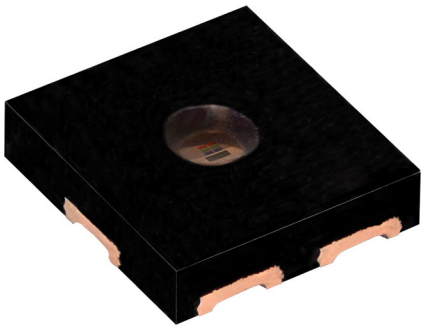
High Accuracy RGBIR Color Sensor With I²C Interface



FEATURES

- Package type: surface-mount
- Dimensions (L x W x H in mm): 2.67 x 2.45 x 0.6
- AEC-Q100 qualified
- Integrated modules: RGBIR
- Supply voltage range V_{DD}: 2.5 V to 3.6 V
- Communication via I²C interface
- I²C bus H-level range: 1.7 V to 3.6 V
- Floor life: 4 weeks, MSL 2a, according to J-STD-020E
- Low shutdown by current consumption: typ. 0.5 µA
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

e4

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

LINKS TO ADDITIONAL RESOURCES

3D Models

Application Notes

DESCRIPTION

VEML6046X00 is a high accuracy color digital 16-bit resolution sensor in a miniature opaque 2.67 mm x 2.45 mm package. It includes a high sensitive photodiodes, a low noise amplifier, a 16-bit A/D converter and supports an easy to use I²C bus communication interface and additional interrupt feature.

APPLICATIONS

- RGBIR sensor in automotive for
  - Display backlight controls
  - Infotainment systems
  - Rear view mirror dimming
  - Interior lighting control systems
  - Head-up displays
  - Color recognition
  - CCT measurement
  - Mood lighting

PRODUCT SUMMARY

PART NUMBER	OPERATING VOLTAGE RANGE (V)	I²C BUS VOLTAGE RANGE (V)	PEAK SENSITIVITY (nm)	AMBIENT LIGHT RANGE (lx)	AMBIENT LIGHT RESOLUTION (lx)	OUTPUT CODE	ADC RESOLUTION PROXIMITY / AMBIENT LIGHT
VEML6046X00	2.5 to 3.6	1.7 to 3.6	600, 550, 470, 820 (R, G, B, IR)	0 to 176 000	0.0053	16 bit, I²C	- / 16 bit

ORDERING INFORMATION

ORDERING CODE	SLAVE ADDRESS (7 BIT)	PACKAGING	VOLUME (1)	REMARKS
VEML6046X00	0x29	Tape and reel	MOQ: 3000	2.67 mm x 2.45 mm x 0.6 mm

Note

(1) MOQ: minimum order quantity

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

PARAMETER	TEST CONDITION	SYMBOL	MIN.	MAX.	UNIT
Supply voltage		V_{DD}	0	3.6	V
Ambient temperature range		T_{amb}	-40	+110	°C
Storage temperature range		T_{stg}	-40	+110	°C
Total power dissipation	$T_{amb} \leq 25$ °C	P_{tot}	-	50	mW
Junction temperature		T_j	-	+110	°C

BASIC CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
ASIC						
Supply voltage		V_{DD}	2.5	3.3	3.6	V
Supply current	Shutdown state [1]; $V_{DD} = V_{BUS}$	I_{DD}	-	0.5	-	µA
	Shutdown state [1]; $V_{DD} = V_{BUS}$ = 3.0 V		-	-	1.2	
	Shutdown state [1]; V_{DD} = 3.6 V, V_{BUS} = 1.7 V		-	3.1	-	
	Active state; V_{DD} = 3.3 V		-	370	-	
I^2C clock rate range		f_{SCL}	10	-	400	kHz
I^2C signal input, logic high	$V_{BUS} = V_{DD}$	V_{IH}	0.7 x V_{BUS}	-	3.6	V
	$V_{BUS} \neq V_{DD}$		0.85 x V_{BUS}	-	-	
I^2C signal input, logic low	$V_{BUS} = V_{DD}$	V_{IL}	-0.3	-	0.3 x V_{BUS}	V
	$V_{BUS} \neq V_{DD}$		-0.3	-	0.2 x V_{BUS}	
Digital current out (low, current sink)		I_{ol}	3	-	-	mA
Digital resolution (LSB count)	With RGB_GAIN = x 2, RGB_IT = 400 ms, RGB_PDDIV = 2/2 PD		-	0.0053	-	lx/count
Detectable maximum illuminance	With RGB_GAIN = x 0.5, RGB_IT = 6.25 ms, RGB_PDDIV = 1/2 PD	$E_{V\ max.}$	-	176 000	-	lx
Dark offset [2]	With RGB_GAIN = x 1, RGB_IT = 400 ms, RGB_PDDIV = 2/2 PD	R	-	2	-	step
		G	-	2	-	
		B	-	2	-	
		IR	-	2	-	

