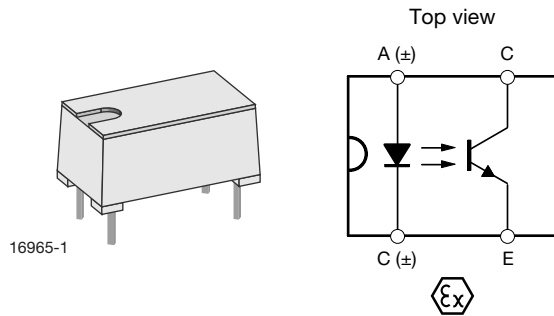


# Optocoupler, Phototransistor Output, ATEX Certified



16965-1

## DESCRIPTION

The CNY65Exi consists of a phototransistor optically coupled to an infrared-emitting diode in a 4 pin plastic package. The components are mounted opposite one another, with a distance between input and output of > 3.0 mm; meeting the highest of safety requirements.

The CNY65Exi is ATEX certified for explosive atmospheres according to the Directive 2014/34/EU

## AGENCY APPROVALS

- ATEX  $\text{Ex}$ : PTB 03 ATEX 2033 U  
EN 60079-0 : 2012 + A11 : 2013  
EN 60079-11 : 2012  
EN 60079-26 : 2015

## FEATURES

- ATEX certificate: PTB 03 ATEX 2033 U  
[www.vishay.com/doc?85361](http://www.vishay.com/doc?85361)
- Suitable for intrinsic safe circuits for gas and dust
- Gas safety provision: II (1) G [Ex ia] IIC
- Dust safety provision: II (1) D [Ex ia] IIIC
- Conforms to EN 60079-0: 2012 + A11: 2013
- Qualified for continuously, longterm, or frequently dangerous explosive environments, zone 0
- Isolation voltage ( $V_{ISO}$ ) of 11 600  $V_{peak}$  for 1 minute
- Distance from emitter to detector through insulation  $\geq 3$  mm
- CTR from 50 % to 300 %
- Very low coupling capacity ( $C_K$ )
  - 0.3 pF superior noise immunity between input and output pins
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

## APPLICATIONS

- Electronics used in potentially explosive gas and dust environments
  - Safety related process automation and instrumentation
  - Natural gas metering and flow measurement
  - Power and motor switching
  - Power supplies, metering, and data acquisition
  - Lighting and signaling
  - Petrol and grain transport and storage

ORDERING INFORMATION		
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AGENCY CERTIFIED/PACKAGE	CTR (%)	
ATEX	50 to 300	100 to 200
DIP-4, HV, high isolation distance	CNY65Exi	CNY65BExi



ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		V <sub>R</sub>	5	V
Forward current		I <sub>F</sub>	75	mA
Forward surge current	t <sub>p</sub> ≤ 10 μs	I <sub>FSM</sub>	1.5	A
Power dissipation		P <sub>diss</sub>	120	mW
Junction temperature		T <sub>j</sub>	100	°C
<b>OUTPUT</b>				
Collector emitter voltage		V <sub>CEO</sub>	32	V
Emitter collector voltage		V <sub>ECO</sub>	7	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
Power dissipation		P <sub>diss</sub>	130	mW
Junction temperature		T <sub>j</sub>	100	°C
<b>COUPLER</b>				
Total power dissipation		P <sub>tot</sub>	250	mW
Ambient temperature range		T <sub>amb</sub>	-55 to +85	°C
Storage temperature range		T <sub>stg</sub>	-55 to +100	°C
Soldering temperature	2 mm from case, t ≤ 10 s	T <sub>slid</sub>	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 Rating for extended periods of the time can adversely affect reliability

