Reflective Optical Sensor with Transistor Output

FEATURES

- Package type: SMD
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 2.5 x 2 x 0.8
- Operating range within > 20 % relative collector current: 0.2 mm to 2.5 mm
- Emitter wavelength: 940 nm
- Moisture sensitivity level (MSL): 4
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e2

RoHS COMPLIANT

HALOGEN FREE

DESCRIPTION

The VCNT2020 is a reflective sensor in a miniature SMD package. It has a compact construction where the emitting light source and the detector are arranged in the same plane. The operating infrared wavelength is 940 nm. The detector consists of a silicon phototransistor. The sensor analog output signal (photo current) is triggered by detection of reflected infrared light from a close by object.

The sensor has a built in daylight blocking filter, which greatly suppresses disturbing ambient light and therefore increases signal to noise ratio.

APPLICATIONS

- Position sensor
- Optical switch
- Optical encoder (e.g. disc and tape drives for DVD and / or camera applications)
- Object detection (e.g. paper presence in printer and copy machines)

PRODUCT SUMMARY

PART NUMBER	DISTANCE FOR MAXIMUM CTR_{rel} (1) (mm)	DISTANCE RANGE FOR RELATIVE I_{out} > 20 % (mm)	TYPICAL OUTPUT CURRENT UNDER TEST (2) (mA)	DAYLIGHT BLOCKING FILTER INTEGRATED
VCNT2020	0.5	0.2 to 2.5	1.6	Yes

Notes

(1) CTR: current transfer ratio, I_{out}/I_{in}

(2) Conditions like in table basic characteristics/sensors

ORDERING INFORMATION

ORDERING CODE	PACKAGING	VOLUME (1)	REMARKS
VCNT2020	Tape and reel	MOQ: 3000 pcs	Drypack, MSL 4

Note

(1) MOQ: minimum order quantity

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

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT (EMITTER)				
Reverse voltage		V_R	5	V
Forward current		I_F	100	mA
Forward surge current	$t_p \leq 100$ µs	I_{FSM}	500	mA
OUTPUT (DETECTOR)				
Collector emitter breakdown voltage		$V_{(BR)CEO}$	20	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	20	mA
SENSOR				
Total power dissipation	$T_{amb} \leq 25$ °C	P_{tot}	170	mW
Ambient temperature range		T_{amb}	-25 to +85	°C
Storage temperature range		T_{stg}	-25 to +85	°C
Soldering temperature	In accordance with fig. 11	T_{sd}	260	°C