Notes

[1] Light conditions: E_V = 100 lx with 4300K white LED

[2] Light conditions: dark

CIRCUIT BLOCK DIAGRAM

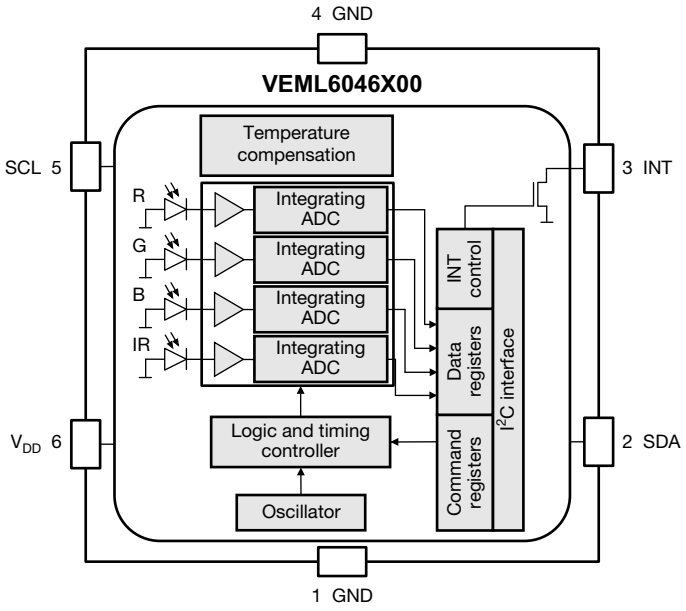
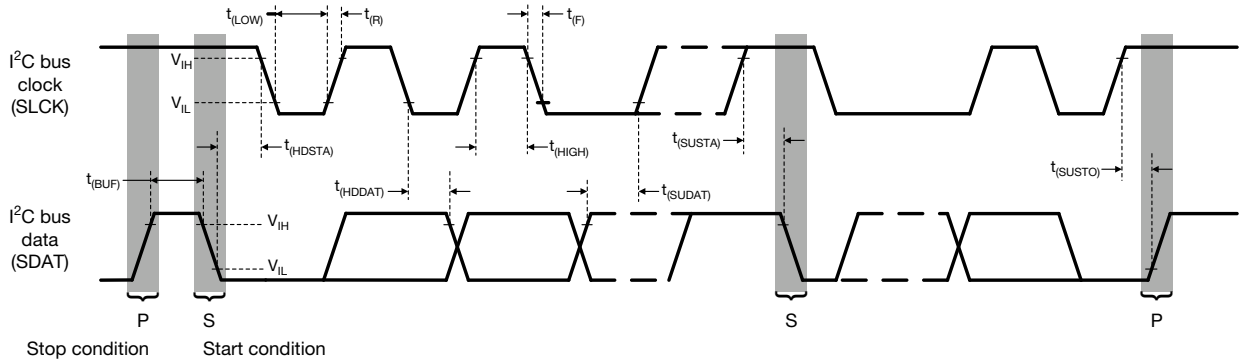


