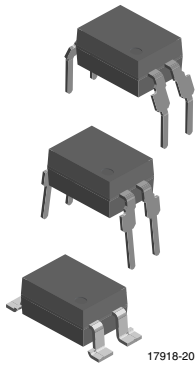
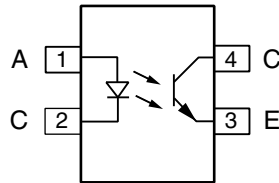


# Optocoupler, Phototransistor Output, High Reliability, 5000 V<sub>RMS</sub>, 110 °C Rated



17918-20



## DESCRIPTION

The 110 °C rated SFH1617A (DIP) 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. 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, 5000 V<sub>RMS</sub>
- High collector emitter voltage, V<sub>CEO</sub> = 70 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)



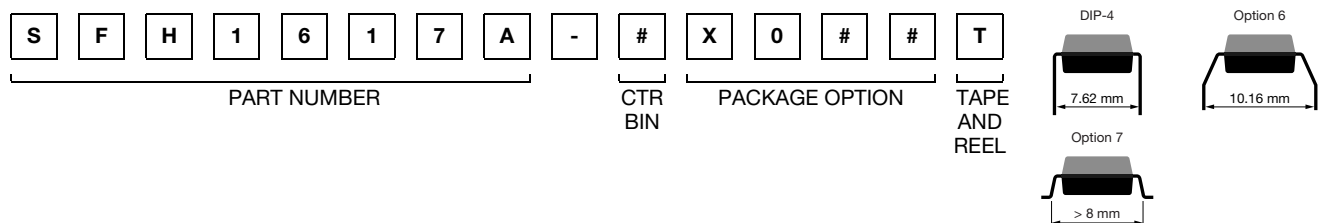
## APPLICATIONS

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

## AGENCY APPROVALS

- UL1577, file no. E52744
- cUL tested to CSA 22.2 bulletin 5A
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 (pending) available with option 1
- BSI EN 60950; EN 60065
- FIMKO
- CQC (pending)

## ORDERING INFORMATION



AGENCY CERTIFIED / PACKAGE	CTR (%)			
<b>UL, cUL, BSI, FIMKO</b>	<b>40 to 80</b>	<b>63 to 125</b>	<b>100 to 200</b>	<b>160 to 320</b>
DIP-4	-	SFH1617A-2	SFH1617A-3	-
<b>VDE, UL, cUL, BSI, FIMKO</b>	<b>40 to 80</b>	<b>63 to 125</b>	<b>100 to 200</b>	<b>160 to 320</b>
DIP-4, 400 mil, option 6	-	-	SFH1617A-3X016	-
SMD-4, option 7	-	SFH1617A-2X017T	-	-

### Note

- Additional options may be possible, please contact sales office



ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		V <sub>R</sub>	6.0	V
DC forward current		I <sub>F</sub>	60	mA
Surge forward current	t ≤ 10 μs	I <sub>FSM</sub>	2.5	A
LED power dissipation		P <sub>diss</sub>	70	mW
<b>OUTPUT</b>				
Collector emitter voltage		V <sub>CEO</sub>	70	V
Emitter collector voltage		V <sub>ECO</sub>	7.0	V
Collector current		I <sub>C</sub>	50	mA
Collector peak current	t <sub>p</sub> /T = 0.5, t <sub>p</sub> ≤ 10 ms	I <sub>CM</sub>	100	mA
Output power dissipation		P <sub>diss</sub>	150	mW
<b>COUPLER</b>				
Isolation test voltage between emitter and detector, refer to climate DIN 40046, part 2, Nov. 74		V <sub>ISO</sub>	5000	V <sub>RMS</sub>
Isolation resistance	V <sub>IO</sub> = 500 V, T <sub>amb</sub> = 25 °C	R <sub>IO</sub>	≥ 10 <sup>12</sup>	Ω
	V <sub>IO</sub> = 500 V, T <sub>amb</sub> = 100 °C	R <sub>IO</sub>	≥ 10 <sup>11</sup>	Ω
Storage temperature range		T <sub>stg</sub>	-55 to +150	°C
Ambient temperature range		T <sub>amb</sub>	-55 to +110	°C
Soldering temperature <sup>(1)</sup>	2 mm from case, ≤ 10 s	T <sub>slid</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
- <sup>(1)</sup> Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP)

