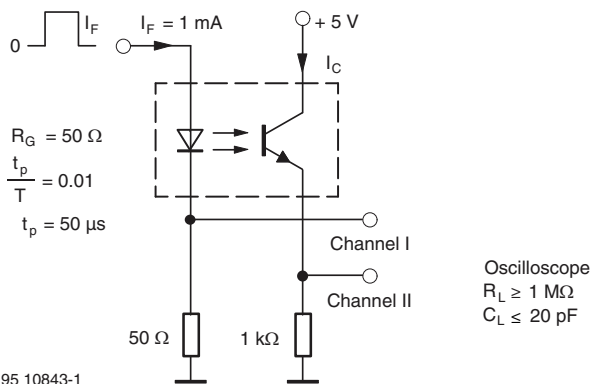


Fig. 4 - Switching Times

96 11698



95 10843-1

Fig. 3 - Test Circuit, Saturated Operation

SAFETY AND INSULATION RATINGS				
PARAMETER	TEST 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 UL 1577, t = 1 min	$V_{ISO}$	5300	$V_{RMS}$
Maximum transient isolation voltage	According to DIN EN 60747-5-5	$V_{IOTM}$	8000	$V_{peak}$
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	$V_{IORM}$	890	$V_{peak}$
Isolation resistance	$T_{amb} = 25\text{ }^{\circ}\text{C}$ , $V_{IO} = 500\text{ V}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$T_{amb} = 115\text{ }^{\circ}\text{C}$ , $V_{IO} = 500\text{ V}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Output safety power		$P_{SO}$	700	mW
Input safety current		$I_{SI}$	400	mA
Input safety temperature		$T_S$	175	$^{\circ}\text{C}$
Creepage distance	DIP-4		$\geq 7$	mm
Clearance distance			$\geq 7$	mm
Creepage distance	DIP-4, 400 mil, option 6		$\geq 8$	mm
Clearance distance			$\geq 8$	mm
Creepage distance	SMD-4, option 7		$\geq 7$	mm
Clearance distance			$\geq 7$	mm
Creepage distance	SMD-4, 400 mil, option 8		$\geq 8$	mm
Clearance distance			$\geq 8$	mm
Creepage distance	SMD-4, option 9		$\geq 7$	mm
Clearance distance			$\geq 7$	mm
Insulation thickness		DTI	$\geq 0.4$	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.

