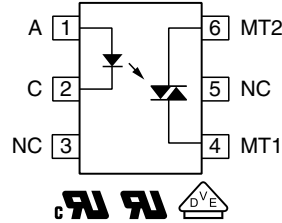
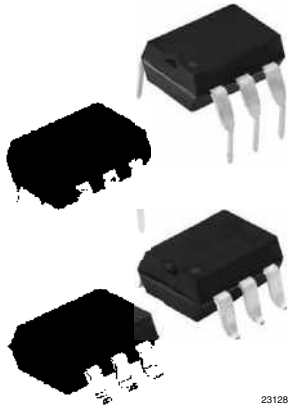


# Optocoupler, Phototriac Output, Non-Zero Crossing



## FEATURES

- $I_{RMS} = 300 \text{ mA}$
- High static  $dV/dt < 10\,000 \text{ V}/\mu\text{s}$
- Electrically insulated between input and output circuit
- Microcomputer compatible - very low trigger current
- Trigger current
  - ( $I_{FT} < 1.2 \text{ mA}$ ) BRT12F
  - ( $I_{FT} < 2 \text{ mA}$ ) BRT11H, BRT12H, BRT13H
  - ( $I_{FT} < 3 \text{ mA}$ ) BRT12M, BRT13M
- Non-zero voltage detectors high input sensitivity
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

## LINKS TO ADDITIONAL RESOURCES



## DESCRIPTION

The BRT11, BRT12, and BRT13 product family consists of AC optocouplers non-zero voltage detectors consisting of two electrically insulated lateral power ICs which integrate a thyristor system, a photo detector and noise suppression at the output and an IR GaAs diode input.

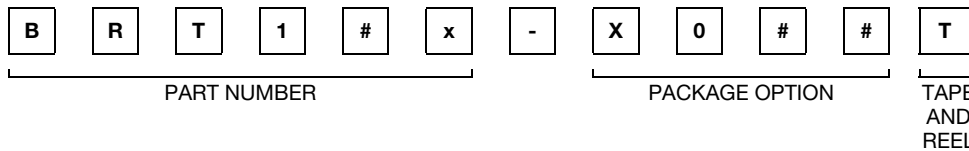
## APPLICATIONS

- Industrial controls
- Office equipment
- Consumer appliances

## AGENCY APPROVALS

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

## ORDERING INFORMATION



AGENCY CERTIFIED / PACKAGE	$V_{DRM} \text{ (V)}$				
	$\leq 400$	$\leq 600$	$\leq 600$	$\leq 600$	$\leq 800$
<b>UL</b>	$I_{FT} = 2 \text{ mA}$	$I_{FT} = 1.2 \text{ mA}$	$I_{FT} = 2 \text{ mA}$	$I_{FT} = 3 \text{ mA}$	$I_{FT} = 2 \text{ mA}$
DIP-6	BRT11H	BRT12F	BRT12H	BRT12M	BRT13H
DIP-6, 400 mil, option 6	-	-	BRT12H-X006	-	BRT13H-X006
SMD-6, option 7	-	BRT12F-X007T	BRT12H-X007T	-	BRT13H-X007T <sup>(1)</sup>
SMD-6, option 9	-	-	BRT12H-X009T	-	BRT13H-X009T
<b>UL, VDE</b>	$I_{FT} = 2 \text{ mA}$	$I_{FT} = 1.2 \text{ mA}$	$I_{FT} = 2 \text{ mA}$	$I_{FT} = 3 \text{ mA}$	$I_{FT} = 2 \text{ mA}$
DIP-6	-	-	BRT12H-X001	BRT12M-X001	-
DIP-6, 400 mil, option 6	-	-	BRT12H-X016	-	-
SMD-6, option 7	-	-	-	-	BRT13H-X017T