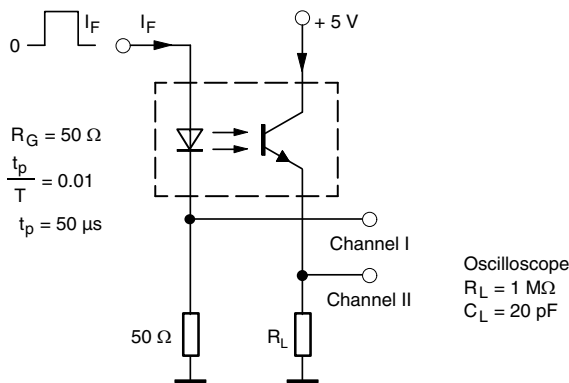
ELECTRICAL CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>							
Forward voltage	I <sub>F</sub> = 60 mA		V <sub>F</sub>	-	1.35	1.65	V
Reverse current	V <sub>R</sub> = 6.0 V		I <sub>R</sub>	-	0.01	10	μA
Capacitance	V <sub>R</sub> = 0 V, f = 1.0 MHz		C <sub>O</sub>	-	13	-	pF
<b>OUTPUT</b>							
Collector emitter capacitance	V <sub>CE</sub> = 5.0 V, f = 1.0 MHz		C <sub>CE</sub>	-	5.2	-	pF
Collector emitter leakage current	V <sub>CE</sub> = 10 V	SFH1617A-1	I <sub>CEO</sub>	-	2.0	50	nA
		SFH1617A-2	I <sub>CEO</sub>	-	2.0	50	nA
		SFH1617A-3	I <sub>CEO</sub>	-	5.0	100	nA
		SFH1617A-4	I <sub>CEO</sub>	-	5.0	100	nA
<b>COUPLER</b>							
Collector emitter saturation voltage	I <sub>F</sub> = 10 mA, f = 1.0 MHz		V <sub>CEsat</sub>	-	0.25	0.4	V
Coupling capacitance			C <sub>C</sub>	-	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

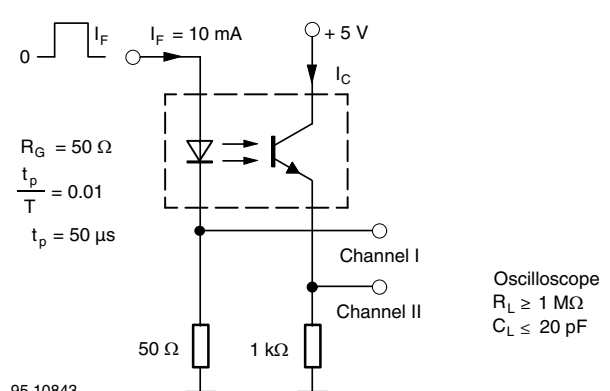
<b>CURRENT TRANSFER RATIO</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
$I_C/I_F$	$I_F = 10\text{ mA}$ , $V_{CE} = 5.0\text{ V}$	SFH1617A-1	CTR	40	-	80	%
		SFH1617A-2	CTR	63	-	125	%
		SFH1617A-3	CTR	100	-	200	%
		SFH1617A-4	CTR	160	-	320	%
	$I_F = 1.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$	SFH1617A-1	CTR	13	30	-	%
		SFH1617A-2	CTR	22	45	-	%
		SFH1617A-3	CTR	34	70	-	%
		SFH1617A-4	CTR	56	90	-	%

