

## 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](http://www.vishay.com/doc?99912)



### 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	TARGET MATERIAL	DISTANCE RANGE FOR RELATIVE $I_{OUT} > 0.5 \text{ mA}$ WITH $I_{Fmax.}$ (mm)	TYPICAL CTR <sup>(1)</sup> (%)	DISTANCE OF PEAK SENSITIVITY (mm)	DAYLIGHT BLOCKING FILTER INTEGRATED
VCNT2020	Kodak Gray Card, gray side (18 %)	0 to 2	1.3	0.5	Yes
VCNT2020	Kodak Gray Card, white side (90 %)	0 to 7	12		Yes

#### Note

<sup>(1)</sup> CTR: current transfer ratio,  $I_{out}/I_{in}$

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

#### Note

<sup>(1)</sup> MOQ: minimum order quantity



ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT (EMITTER)</b>				
Reverse voltage		V <sub>R</sub>	5	V
Forward current		I <sub>F</sub>	100	mA
Forward surge current	t <sub>p</sub> ≤ 100 μs	I <sub>FSM</sub>	500	mA
<b>OUTPUT (DETECTOR)</b>				
Collector emitter breakdown voltage		V <sub>(BR)CEO</sub>	20	V
Emitter collector voltage		V <sub>ECO</sub>	7	V
Collector current		I <sub>C</sub>	20	mA
<b>SENSOR</b>				
Total power dissipation	T <sub>amb</sub> ≤ 25 °C	P <sub>tot</sub>	170	mW
Ambient temperature range		T <sub>amb</sub>	-25 to +85	°C
Storage temperature range		T <sub>stg</sub>	-25 to +85	°C
Soldering temperature	In accordance with Fig. 11	T <sub>sd</sub>	260	°C

