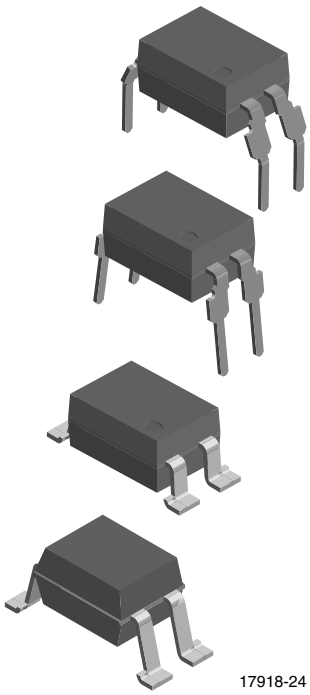
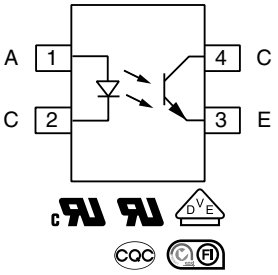
Optocoupler, Phototransistor Output, High Reliability, 5300 V_{RMS}



17918-24



FEATURES

- Operating temperature from -55 °C to +110 °C
- Good CTR linearity depending on forward current
- Isolation voltage, 5300 V_{RMS}
- High collector emitter voltage, V_{CEO} = 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 www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

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

LINKS TO ADDITIONAL RESOURCES

Product Page | Design Tools | SPICE Models | Footprints | Related Documents

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.

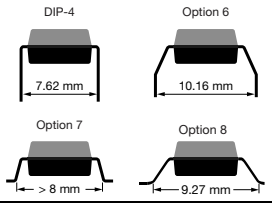
- UL / cUL 1577
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- BSI
- CQC GB4943.1-2011
- CQC GB8898-2011
- FIMKO

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ORDERING INFORMATION

V	O	6	1	7	A	-	#	X	0	#	#	T
PART NUMBER							CTR BIN	PACKAGE OPTION				TAPE AND REEL



AGENCY CERTIFIED / PACKAGE	CTR (%) 5 mA							
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	-	-	VO617A-2X007T	VO617A-3X007T	VO617A-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

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)

PARAMETER	CONDITIONS	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		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		P_{diss}	150	mW
COUPLER				
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

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

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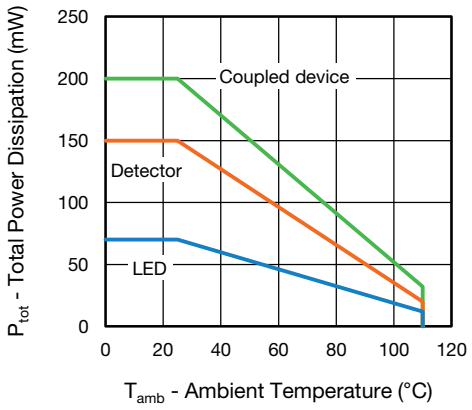


Fig. 1 - Total Power Dissipation vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT							
Forward voltage	I_F = 60 mA	-	V_F	1	1.35	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	VO617A-1	I_{CEO}	-	2	50	nA
		VO617A-2		-	2	50	
		VO617A-3		-	5	100	
		VO617A-4		-	5	100	
		VO617A-7		-	5	100	
		VO617A-8		-	5	100	
		VO617A-9		-	5	100	
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 = 5 mA, I_C = 1.0 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

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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 = 5 mA, V_{CE} = 5 V	VO617A	CTR	50	-	600	%
		VO617A-1	CTR	40	-	80	%
		VO617A-2	CTR	63	-	125	%
		VO617A-3	CTR	100	-	200	%
		VO617A-4	CTR	160	-	320	%
		VO617A-7	CTR	80	-	160	%
		VO617A-8	CTR	130	-	260	%
		VO617A-9	CTR	200	-	400	%

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 = 5 mA, V_{CC} = 5 V, R_L = 75 Ω	-	t_r, t_f	-	2	-	µs
Turn-on time	I_F = 5 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 = 5 mA, V_{CC} = 5 V, R_L = 75 Ω	-	f_{ctr}	-	190	-	kHz
SATURATED							
Turn-on time	I_F = 5 mA	-	t_{on}	-	6	-	µs
Turn-off time	I_F = 5 mA	-	t_{off}	-	25	-	µs
Rise time	I_F = 5 mA	-	t_r	-	4.6	-	µs
Fall time	I_F = 5 mA	-	t_f	-	15	-	µs