<b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>NON-SATURATED</b>							
Turn-on time	$I_F = 10\text{ mA}$ , $V_{CC} = 5.0\text{ V}$ , $R_L = 75\text{ }\Omega$		$t_{on}$	-	3.0	-	$\mu\text{s}$
Rise time	$I_F = 10\text{ mA}$ , $V_{CC} = 5.0\text{ V}$ , $R_L = 75\text{ }\Omega$		$t_r$	-	2.0	-	$\mu\text{s}$
Turn-off time	$I_F = 10\text{ mA}$ , $V_{CC} = 5.0\text{ V}$ , $R_L = 75\text{ }\Omega$		$t_{off}$	-	2.3	-	$\mu\text{s}$
Fall time	$I_F = 10\text{ mA}$ , $V_{CC} = 5.0\text{ V}$ , $R_L = 75\text{ }\Omega$		$t_f$	-	2.0	-	$\mu\text{s}$
Cut-off frequency	$I_F = 10\text{ mA}$ , $V_{CC} = 5.0\text{ V}$		$f_{ctr}$	-	100	-	kHz
<b>SATURATED</b>							
Turn-on time	$I_F = 20\text{ mA}$	SFH1617A-1	$t_{on}$	-	3.0	-	$\mu\text{s}$
	$I_F = 10\text{ mA}$	SFH1617A-2	$t_{on}$	-	4.2	-	$\mu\text{s}$
		SFH1617A-3	$t_{on}$	-	4.2	-	$\mu\text{s}$
	$I_F = 5.0\text{ mA}$	SFH1617A-4	$t_{on}$	-	6.0	-	$\mu\text{s}$
Rise time	$I_F = 20\text{ mA}$	SFH1617A-1	$t_r$	-	2.0	-	$\mu\text{s}$
	$I_F = 10\text{ mA}$	SFH1617A-2	$t_r$	-	3.0	-	$\mu\text{s}$
		SFH1617A-3	$t_r$	-	3.0	-	$\mu\text{s}$
	$I_F = 5.0\text{ mA}$	SFH1617A-4	$t_r$	-	4.6	-	$\mu\text{s}$
Turn-off time	$I_F = 20\text{ mA}$	SFH1617A-1	$t_{off}$	-	18	-	$\mu\text{s}$
	$I_F = 10\text{ mA}$	SFH1617A-2	$t_{off}$	-	23	-	$\mu\text{s}$
		SFH1617A-3	$t_{off}$	-	23	-	$\mu\text{s}$
	$I_F = 5.0\text{ mA}$	SFH1617A-4	$t_{off}$	-	25	-	$\mu\text{s}$
Fall time	$I_F = 20\text{ mA}$	SFH1617A-1	$t_f$	-	11	-	$\mu\text{s}$
	$I_F = 10\text{ mA}$	SFH1617A-2	$t_f$	-	14	-	$\mu\text{s}$
		SFH1617A-3	$t_f$	-	14	-	$\mu\text{s}$
	$I_F = 5.0\text{ mA}$	SFH1617A-4	$t_f$	-	15	-	$\mu\text{s}$