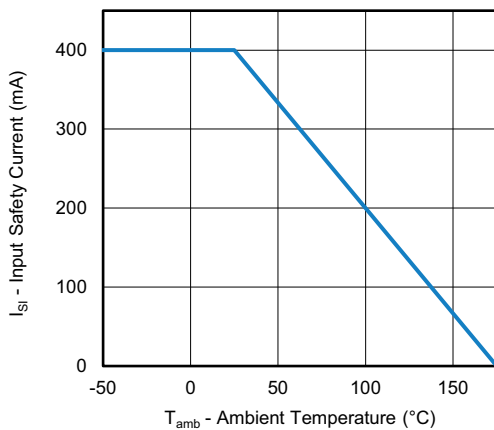


Fig. 5 - Input Safety Current vs. Ambient Temperature

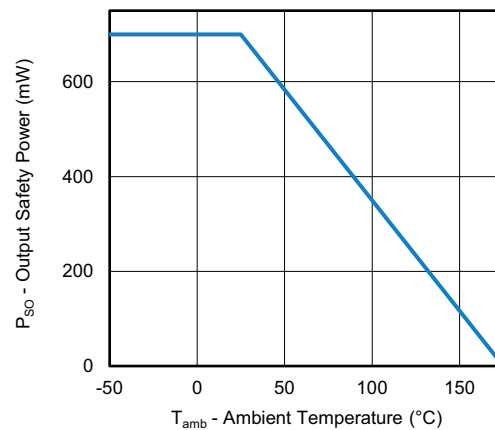


Fig. 6 - Output Safety Power vs. Ambient Temperature

**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

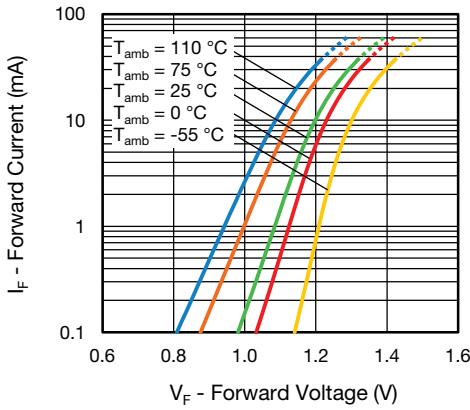


Fig. 7 - Forward Voltage vs. Forward Current

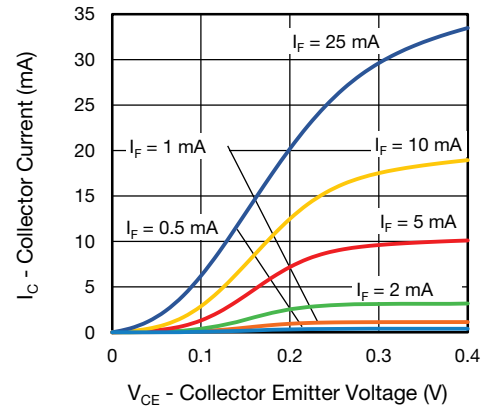


Fig. 10 - Collector Current vs. Collector Emitter Voltage

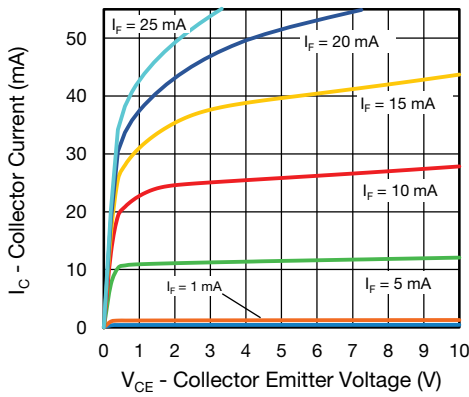


Fig. 8 - Collector Current vs. Collector Emitter Voltage

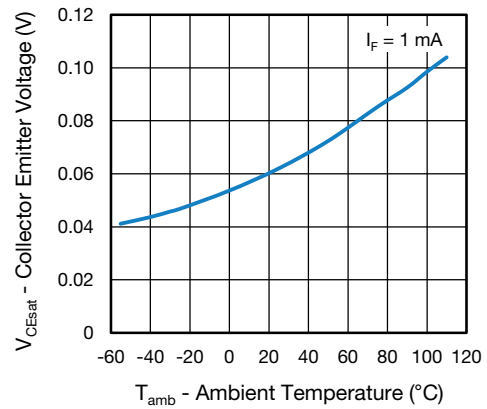


Fig. 11 - Collector Emitter Voltage vs. Ambient Temperature

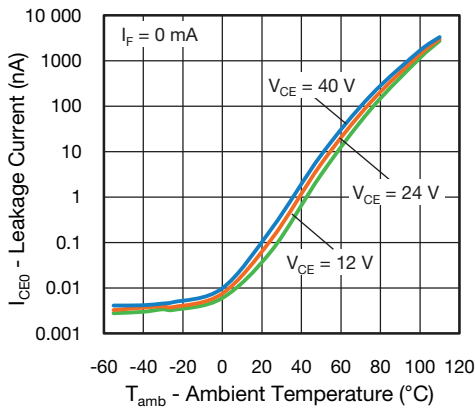


Fig. 9 - Collector Emitter Current vs. Ambient Temperature

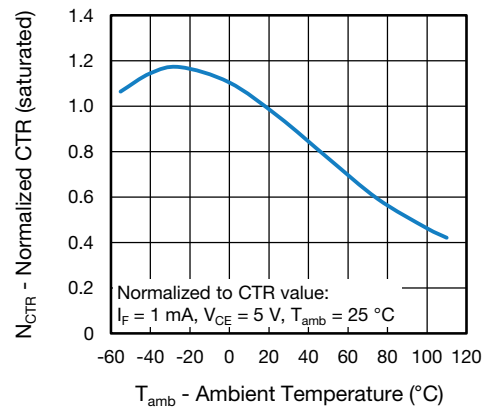


Fig. 12 - Normalized Current Transfer Ratio vs. Ambient Temperature (sat.)