ELECTRICAL CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	I <sub>F</sub> = 50 mA	V <sub>F</sub>	-	1.25	1.6	V
<b>OUTPUT</b>						
Collector emitter voltage	I <sub>C</sub> = 1 mA	V <sub>CEO</sub>	32	-	-	V
Emitter collector voltage	I <sub>E</sub> = 100 μA	V <sub>ECO</sub>	7	-	-	V
Collector dark current	V <sub>CE</sub> = 20 V, I <sub>F</sub> = 0, E = 0	I <sub>CEO</sub>	-	-	200	nA
<b>COUPLER</b>						
Isolation resistance	V <sub>IO</sub> = 1 kV, 40 % relative humidity	R <sub>IO</sub> <sup>(1)</sup>	-	10 <sup>12</sup>	-	Ω
Collector saturation voltage	I <sub>F</sub> = 10 mA, I <sub>C</sub> = 1 mA	V <sub>CEsat</sub>	-	-	0.3	V
Cut-off frequency	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 10 mA, R <sub>L</sub> = 100 Ω	f <sub>c</sub>	110	-	-	kHz
Coupling capacitance	f = 1 MHz	C <sub>k</sub>	-	0.3	-	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
- <sup>(1)</sup> Related to standard climate 23/50 DIN 50014

CURRENT TRANSFER RATIO (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
I <sub>C</sub> /I <sub>F</sub>	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 10 mA	CNY65Exi	CTR	50	100	300	%
		CNY65BExi	CTR	100	-	200	%

SAFETY AND INSULATION RATINGS				
PARAMETER		SYMBOL	VALUE	UNIT
Climatic classification	According to IEC 68 part 1		40 / 85 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	475	
Maximum rated withstanding isolation voltage	t = 1 min	V <sub>ISO</sub>	8200	V <sub>RMS</sub>
Maximum transient isolation voltage		V <sub>IOTM</sub>	12 000	V <sub>peak</sub>
Maximum repetitive peak isolation voltage		V <sub>IORM</sub>	1450	V <sub>peak</sub>
Isolation resistance	T <sub>amb</sub> = 25 °C, V <sub>IO</sub> = 500 V	R <sub>IO</sub>	≥ 10 <sup>12</sup>	Ω
	T <sub>amb</sub> = 100 °C, V <sub>IO</sub> = 500 V	R <sub>IO</sub>	≥ 10 <sup>11</sup>	Ω
	T <sub>amb</sub> = T <sub>S</sub> , V <sub>IO</sub> = 500 V	R <sub>IO</sub>	≥ 10 <sup>9</sup>	Ω
Output safety power		P <sub>SO</sub>	250	mW
Input safety current		I <sub>si</sub>	120	mA
Input safety temperature		T <sub>S</sub>	150	°C
Creepage distance			≥ 14	mm
Clearance distance			≥ 14	mm
Insulation thickness		DTI	≥ 3	mm

**Note**

- According to DIN EN 60747-5-5 (see Fig. 2). This optocoupler is suitable for safe electrical isolation only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits

SWITCHING CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Delay time	V <sub>S</sub> = 5 V, I <sub>C</sub> = 5 mA, R <sub>L</sub> = 100 Ω, (see Fig. 1)	t <sub>d</sub>	-	2.6	-	μs
Rise time	V <sub>S</sub> = 5 V, I <sub>C</sub> = 5 mA, R <sub>L</sub> = 100 Ω, (see Fig. 1)	t <sub>r</sub>	-	2.4	-	μs
Fall time	V <sub>S</sub> = 5 V, I <sub>C</sub> = 5 mA, R <sub>L</sub> = 100 Ω, (see Fig. 1)	t <sub>f</sub>	-	2.4	-	μs
Storage time	V <sub>S</sub> = 5 V, I <sub>C</sub> = 5 mA, R <sub>L</sub> = 100 Ω, (see Fig. 1)	t <sub>s</sub>	-	0.3	-	μs
Turn-on time	V <sub>S</sub> = 5 V, I <sub>C</sub> = 5 mA, R <sub>L</sub> = 100 Ω, (see Fig. 1)	t <sub>on</sub>	-	5	-	μs
Turn-off time	V <sub>S</sub> = 5 V, I <sub>C</sub> = 5 mA, R <sub>L</sub> = 100 Ω, (see Fig. 1)	t <sub>off</sub>	-	3	-	μs
Turn-on time	V <sub>S</sub> = 5 V, I <sub>F</sub> = 10 mA, R <sub>L</sub> = 1 kΩ, (see Fig. 2)	t <sub>on</sub>	-	25	-	μs
Turn-off time	V <sub>S</sub> = 5 V, I <sub>F</sub> = 10 mA, R <sub>L</sub> = 1 kΩ, (see Fig. 2)	t <sub>off</sub>	-	42.5	-	μs