## Note

<sup>(1)</sup> Also available in tube, do not put T on the end



<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)					
PARAMETER	TEST CONDITION	PART	SYMBOL	VALUE	UNIT
<b>INPUT</b>					
Reverse voltage			$V_R$	6	V
Forward current			$I_F$	20	mA
Surge forward current			$I_{FSM}$	1.5	A
Power dissipation	$t \leq 10\text{ }\mu\text{s}$		$P_{diss}$	30	mW
<b>OUTPUT</b>					
Repetitive peak off-state voltage		BRT11	$V_{DRM}$	400	V
		BRT12	$V_{DRM}$	600	V
		BRT13	$V_{DRM}$	800	V
RMS on-state current			$I_{TRMS}$	300	mA
Single cycle surge current	50 Hz		$I_{TSM}$	3	A
Power dissipation			$P_{diss}$	600	mW
<b>COUPLER</b>					
Maximum power dissipation			$P_{tot}$	630	mW
Reference voltage in accordance with VDE 0110 b			$V_{ref}$	500	$V_{RMS}$
Reference voltage in accordance with VDE 0110 b (insulation group C)			$V_{ref}$	600	$V_{DC}$
Storage temperature range			$T_{stg}$	-40 to +150	$^{\circ}\text{C}$
Ambient temperature range			$T_{amb}$	-40 to +100	$^{\circ}\text{C}$

**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> Test AC voltage in accordance with DIN 57883, June 1980

<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>							
Forward voltage	$I_F = 10\text{ mA}$		$V_F$	-	1.1	1.35	V
Reverse current	$V_R = 6\text{ V}$		$I_R$	-	-	10	$\mu\text{A}$
Thermal resistance, junction to ambient <sup>(1)</sup>			$R_{thJA}$	-	-	750	$^{\circ}\text{C/W}$
<b>OUTPUT</b>							
Peak off-state voltage	$I_{D(RMS)} = 100\text{ }\mu\text{A}$	BRT11	$V_{DM}$	-	400	-	$\mu\text{A}$
		BRT12		-	600	-	$\mu\text{A}$
		BRT13		-	800	-	$\mu\text{A}$
Off-state current	$T_C = 80\text{ }^{\circ}\text{C}, V_{DRM}$		$I_D$	-	0.5	100	$\mu\text{A}$
On-state voltage	$I_T = 300\text{ mA}$		$V_T$	-	-	2.3	V
Pulse current	$t_p \leq 5\text{ }\mu\text{s}, f = 100\text{ Hz}, dl_{tp}/dt \leq 8\text{ A}/\mu\text{s}$		$I_{tp}$	-	-	2	A
Critical rate of rise of off-state voltage	$V_D = 0.67 V_{DRM}, T_j = 25\text{ }^{\circ}\text{C}$		$dV/dt_{cr}$	10	-	-	kV/ $\mu\text{s}$
	$V_D = 0.67 V_{DRM}, T_j = 80\text{ }^{\circ}\text{C}$		$dV/dt_{cr}$	5	-	-	kV/ $\mu\text{s}$
Critical rate of rise of voltage at current commutation	$V_D = 0.67 V_{DRM}, T_j = 25\text{ }^{\circ}\text{C}, dl/dt_{crq} \leq 15\text{ A/ms}$		$dV/dt_{crq}$	10	-	-	kV/ $\mu\text{s}$
	$V_D = 0.67 V_{DRM}, T_j = 80\text{ }^{\circ}\text{C}, dl/dt_{crq} \leq 15\text{ A/ms}$		$dV/dt_{crq}$	5	-	-	kV/ $\mu\text{s}$
Critical rate of rise of on-state at current			$dl/dt_{cr}$	8	-	-	A/ $\mu\text{s}$
Holding current	$V_D = 10\text{ V}$		$I_H$	-	80	500	$\mu\text{A}$
Thermal resistance, junction to ambient			$R_{thJA}$	-	-	125	$^{\circ}\text{C/W}$