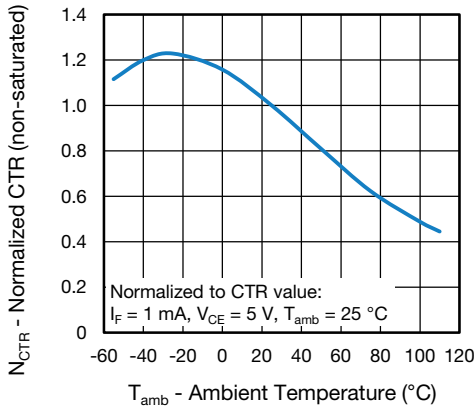


Fig. 13 - Normalized Current Transfer Ratio vs. Ambient Temperature (non-sat.)

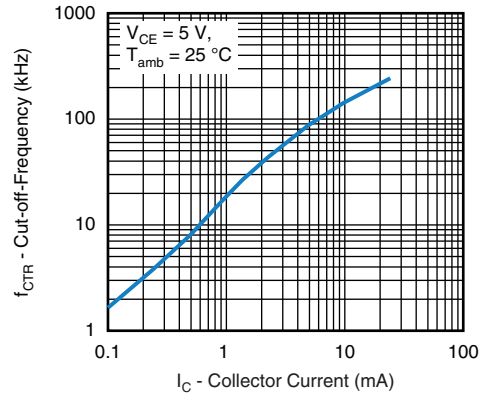


Fig. 16 - Cut-Off Frequency vs. Collector Current

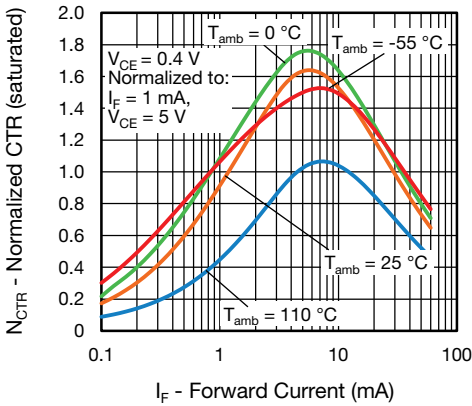


Fig. 14 - Current Transfer Ratio vs. Forward Current (sat.)

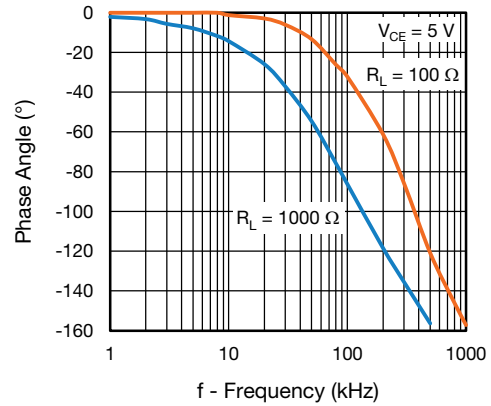


Fig. 17 - Phase Angle vs. Frequency

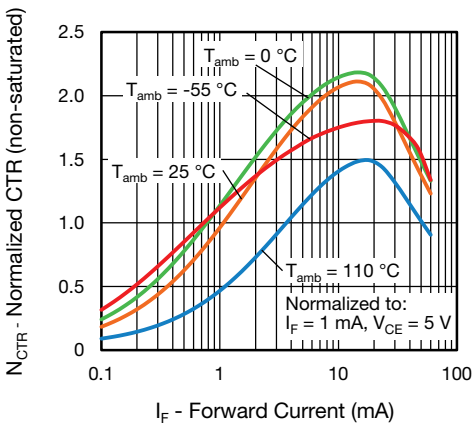


Fig. 15 - Current Transfer Ratio vs. Forward Current (non-sat.)