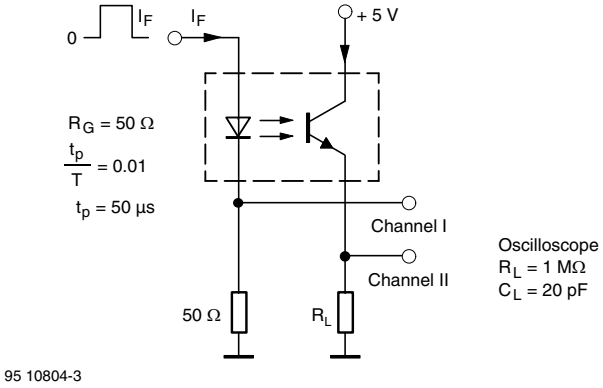


Fig. 2 - Test Circuit, Non-Saturated Operation

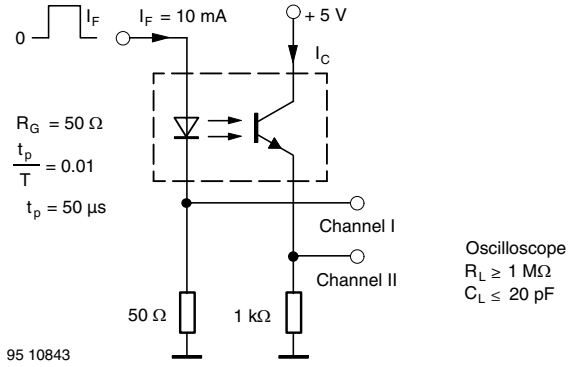


Fig. 3 - Test Circuit, Saturated Operation

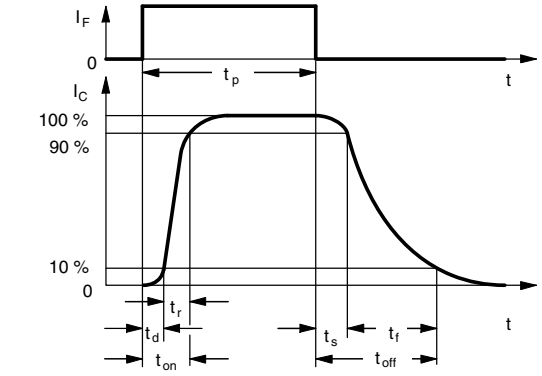


Fig. 4 - Switching Times

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SAFETY AND INSULATION RATINGS				
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_{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} = 115 °C, V_{IO} = 500 V	R_{IO}	$\geq 10^{11}$	Ω
	T_{amb} = 175 °C, V_{IO} = 500 V	R_{IO}	$\geq 10^{9}$	Ω
Output safety power		P_{SO}	700	mW
Input safety current		I_{SI}	400	mA
Input safety temperature		T_S	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

- 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)