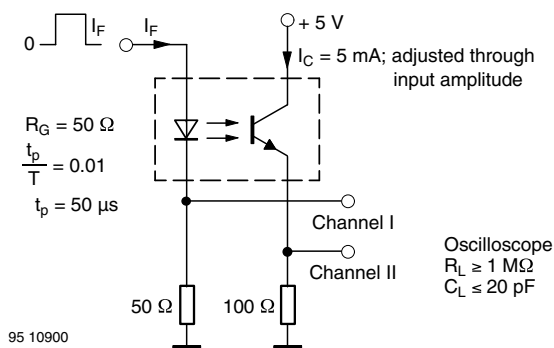


Fig. 1 - Test Circuit, Non-Saturated Operation

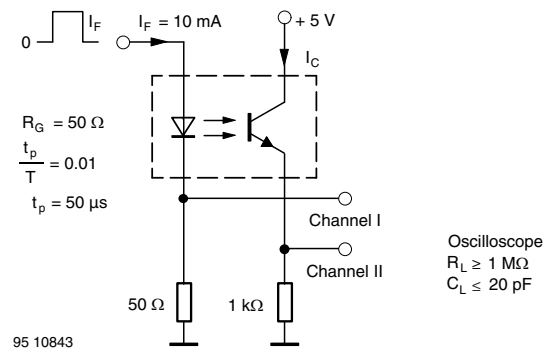


Fig. 2 - Test Circuit, Saturated Operation

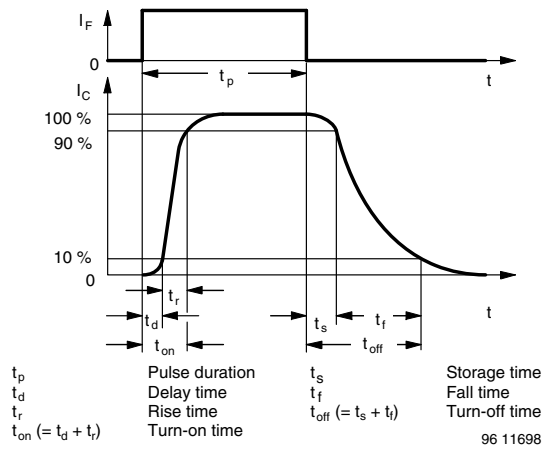


Fig. 3 - Switching Times

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

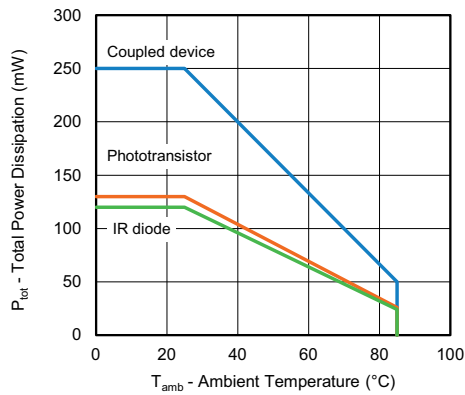


Fig. 4 - Total Power Dissipation vs. Ambient Temperature

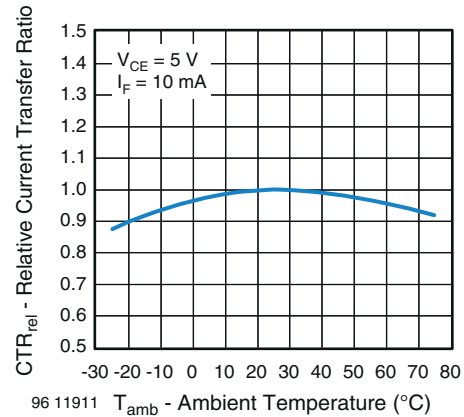