ABSOLUTE MAXIMUM RATINGS

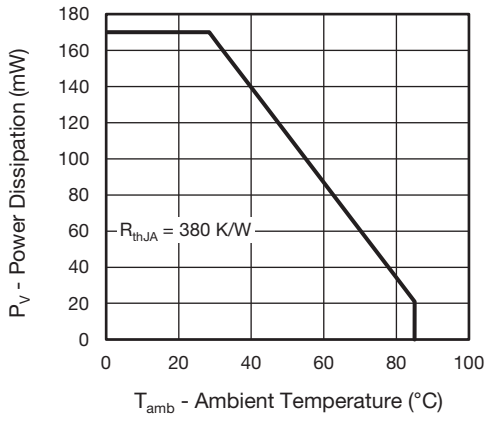


Fig. 1 - Power Dissipation vs. Ambient Temperature

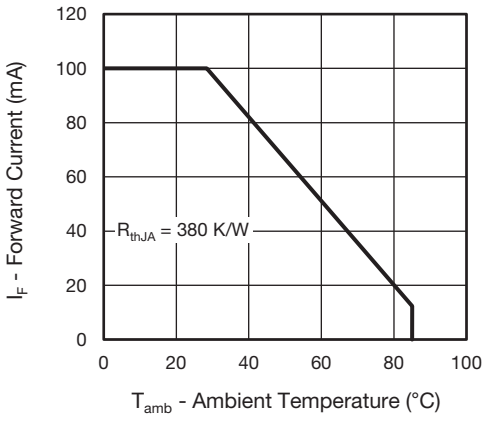


Fig. 2 - Forward Current vs. Ambient Temperature

BASIC CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT (EMITTER)						
Forward voltage	I_F = 20 mA	V_F	-	1.25	1.4	V
	I_F = 100 mA		-	1.5	1.7	
Temperature coefficient of V_F	I_F = 20 mA	TKV_F	-	-1.0	-	mV/K
Peak wavelength	I_F = 100 mA	λ_P	-	940	-	nm
Reverse current	V_R = 5 V	I_R	-	-	10	µA
OUTPUT (DETECTOR)						
Collector emitter breakdown voltage	I_C = 0.1 mA, E = 0	$V_{(BR)CEO}$	20	-	-	V
Emitter collector voltage	I_E = 100 µA, E = 0	V_{ECO}	7	-	-	V
Collector emitter dark current	V_{CE} = 5 V, E = 0	I_{CEO}	-	1	100	nA
SENSOR						
Collector current	V_{CE} = 5 V, I_F = 20 mA, d = 1 mm	I_C	0.5	1.6	3.5	mA
Current transfer ratio	I_C/I_F, d = 1 mm, V_{CE} = 5 V	CTR	-	8	-	%
Rise time	I_C = 0.8 mA, V_{CE} = 5 V, R_L = 100 Ω	t_r	-	10	70	µs
Fall time	I_C = 0.8 mA, V_{CE} = 5 V, R_L = 100 Ω	t_f	-	15	70	µs