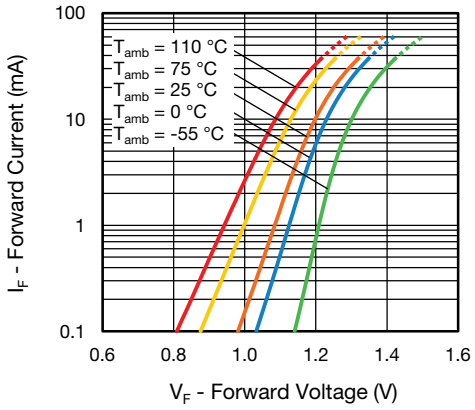


Fig. 5 - Forward Voltage vs. Forward Current

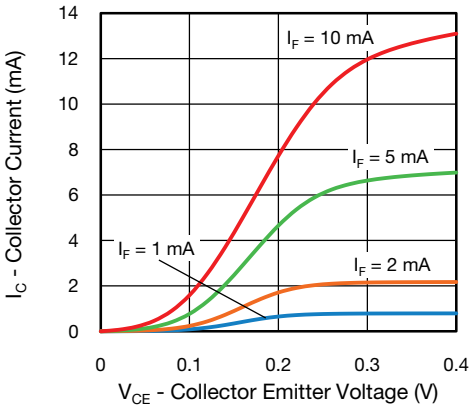


Fig. 8 - Collector Current vs. Collector Emitter Voltage

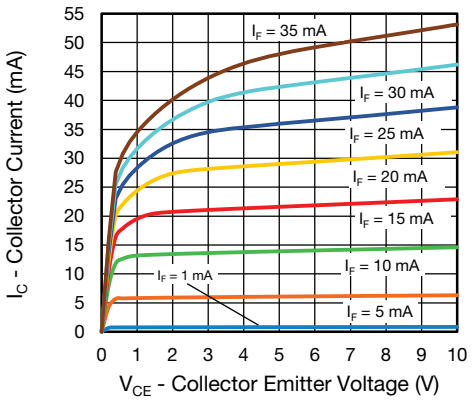


Fig. 6 - Collector Current vs. Collector Emitter Voltage

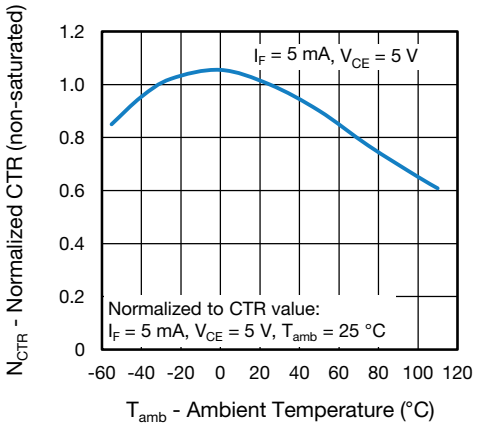


Fig. 9 - Normalized Current Transfer Ratio (non-sat.) vs. Ambient Temperature

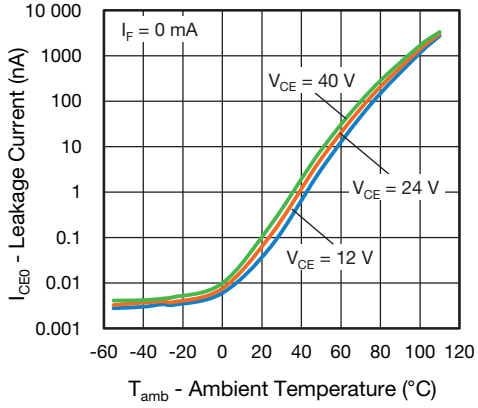


Fig. 7 - Leakage Current vs. Ambient Temperature

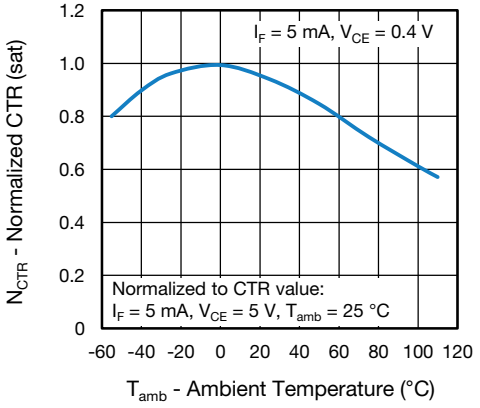


Fig. 10 - Normalized Current Transfer Ratio (sat.) vs. Ambient Temperature

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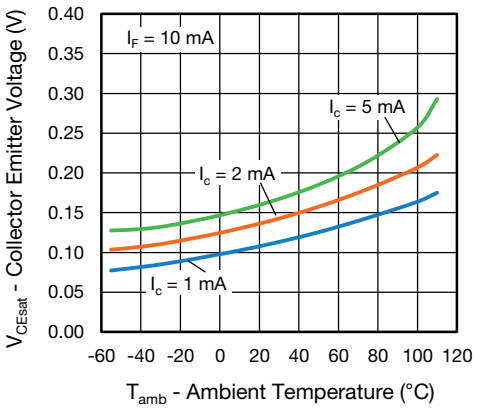