Fig. 6 - Relative Current Transfer Ratio vs. Ambient Temperature

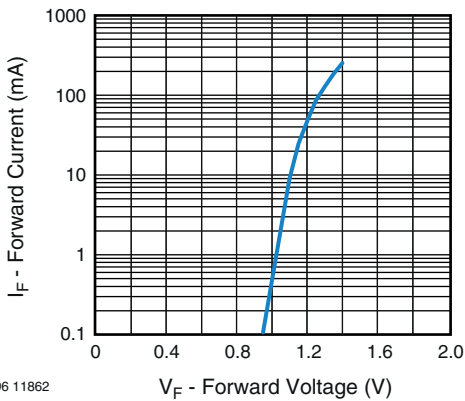


Fig. 5 - Forward Current vs. Forward Voltage

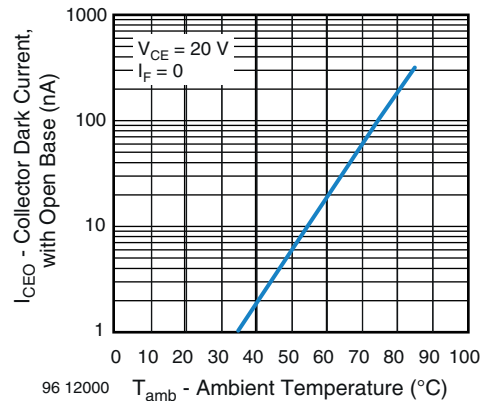


Fig. 7 - Collector Dark Current vs. Ambient Temperature

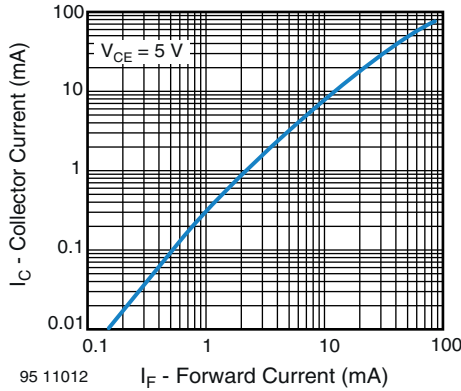


Fig. 8 - Collector Current vs. Forward Current

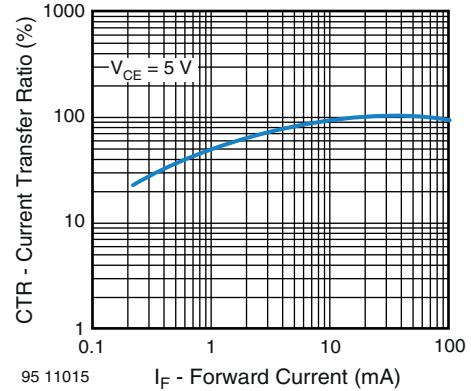