<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>COUPLER</b>							
Trigger current	$V_D = 10\text{ V}$ , F - versions		$I_{FT}$	-	-	1.2	mA
	$V_D = 10\text{ V}$ , H - versions		$I_{FT}$	0.4	-	2	mA
	$V_D = 10\text{ V}$ , M - versions		$I_{FT}$	0.8	-	3	mA
Trigger current temperature gradient			$\Delta I_{FT}/\Delta T_j$	-	7	14	$\mu\text{A}/^{\circ}\text{C}$
Capacitance (input to output)	$f = 1\text{ MHz}$ , $V_R = 0\text{ V}$		$C_{IO}$	-	-	2	pF

**Notes**

- 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.
- (1) Static air, SITAC soldered in PCB or base plate

<b>SAFETY AND INSULATION RATINGS</b>				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification	According to IEC 68 part 1		55 / 100 / 21	
Comparative tracking index		CTI	175	
Maximum rated withstanding isolation voltage	$t = 1\text{ min}$	$V_{ISO}$	4420	$V_{RMS}$
Maximum transient isolation voltage		$V_{IOTM}$	10 000	$V_{peak}$
Maximum repetitive peak isolation voltage		$V_{IORM}$	890	$V_{peak}$
Isolation resistance	$V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Output safety power		$P_{SO}$	400	mW
Input safety current		$I_{SI}$	275	mA
Safety temperature		$T_S$	175	$^{\circ}\text{C}$
Creepage distance	DIP-6; SMD-6, option 7; SMD-6, option 9		$\geq 7$	mm
Clearance distance			$\geq 7$	mm
Creepage distance	DIP-6, option 6		$\geq 8$	mm
Clearance distance			$\geq 8$	mm
Insulation thickness		DTI	$\geq 0.4$	mm

**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.

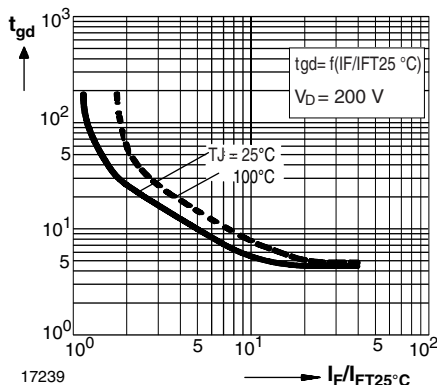
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Typical Trigger Delay Time