Fig. 1 - Block Diagram

I²C TIMING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	SYMBOL	STANDARD MODE (1)		FAST MODE (1)		UNIT
		MIN.	MAX.	MIN.	MAX.	
Clock frequency	$f_{(SMBCLK)}$	10	100	10	400	kHz
Bus free time between start and stop condition	$t_{(BUF)}$	4.7	-	1.3	-	µs
Hold time after (repeated) start condition; after this period, the first clock is generated	$t_{(HDSTA)}$	4.0	-	0.6	-	µs
Repeated start condition setup time	$t_{(SUSTA)}$	4.7	-	0.6	-	µs
Stop condition setup time	$t_{(SUSTO)}$	4.0	-	0.6	-	µs
Data hold time	$t_{(HDDAT)}$	0	3450	0	900	ns
Data setup time	$t_{(SUDAT)}$	250	-	100	-	ns
I²C clock (SCK) low period	$t_{(LOW)}$	4.7	-	1.3	-	µs
I²C clock (SCK) high period	$t_{(HIGH)}$	4.0	-	0.6	-	µs
Detect clock / data low timeout	$t_{(TIMEOUT)}$	25	35	-	-	ms
Clock / data fall time	$t_{(F)}$	-	300	-	300	ns
Clock / data rise time	$t_{(R)}$	-	1000	-	300	ns