Fig. 11 - Current Transfer Ratio vs. Forward Current

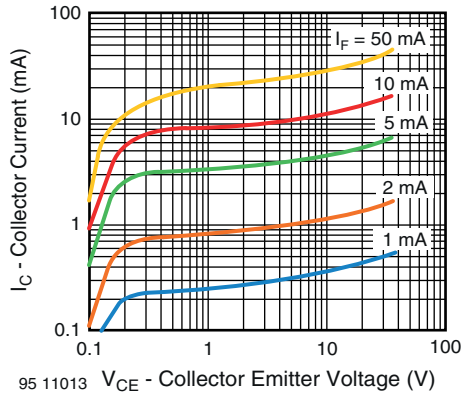


Fig. 9 - Collector Current vs. Collector Emitter Voltage

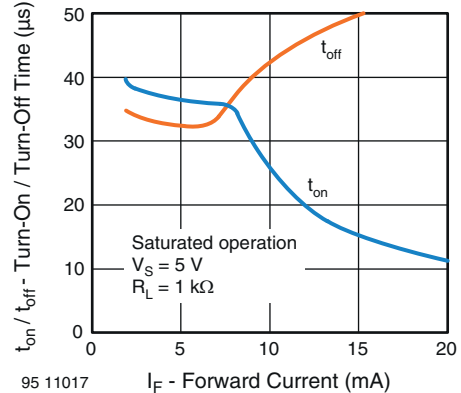


Fig. 12 - Turn-On / Turn-Off Time vs. Forward Current

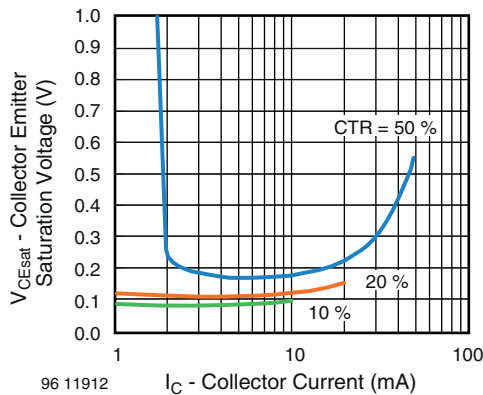


Fig. 10 - Collector Emitter Saturation Voltage vs. Collector Current

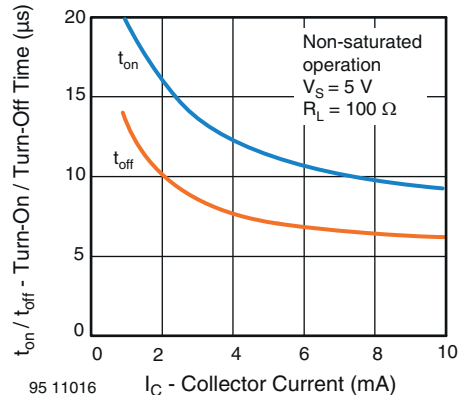
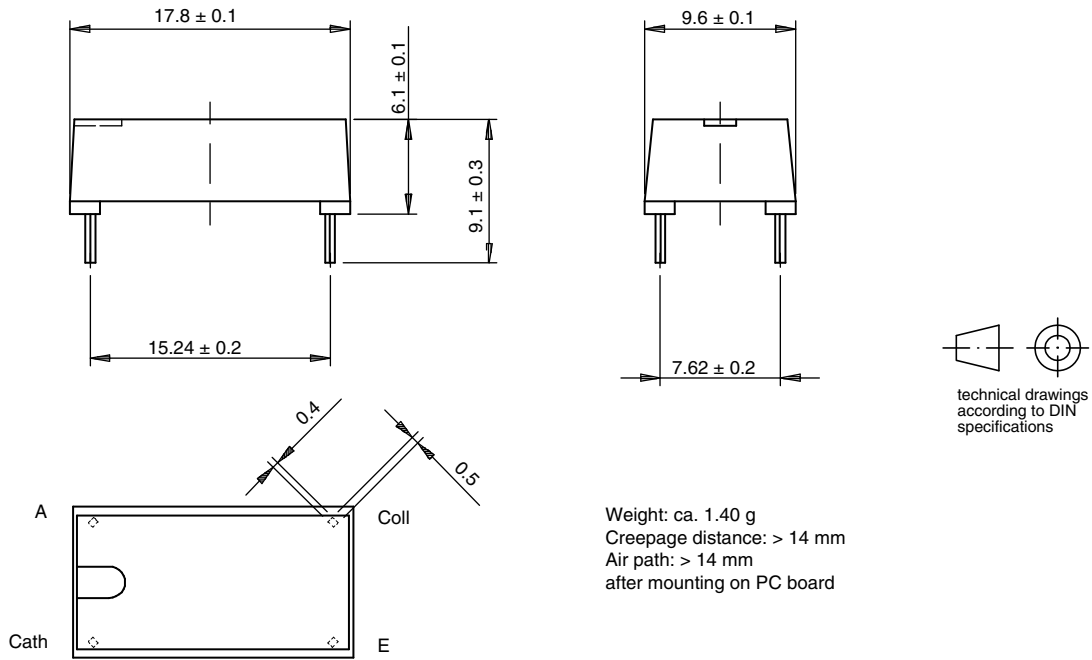