95 10804-3

Fig. 1 - Test Circuit, Non-Saturated Operation



95 10843

Fig. 2 - Test Circuit, Saturated Operation

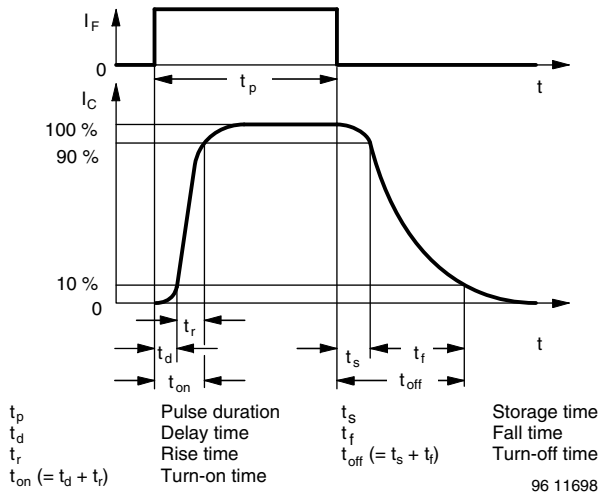


Fig. 3 - Switching Times

SAFETY AND INSULATION RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Climatic classification	According to IEC 68 part 1		-	55 / 110 / 21	-	
Comparative tracking index		CTI	175	-	399	
Rated impulse voltage		$V_{IOTM}$	-	-	8	kV
Maximum working voltages	Recurring peak voltage	$V_{IORM}$	-	-	890	V
Forward current		$I_{SI}$	-	-	275	mA
Power dissipation		$P_{SO}$	-	-	400	mW
Safety temperature		$T_{SI}$	-	-	175	°C
Creepage distance			7.0	-	-	mm
Clearance distance			7.0	-	-	mm
Isolation distance	per IEC 60950 2.10.5.1		0.4	-	-	mm

**Note**

- According to DIN EN 60747-5-2 (VDE 0884). These optocouplers are 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)

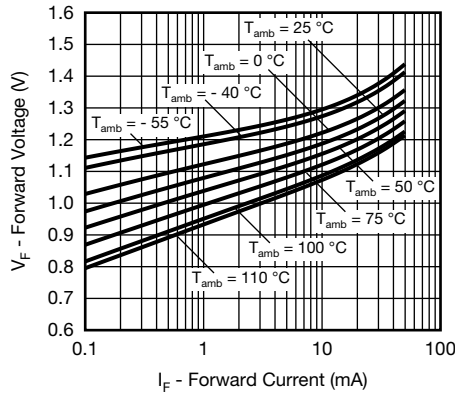


Fig. 4 - Forward Voltage vs. Forward Current

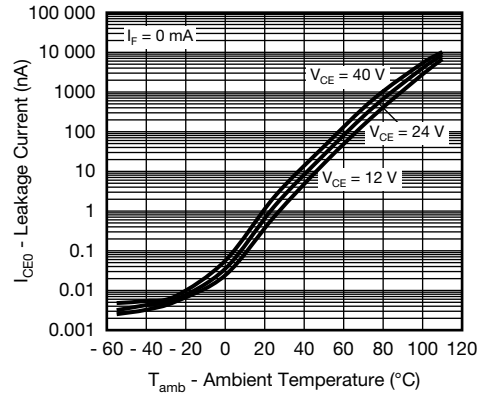


Fig. 7 - Leakage Current vs. Ambient Temperature

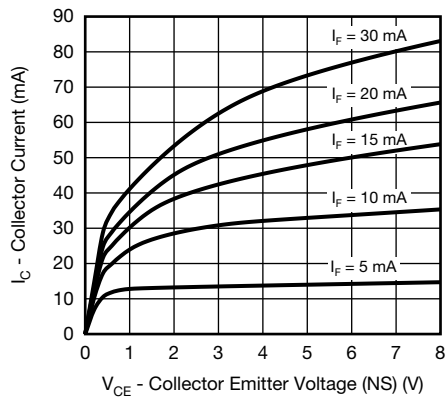


Fig. 5 - Collector Current vs. Collector Emitter Voltage (NS)