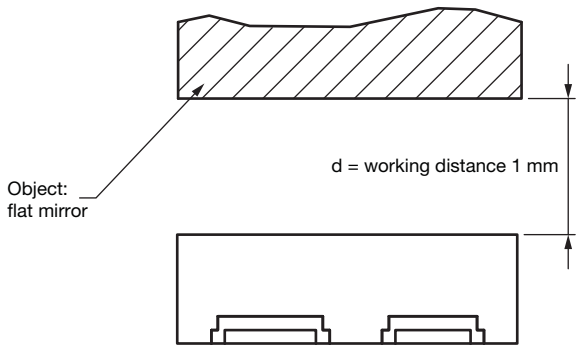


Fig. 3 - Test Circuit

BASIC CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

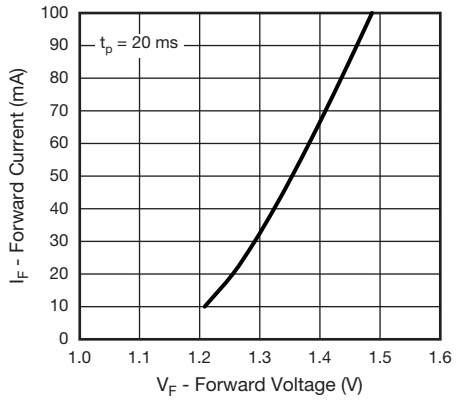


Fig. 4 - Forward Current vs. Forward Voltage

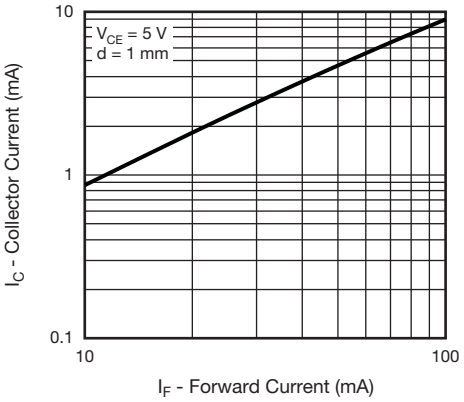


Fig. 7 - Collector Current vs. Forward Current

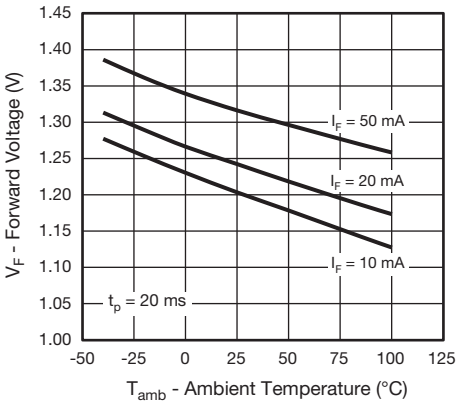


Fig. 5 - Forward Voltage vs. Ambient Temperature

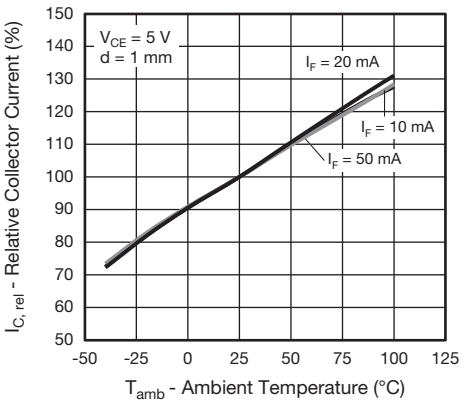


Fig. 8 - Relative Collector Current vs. Ambient Temperature

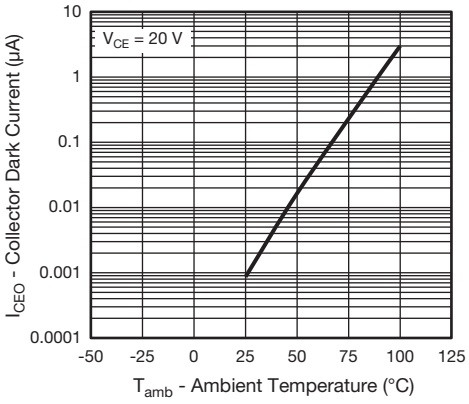


Fig. 6 - Collector Dark Current vs. Ambient Temperature

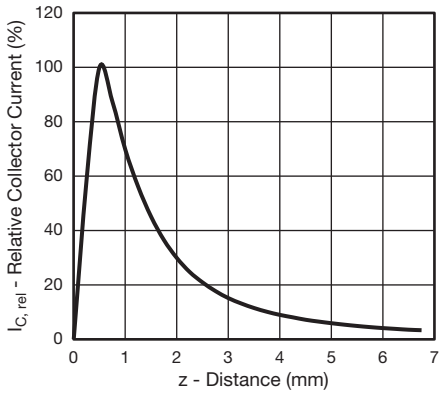


Fig. 9 - Relative Collector Current vs. Distance

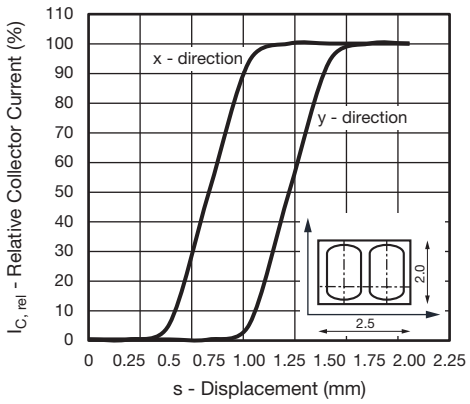


Fig. 10 - Relative Collector Current vs. Displacement

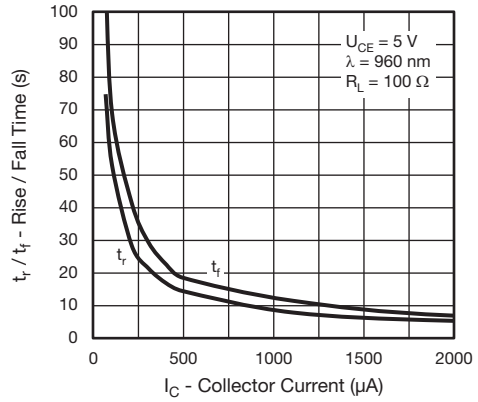


Fig. 11 - Rise / Fall Time vs. Collector Current

PRECAUTIONS FOR USE

1. Over-current-proof

Customer must apply resistors for protection, otherwise slight voltage shift will cause big current change (burn out will happen).

2. Storage

2.1. Storage temperature and rel. humidity conditions are: 5 °C to 30 °C, RH 60

2.2. Floor life must not exceed 168 h, according to JEDEC® level 3, J-STD-020.

Once the package is opened, the products should be used within 168 h. Otherwise, they should be kept in a damp proof box with desiccant.