Note

(1) Data based on standard I²C protocol requirement, not tested in production



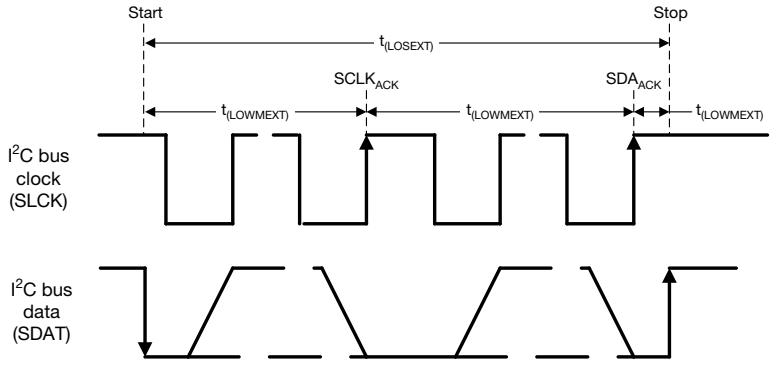


Fig. 2 - I²C Timing Diagram

PARAMETER TIMING INFORMATION

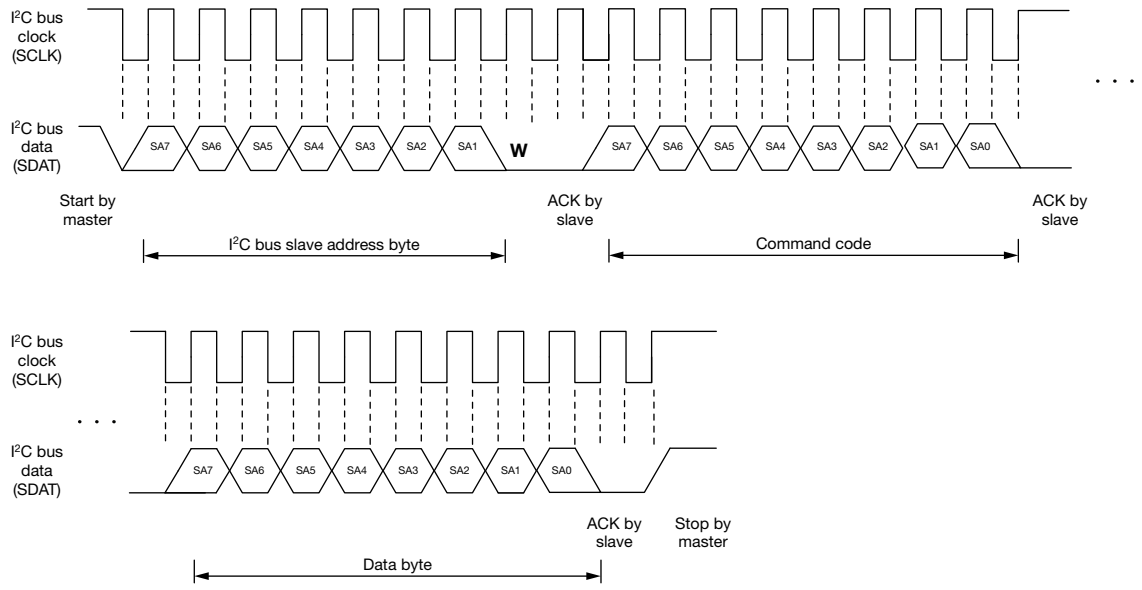


Fig. 3 - I²C Bus Timing for Sending Word Command Format

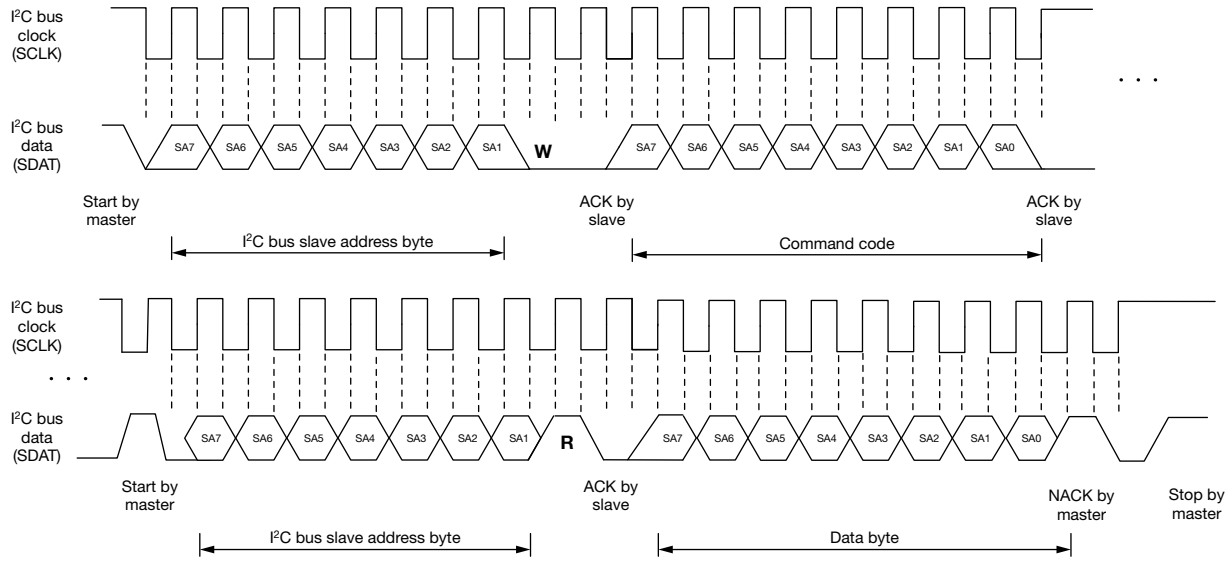


Fig. 4 - I²C Bus Timing for Receive Word Command Format

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

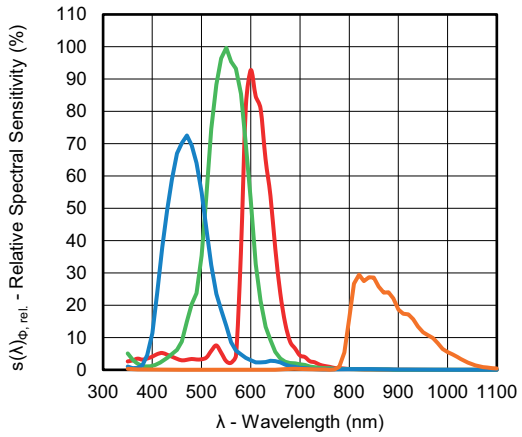


Fig. 5 - Relative Spectral Sensitivity vs. Wavelength

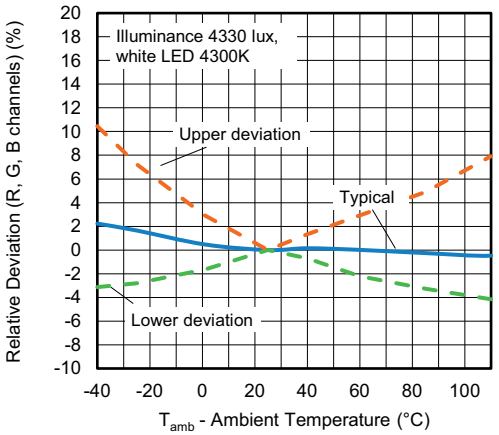


Fig. 7 - Relative Deviation (R, G, B Channels) vs. Temperature (at illumination levels lower than ~200 lux, dark current effects should be taken into account)