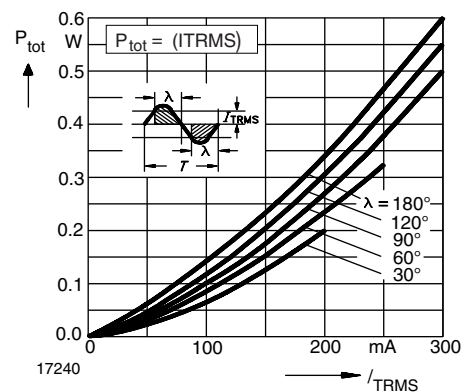


Fig. 2 - Power Dissipation 60 Hz to 60 Hz Line Operation

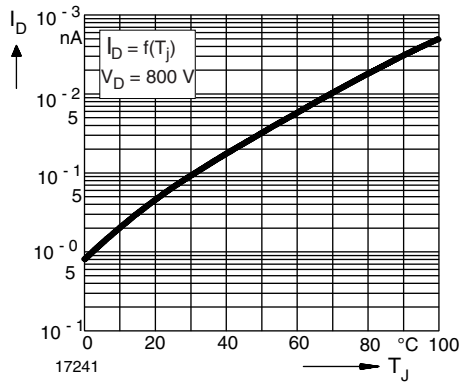


Fig. 3 - Typical Off-State Current

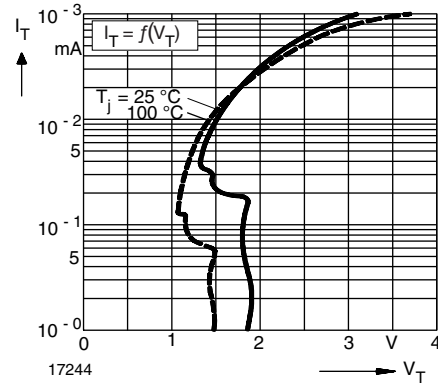


Fig. 6 - Typical Output Characteristics

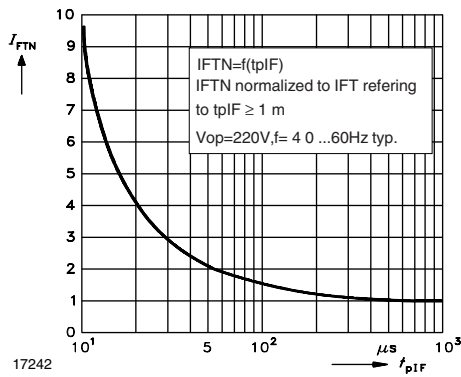