Considering tape life, we suggest to use products within one year from production date.

2.3. If opened more than 168 h in an atmosphere 5 °C to 30 °C, RH 60 %, devices should be treated at 60 °C ± 5 °C for 15 h.

2.4. If humidity indicator in the package shows pink color (normal blue), then devices should be treated with the same conditions as 2.3.

REFLOW SOLDER PROFILE

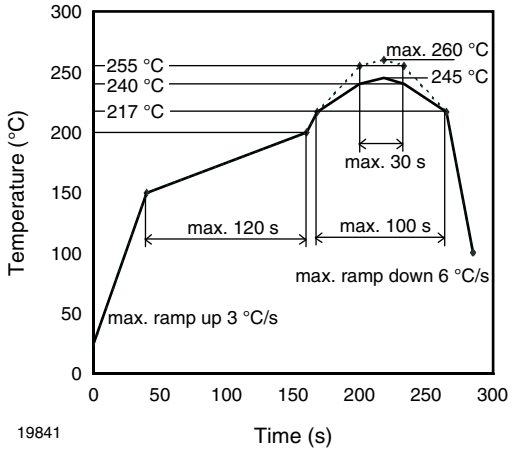
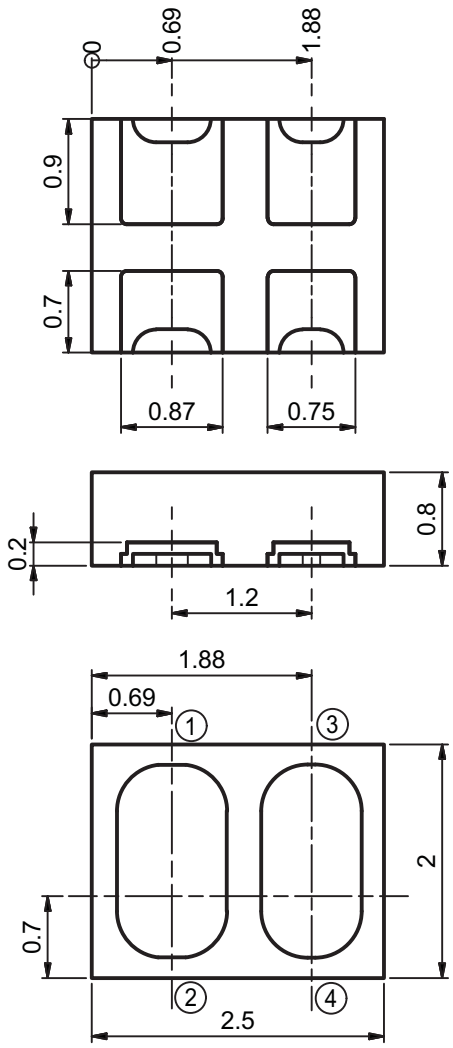
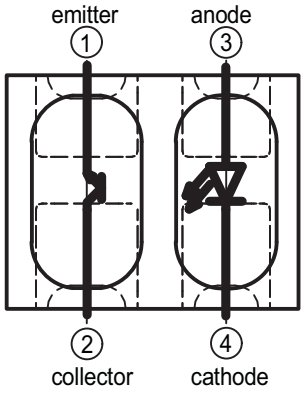


Fig. 12 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020

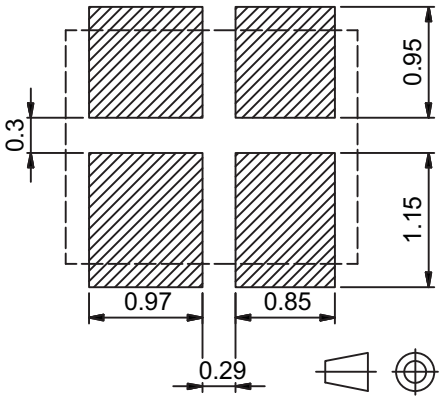
PACKAGE DIMENSIONS in millimeters



Pinning Top View



Recommended Footprint



Technical drawings according to DIN specification.