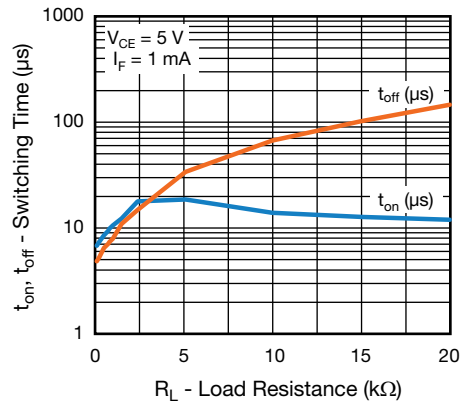


Fig. 18 - Switching Time vs. Load Resistance

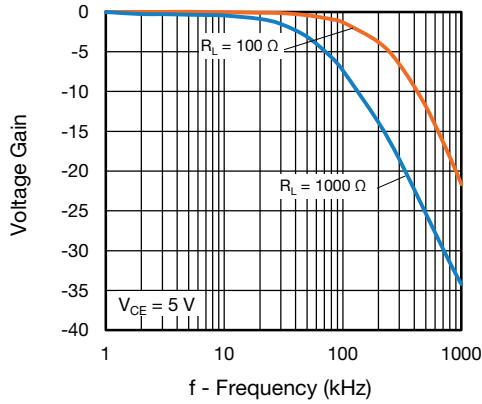
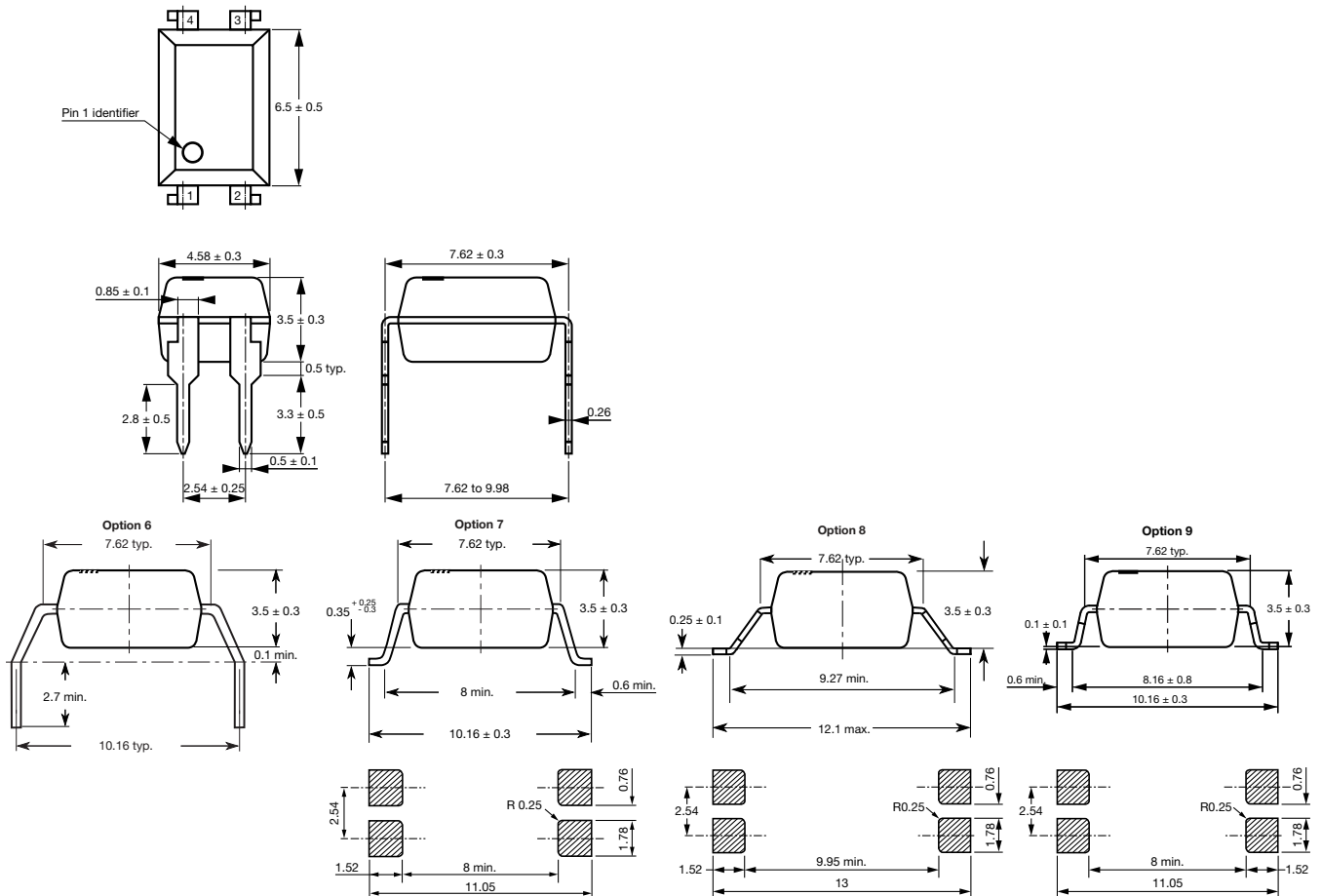