Fig. 4 - Pulse Trigger Current

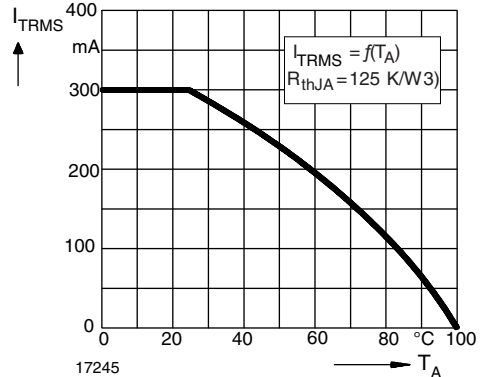


Fig. 7 - Current Reduction

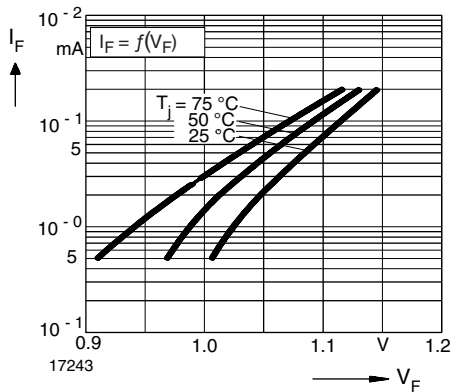


Fig. 5 - Typical Input Characteristics

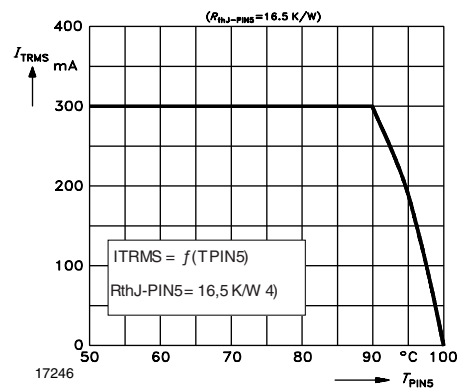
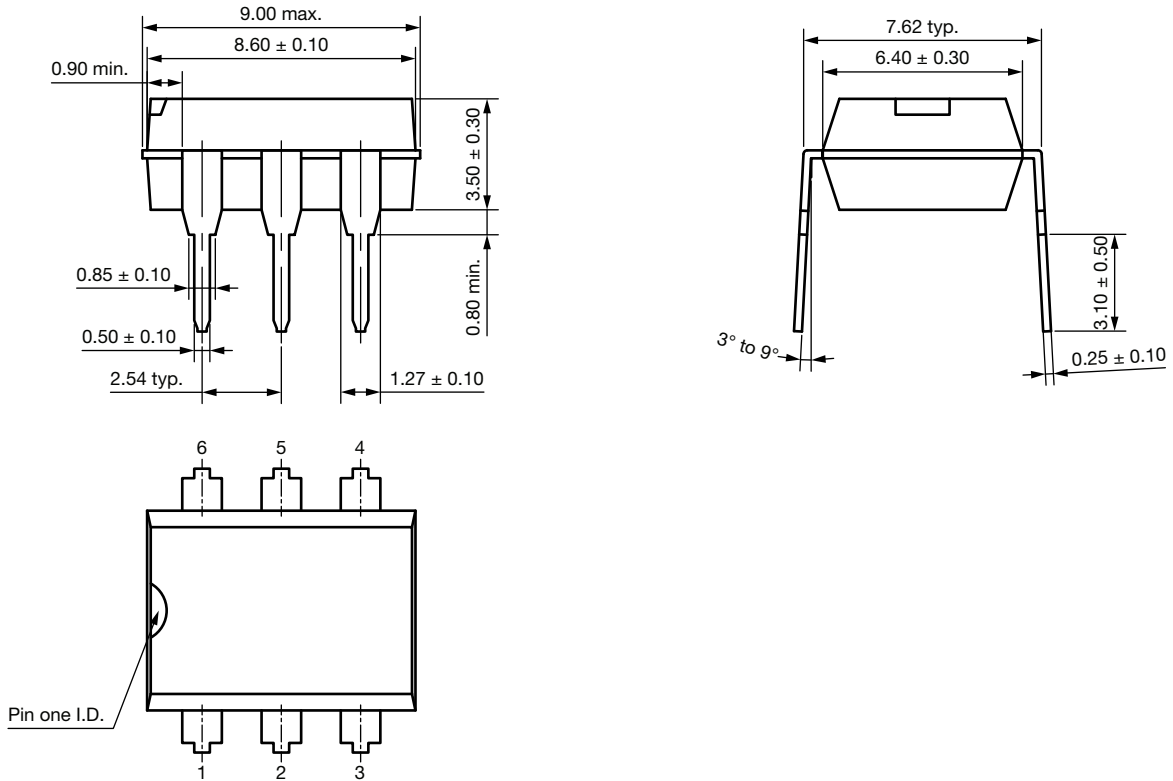