**ABSOLUTE MAXIMUM RATINGS**

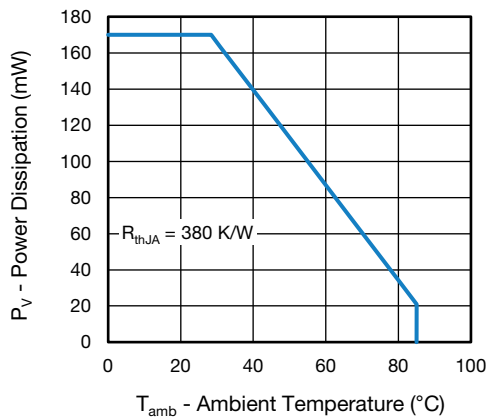


Fig. 1 - Power Dissipation vs. Ambient Temperature

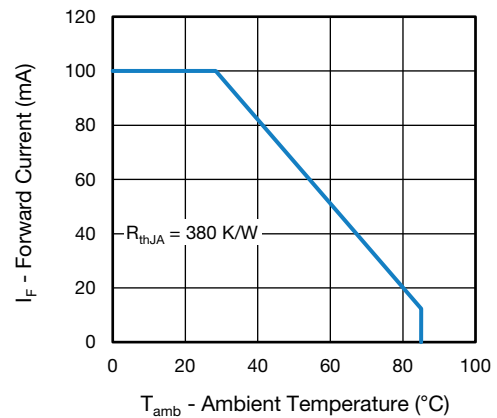


Fig. 2 - Forward Current vs. Ambient Temperature

<b>BASIC CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT (EMITTER)</b>						
Forward voltage	$I_F = 20\text{ mA}$	$V_F$	-	1.25	1.4	V
	$I_F = 100\text{ mA}$		-	1.5	1.7	
Temperature coefficient of $V_F$	$I_F = 20\text{ mA}$	$TKV_F$	-	-1.0	-	mV/K
Peak wavelength	$I_F = 100\text{ mA}$	$\lambda_P$	-	940	-	nm
Reverse current	$V_R = 5\text{ V}$	$I_R$	-	-	10	$\mu\text{A}$
<b>OUTPUT (DETECTOR)</b>						
Collector emitter breakdown voltage	$I_C = 0.1\text{ mA}, E = 0$	$V_{(BR)CEO}$	20	-	-	V
Emitter collector voltage	$I_E = 100\text{ }\mu\text{A}, E = 0$	$V_{ECO}$	7	-	-	V
Collector emitter dark current	$V_{CE} = 5\text{ V}, E = 0$	$I_{CEO}$	-	1	100	nA
<b>SENSOR</b>						
Collector current	$V_{CE} = 5\text{ V}, I_F = 20\text{ mA}, d = 1\text{ mm}$ (flat mirror)	$I_C$	0.8	1.8	2.7	mA
	$V_{CE} = 5\text{ V}, I_F = 20\text{ mA}, d = 1\text{ mm}$ (Kodak gray card, 18 %)	$I_C$	-	0.25	-	mA
Current transfer ratio	$I_C/I_F, V_{CE} = 5\text{ V}, d = 1\text{ mm}$ (Kodak gray card, 18 %)	CTR	-	1.25	-	%
Rise time	$I_C = 0.8\text{ mA}, V_{CE} = 5\text{ V}, R_L = 100\text{ }\Omega$	$t_r$	-	10	70	$\mu\text{s}$
Fall time	$I_C = 0.8\text{ mA}, V_{CE} = 5\text{ V}, R_L = 100\text{ }\Omega$	$t_f$	-	15	70	$\mu\text{s}$

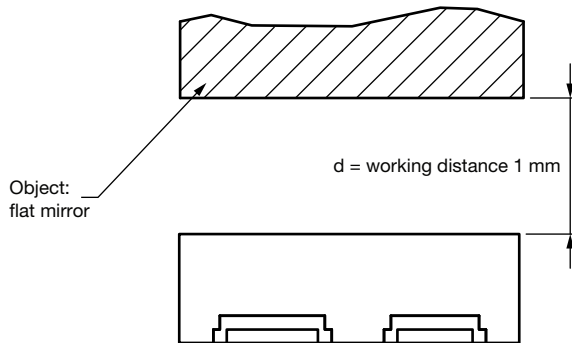


Fig. 3 - Test Circuit

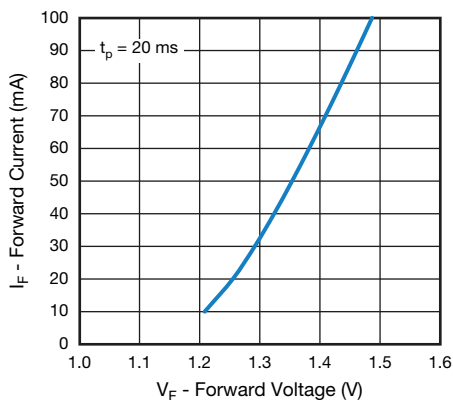
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 4 - Forward Current vs. Forward Voltage