Fig. 11 - Collector Emitter Voltage vs. Ambient Temperature

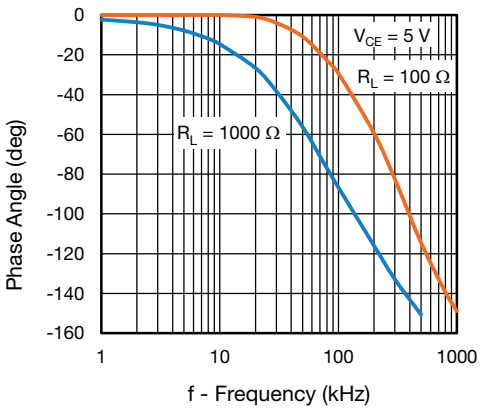


Fig. 14 - Phase Angle vs. Frequency

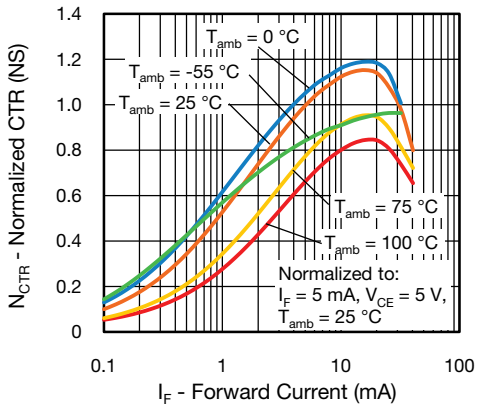


Fig. 12 - Normalized CTR (non-sat.) vs. Forward Current

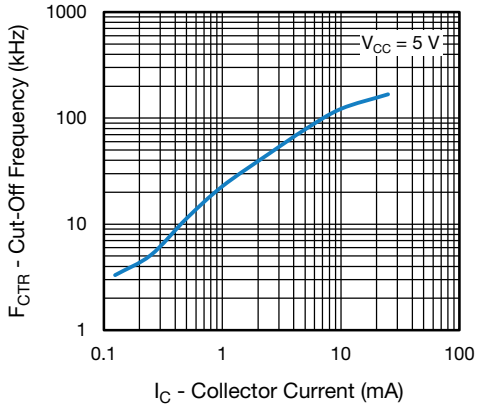


Fig. 15 - Cut-Off Frequency vs. Collector Current

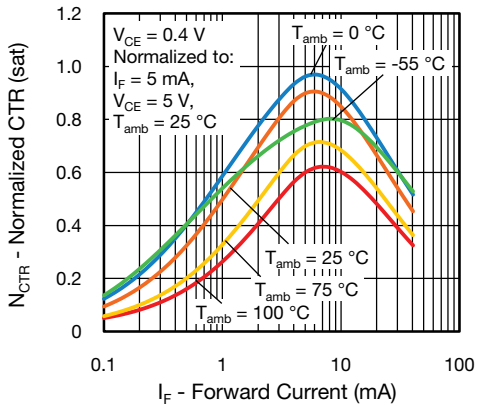


Fig. 13 - Normalized CTR (sat.) vs. Forward Current

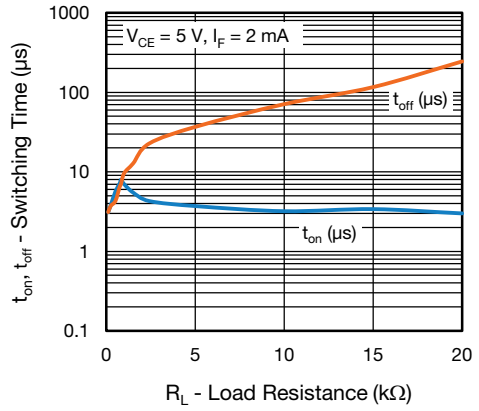


Fig. 16 - Switching Time vs. Load Resistance

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PACKAGE DIMENSIONS (in millimeters)