Fig. 8 - Current Reduction

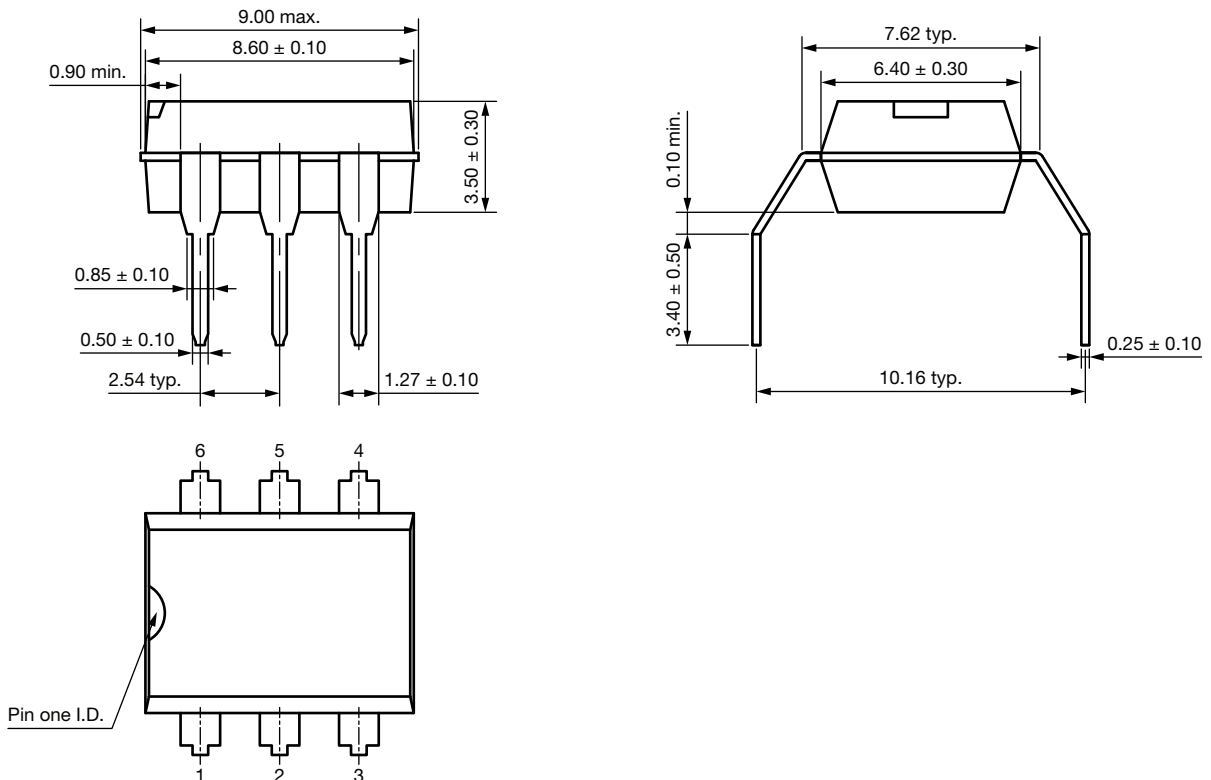


## PACKAGE DIMENSIONS in millimeters

### DIP-6

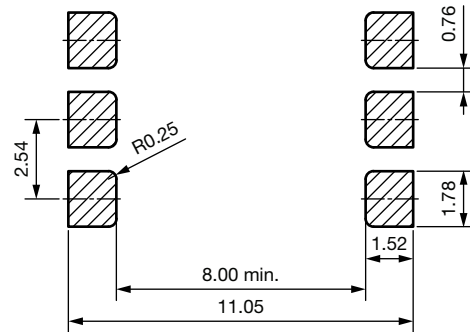
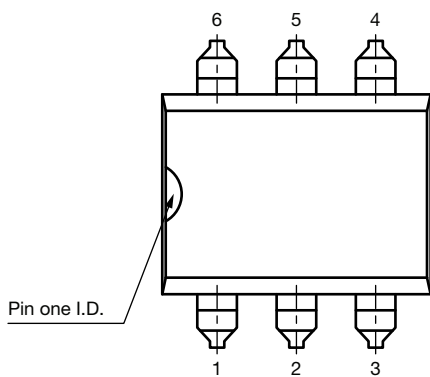
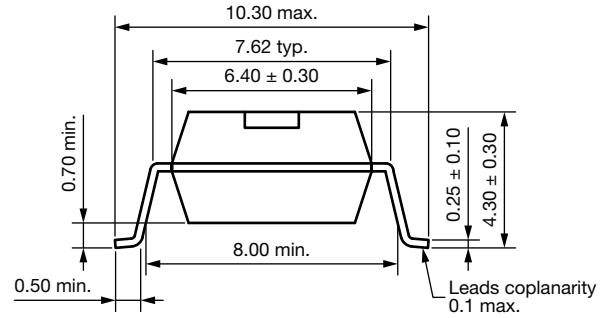
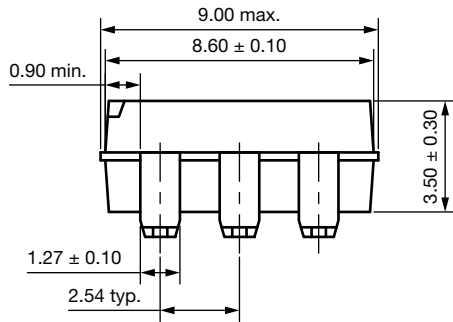