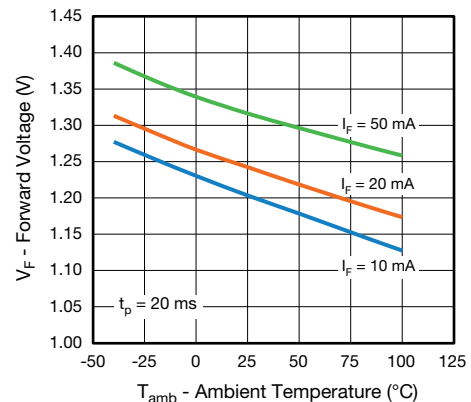


Fig. 5 - Forward Voltage vs. Ambient Temperature

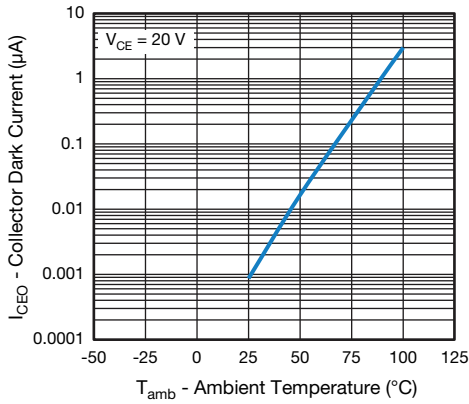


Fig. 6 - Collector Dark Current vs. Ambient Temperature

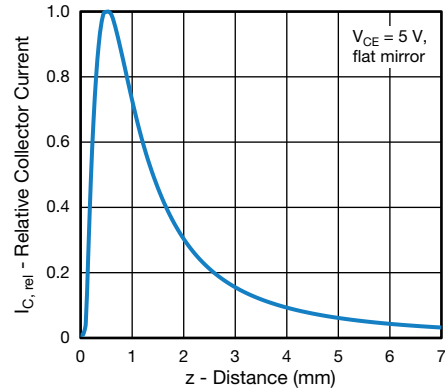


Fig. 9 - Relative Collector Current vs. Distance

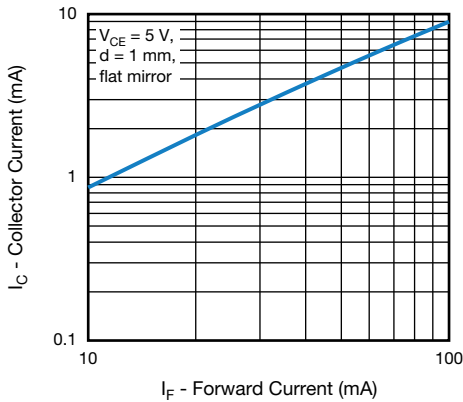


Fig. 7 - Collector Current vs. Forward Current

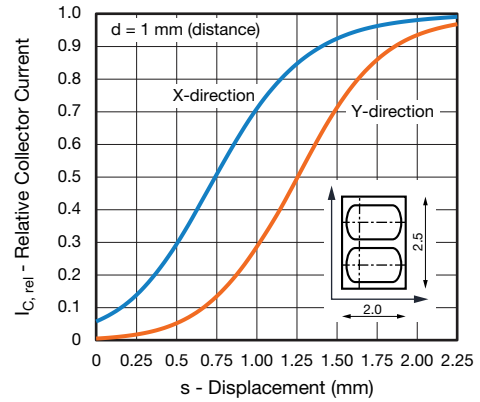


Fig. 10 - Relative Collector Current vs. Displacement

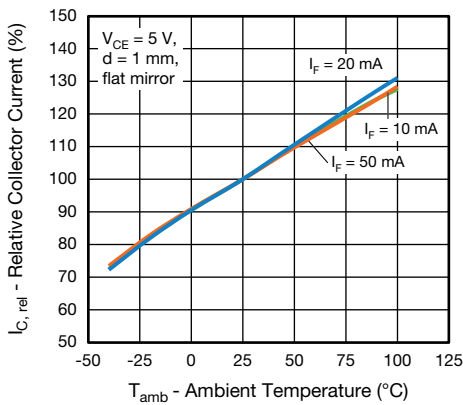


Fig. 8 - Relative Collector Current vs. Ambient Temperature

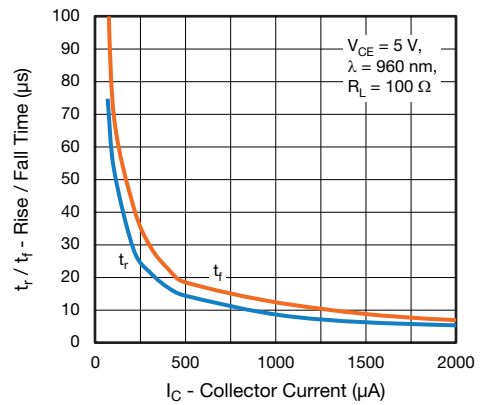


Fig. 11 - Rise / Fall Time vs. Collector Current

**FLOOR LIFE**

Time between soldering and removing from MBB must not exceed the time indicated in J-STD-020:

Moisture sensitivity: level 4

Floor life: 72 h

Conditions:  $T_{amb} < 30\text{ }^{\circ}\text{C}$ ,  $\text{RH} < 60\%$

**DRYING**

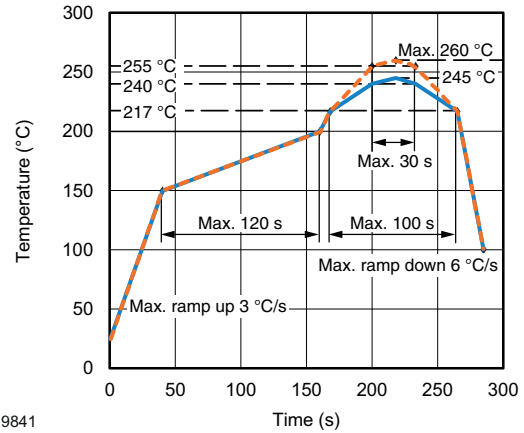
In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-020 or recommended conditions:

192 h at  $40\text{ }^{\circ}\text{C}$  (+  $5\text{ }^{\circ}\text{C}$ ),  $\text{RH} < 5\%$

or

96 h at  $60\text{ }^{\circ}\text{C}$  (+  $5\text{ }^{\circ}\text{C}$ ),  $\text{RH} < 5\%$

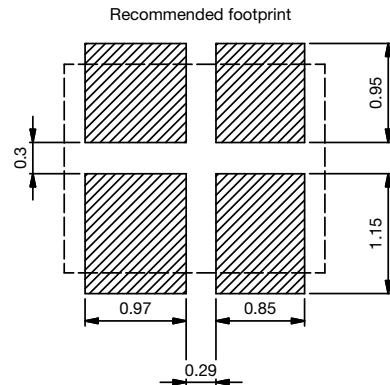
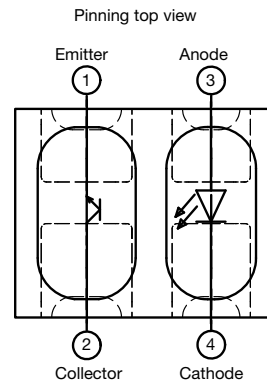
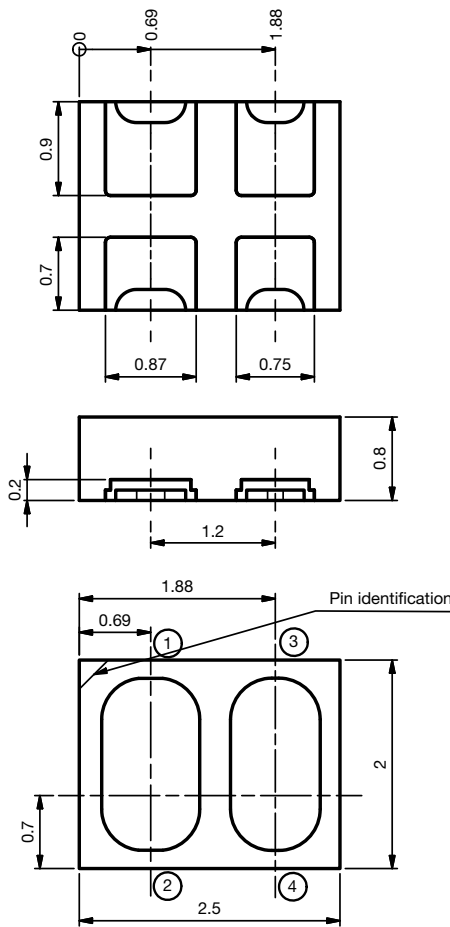
**REFLOW SOLDER PROFILE**