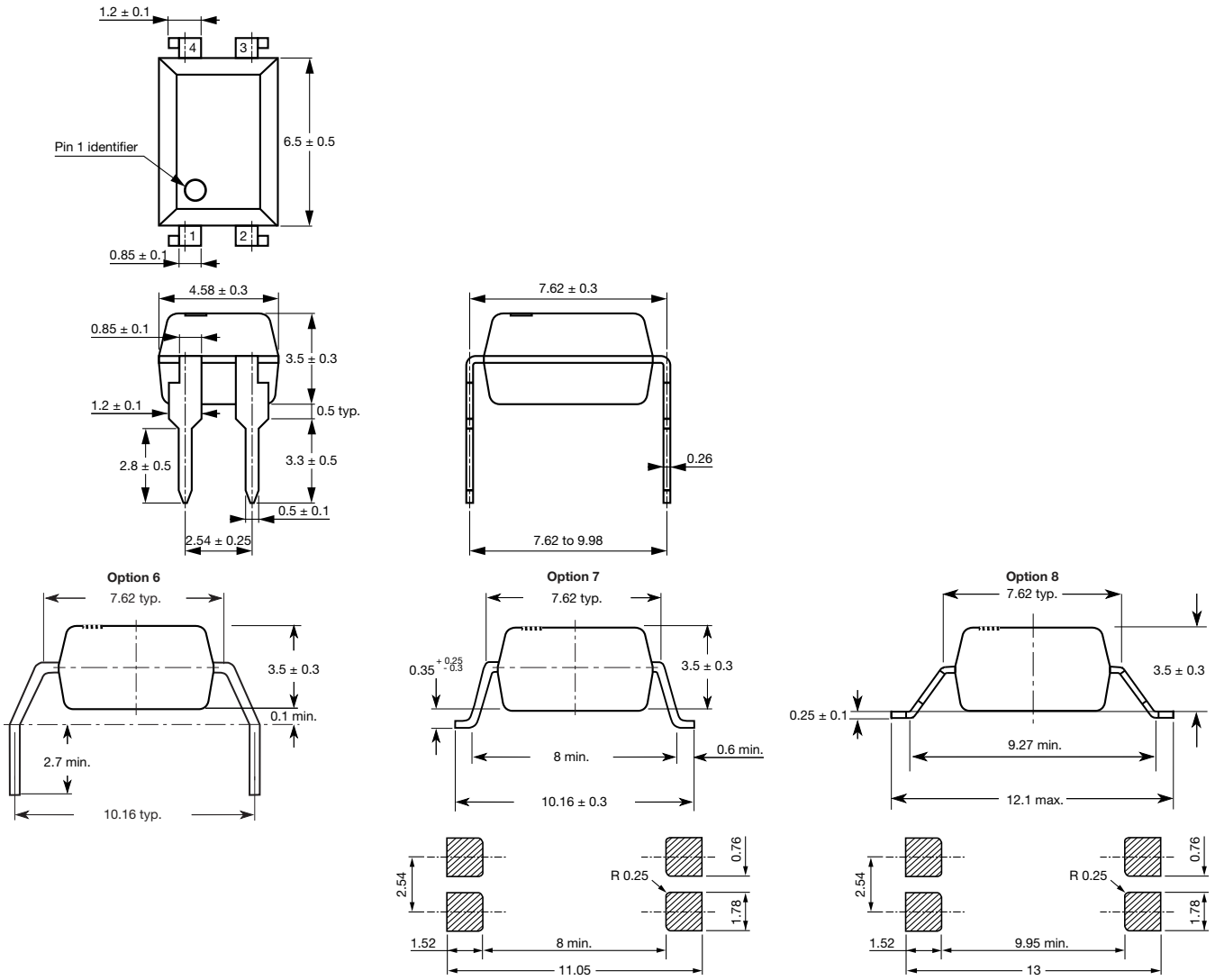


Fig. 17 - Package Drawings

PACKAGE MARKING

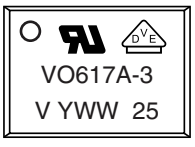


Fig. 18 - Example of VO617A-3X017T

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

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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