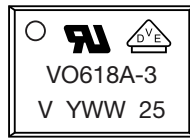
Fig. 19 - Voltage Gain vs. Frequency

**PACKAGE DIMENSIONS** in millimeters





**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

TAPE AND REEL PACKING	
TYPE	UNITS/REEL
SMD-4, option 7	1000
SMD-4, option 8	2000
SMD-4, option 9	1000

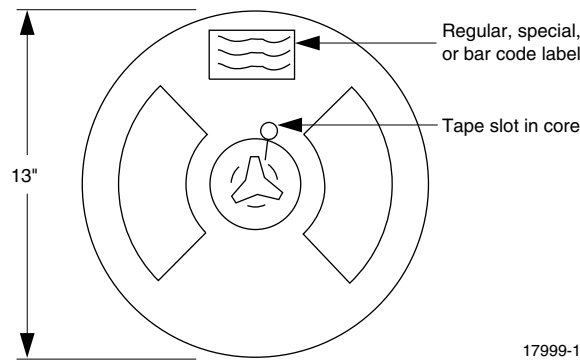


Fig. 20 - Tape and Reel Shipping Medium

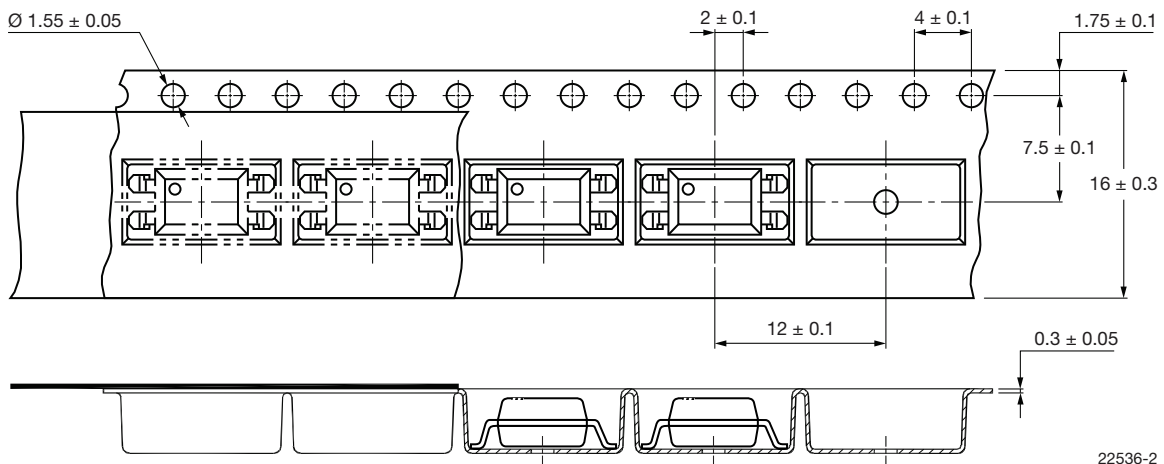


Fig. 21 - Tape and Packing for Option 7 and Option 9

**TAPE AND REEL**

**Option 8**

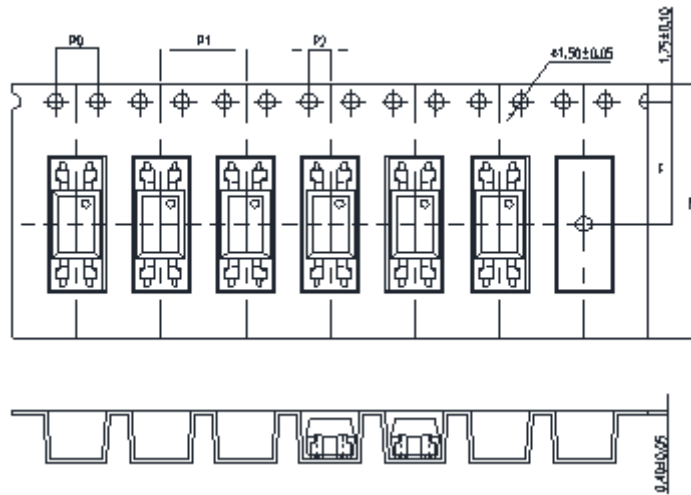
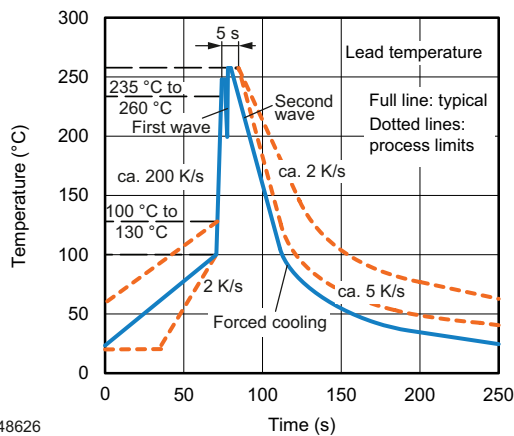


Fig. 22 - Tape and Packing for Option 8