19841

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

**PACKAGE DIMENSIONS** in millimeters



Drawing-No.: 6.550-5338.01-4  
Issue: 1; 16.06.2016

Not indicated tolerances  $\pm 0.1$

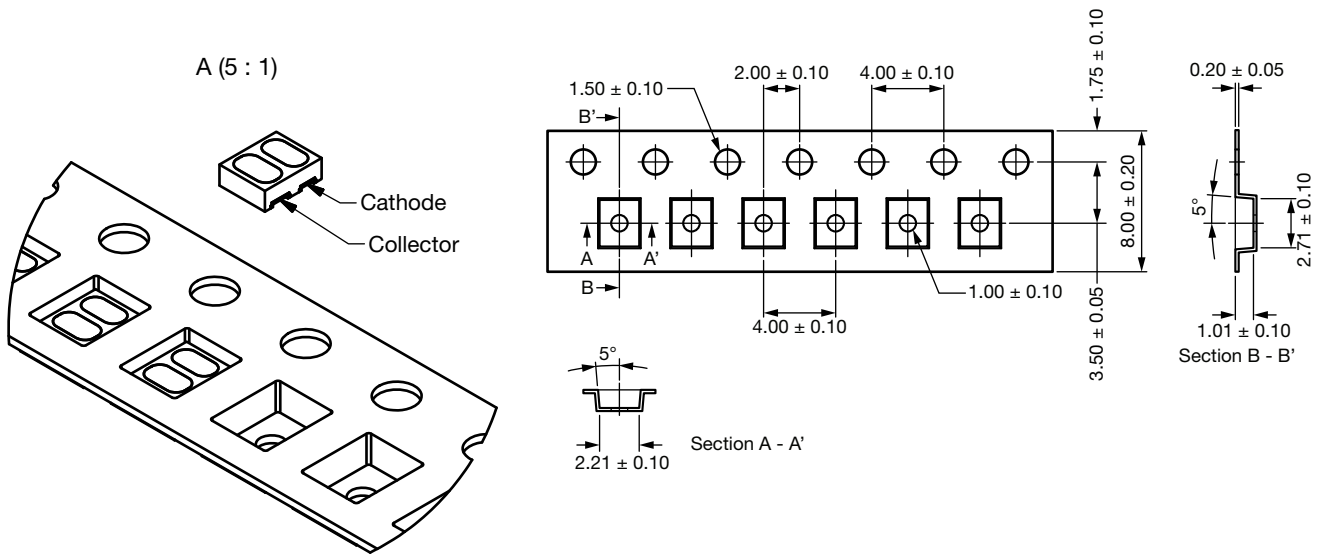
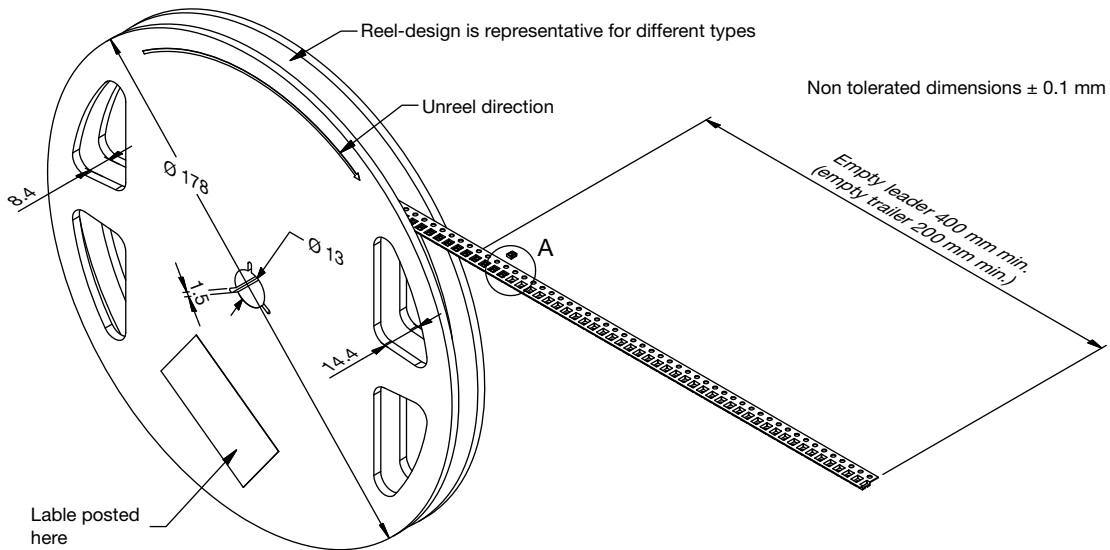


Technical drawings according to DIN specification



**TAPE AND REEL DIMENSIONS** in millimeters

3000 pcs/reel





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