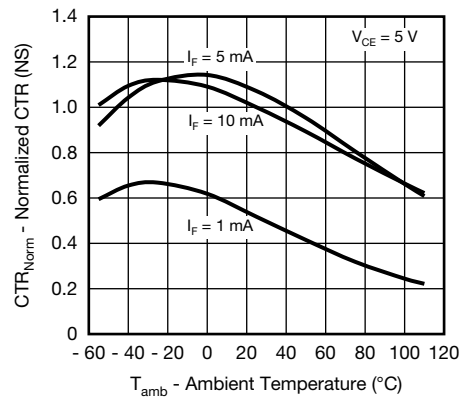


Fig. 8 - Normalized CTR (NS) vs. Ambient Temperature

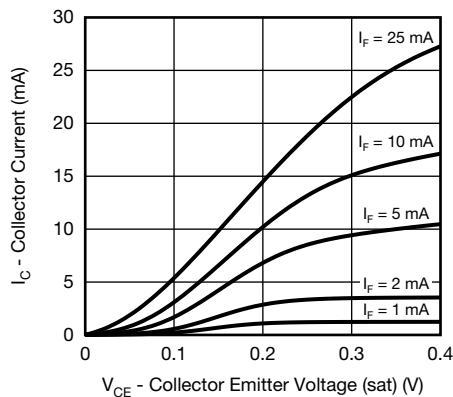


Fig. 6 - Collector Current vs. Collector Emitter Voltage (sat)