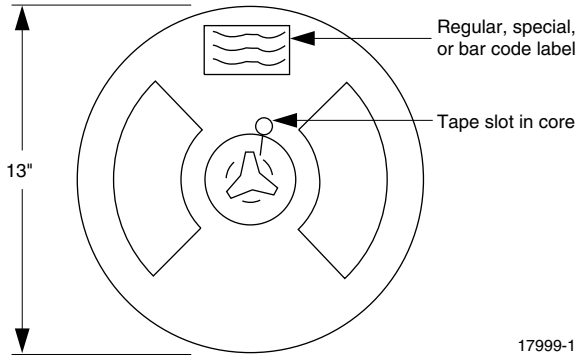


Fig. 19 - Tape and Reel Shipping Medium

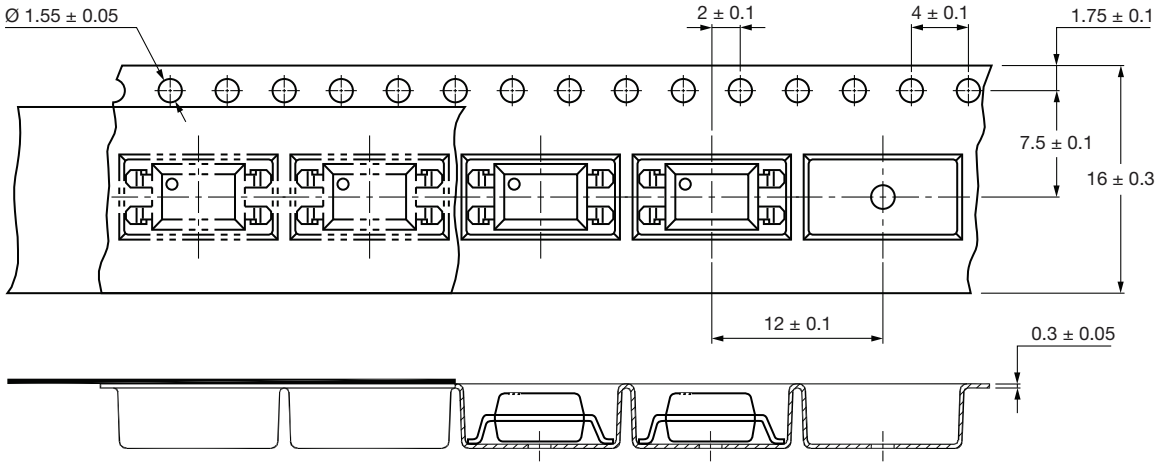


Fig. 20 - Tape and Packing for Option 7 (1000 units per reel)

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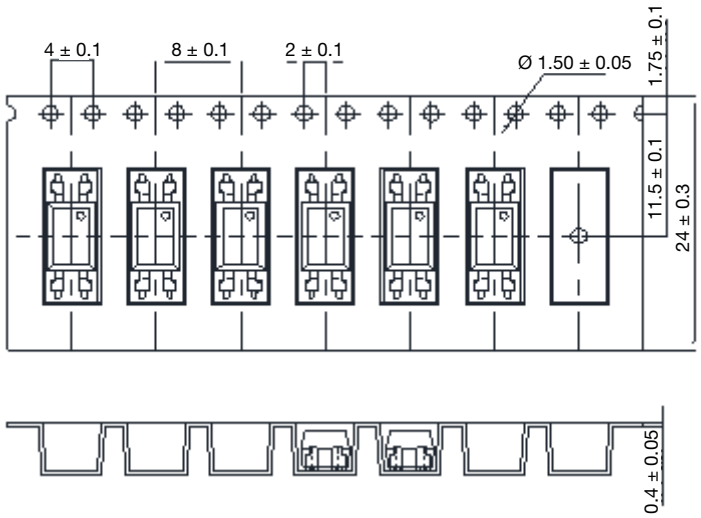


Fig. 21 - Tape and Reel Packaging for Option 8 (2000 units per reel)

SOLDER PROFILES

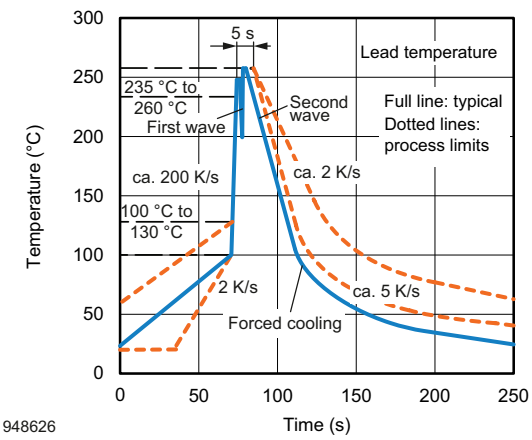


Fig. 22 - Wave Soldering Double Wave Profile
According to J-STD-020 for DIP Devices

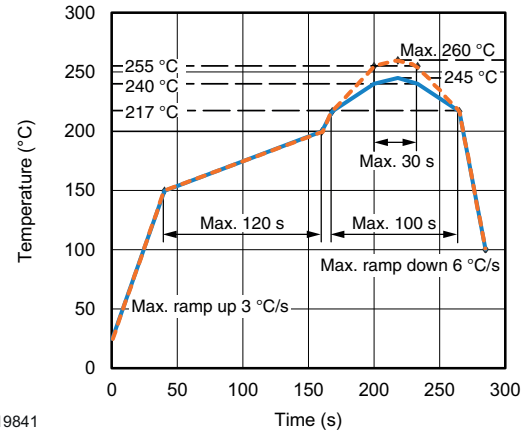


Fig. 23 - Lead (Pb)-free Reflow Solder Profile
According to J-STD-020 for SMD Devices

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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