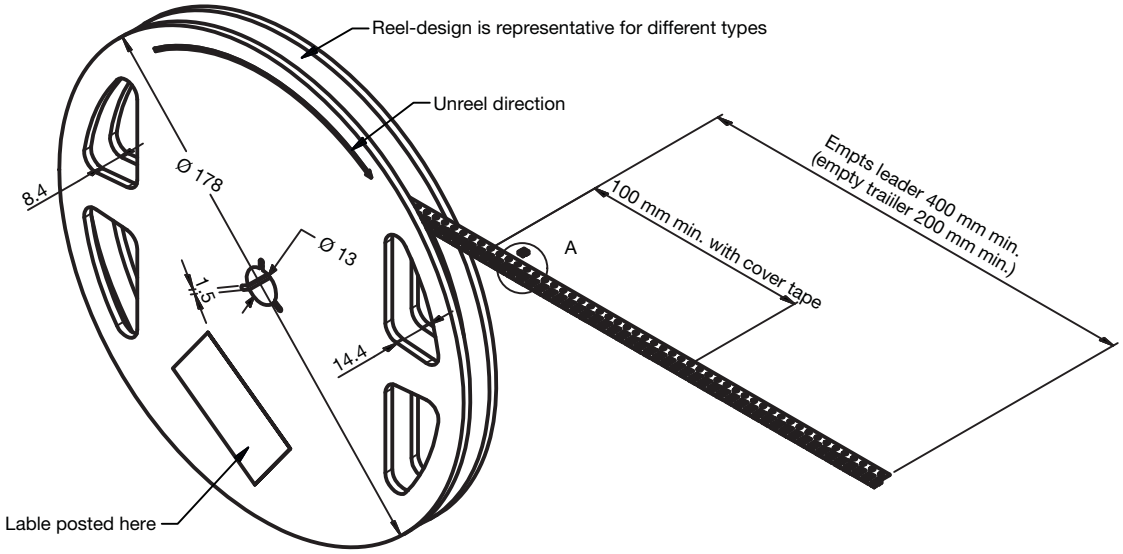
Drawing refers to following types:
VCNT2020

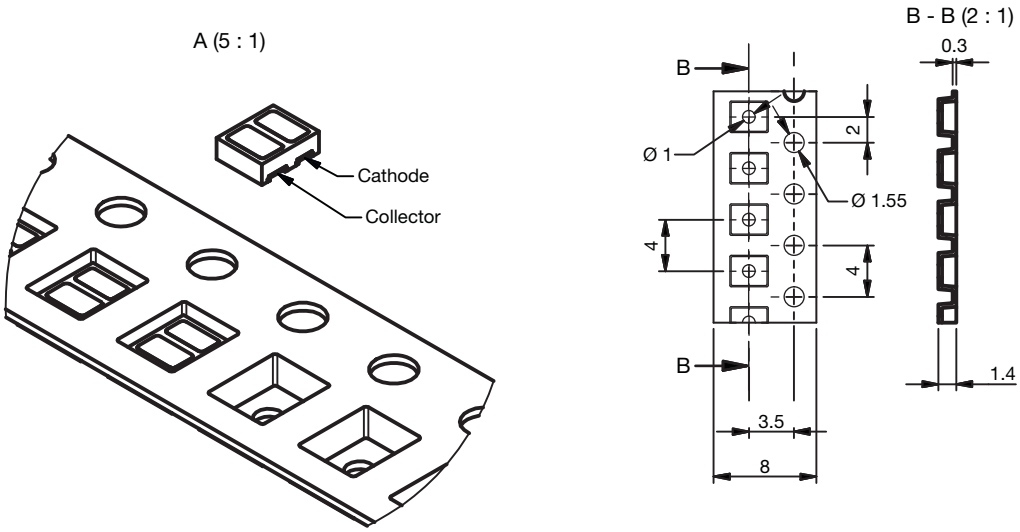
Drawing-No.: VMS 008-5050 Prel. Issue: 10; 15.06.2016

Not indicated tolerances ± 0.1 mm

TAPE AND REEL DIMENSIONS in millimeters

3000 pcs/reel





Drawing-No.: AK-11.0005.03
Issue: Preliminary; 15.05.2015

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