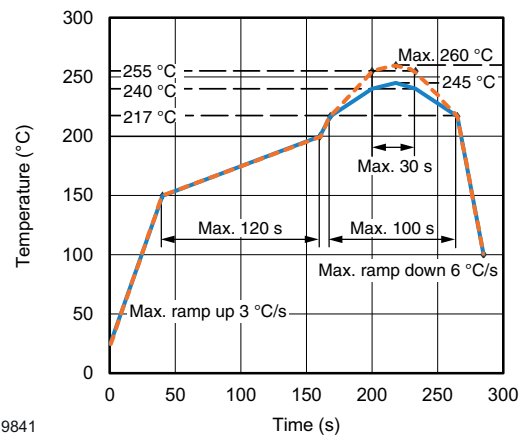
DESCRIPTION	SYMBOL	DIMENSIONS in mm (inch)
Tape width	W	24 ± 0.3 (0.63)
Pitch of spocket holes	P0	4 ± 0.1 (0.15)
Distance of compartment	F	11.5 ± 0.1 (0.295)
	P2	2 ± 0.1 (0.079)
Distance of compartment to compartment	P1	8 ± 0.1 (0.472)

**SOLDER PROFILES**



948626

Fig. 23 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP Devices



19841

Fig. 24 - 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:  $T_{amb} < 30\text{ }^{\circ}\text{C}$ , RH < 85 %

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



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