### DIP-6, 400 mil (option 6)

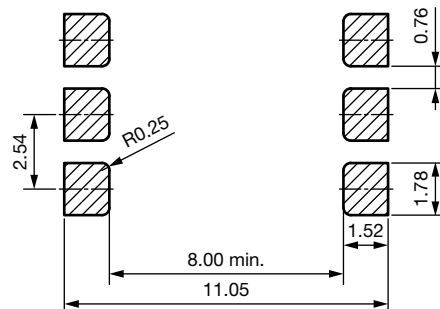
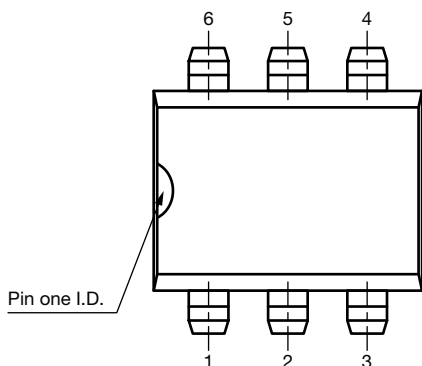
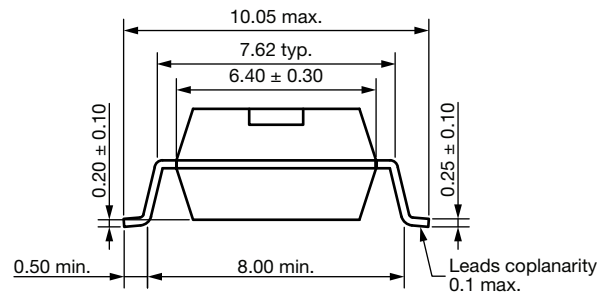
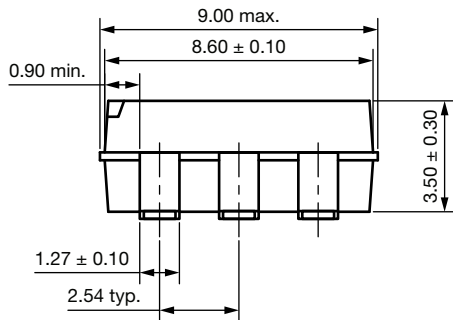




### SMD-6 (option 7)

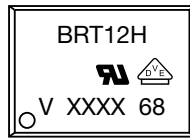


### SMD-6 (option 9)





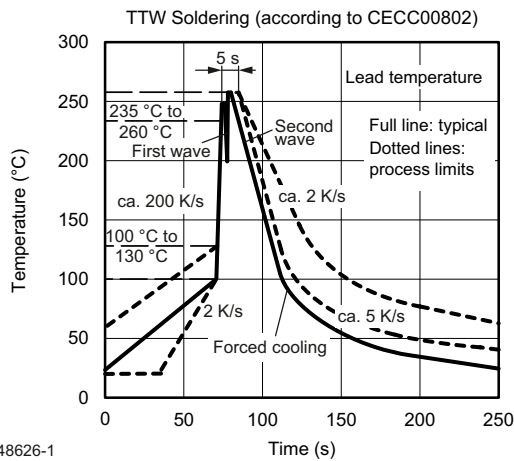
## PACKAGE MARKING (example)



### Notes

- XXXX = LMC (lot marking code)
- VDE logo is only marked on option 1 parts
- Tape and reel suffix (T) is not part of the package marking

## SOLDER PROFILES



948626-1

Fig. 9 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP Devices

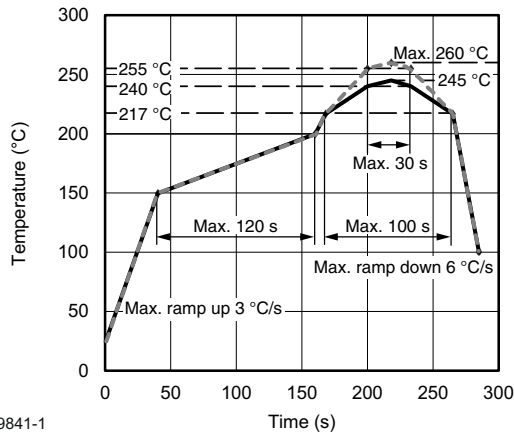
## HANDLING AND STORAGE CONDITIONS

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



19841-1

Fig. 10 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices



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