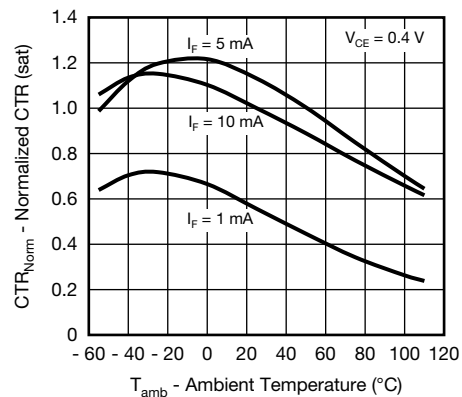


Fig. 9 - Normalized CTR (sat) vs. Ambient Temperature

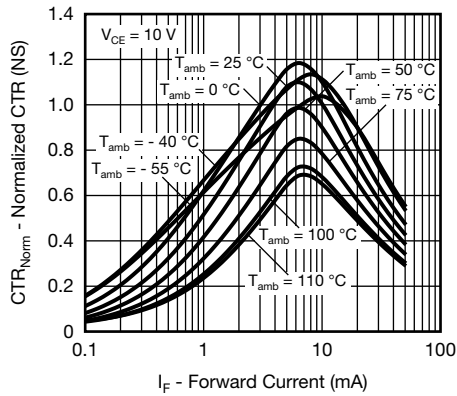


Fig. 10 - Normalized CTR (NS) vs. Forward Current

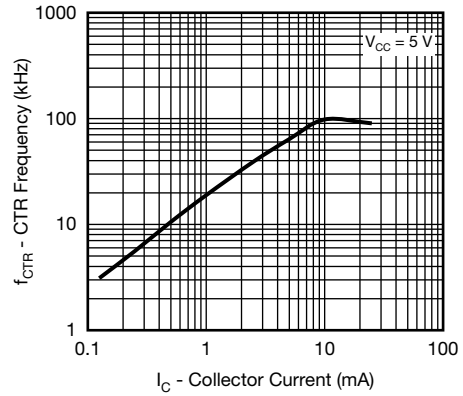


Fig. 13 - CTR Frequency vs. Collector Current

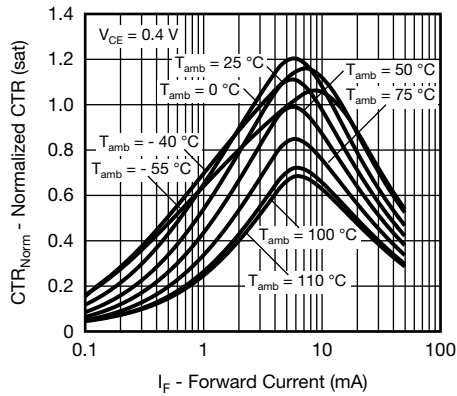


Fig. 11 - Normalized CTR (sat) vs. Forward Current

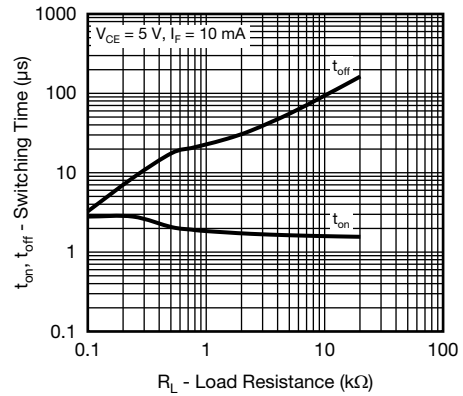


Fig. 14 - Switching Time vs. Load Resistance

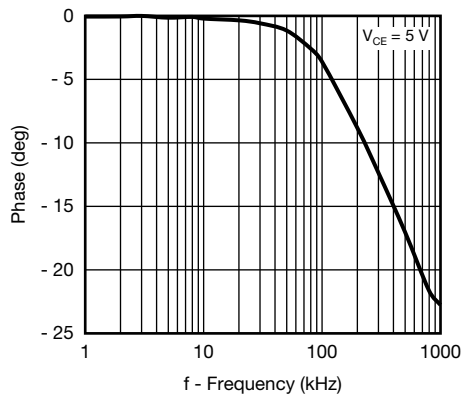
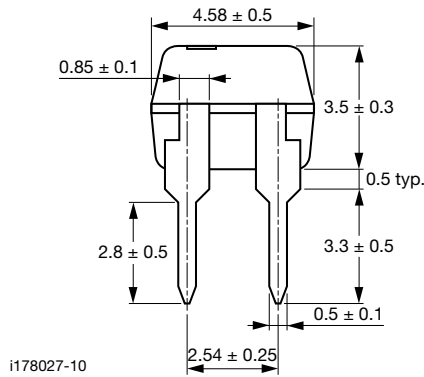
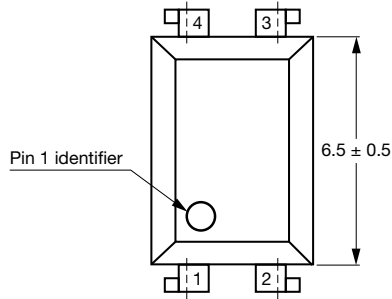
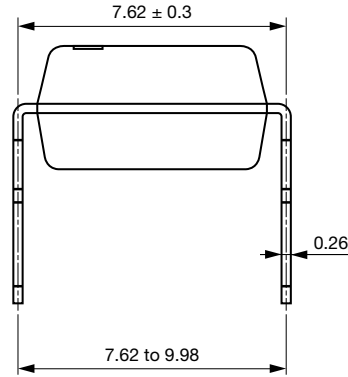


Fig. 12 - CTR Frequency vs. Phase Angle

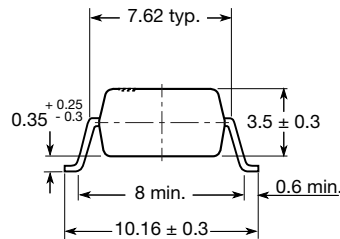
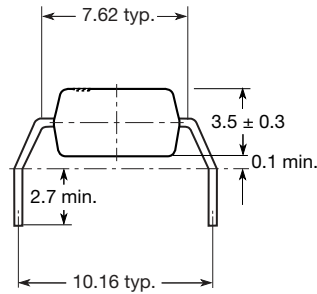
**PACKAGE DIMENSIONS** in millimeters



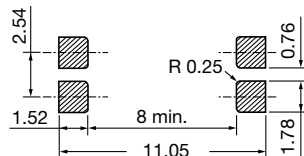
**Option 6**



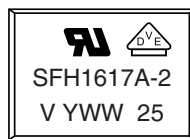
**Option 7**



20802-30



**PACKAGE MARKING**



**Notes**

- 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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