Fig. 13 - Turn-On / Turn-Off Time vs. Collector Current

**PACKAGE DIMENSIONS** (in millimeters)



Weight: ca. 1.40 g  
 Creepage distance: > 14 mm  
 Air path: > 14 mm  
 after mounting on PC board

Drawing-No.: 6.544-5036.01-1  
 Issue: 2; 10.11.98  
 14763

**PACKAGE MARKING** (example of CNY65BExi)

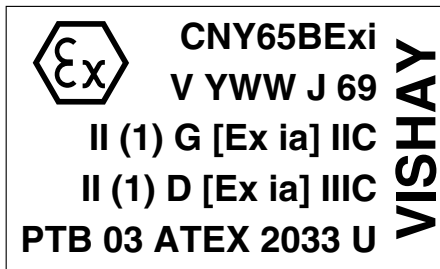


Fig. 14 - Top Marking

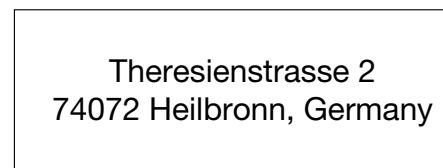


Fig. 15 - Side Marking

TUBE INFORMATION			
TYPE	UNITS/TUBE	TUBES/BOX	UNITS/BOX
CNY65Exi	30	35	1050

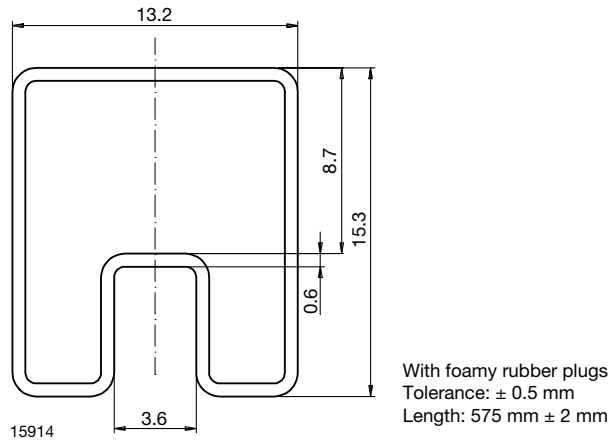
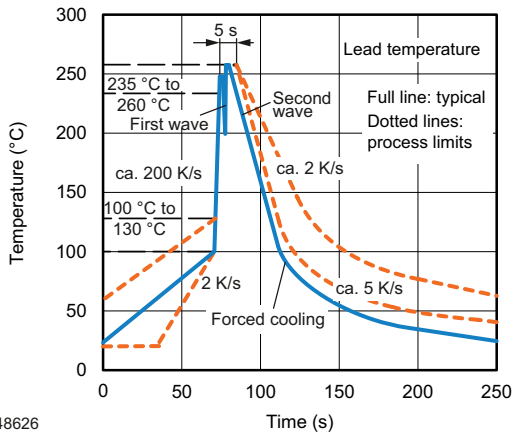


Fig. 16 - CNY65Exi

**SOLDER PROFILES**



948626

Fig. 17 - Wave Soldering Double Wave Profile According to J-STD-020 for Through-Hole Devices

**HANDLING AND STORAGE CONDITIONS**

ESD level: HBM class 2

Floor life: unlimited

Conditions:  $T_{amb} < 30\text{ °C}$ ,  $RH < 85\%$

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



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