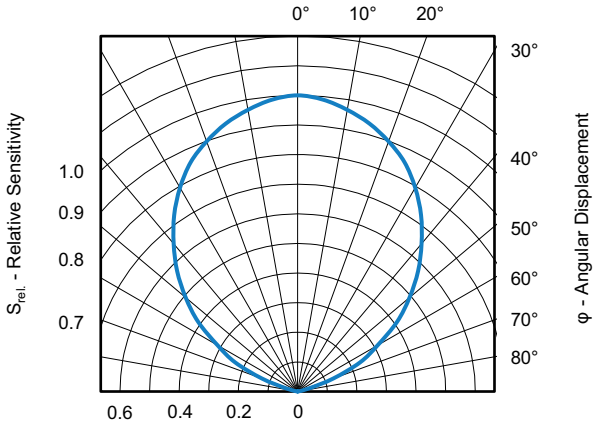


Fig. 6 - Relative Sensitivity vs. Angular Displacement

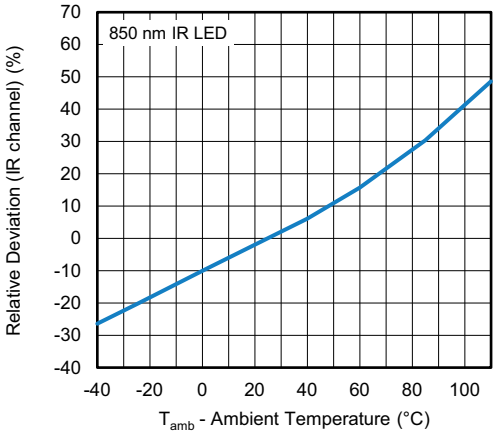


Fig. 8 - Relative Deviation (IR Channel) vs. Ambient Temperature

APPLICATION INFORMATION

1. Application Circuit

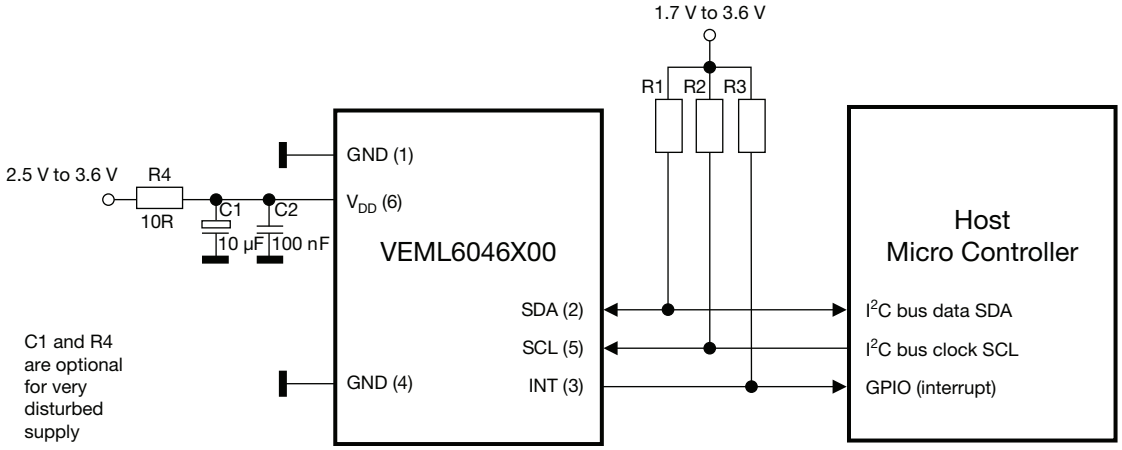


Fig. 9 - Application Circuit
(x) = Pin Number

Notes

- The interrupt pin is an open drain output. Proposed values for the pull-up resistors should be > 1 kΩ, e.g. 2.2 kΩ to 4.7 kΩ for the R1 and R2 (at SDA and SCL) and 10 kΩ to 100 kΩ for R3 (at interrupt).
- Normally just one decoupling capacitor is needed. This should be ≥ 100 nF and placed close to the V_{DD} pin.
  For detailed description about set-up and use of the interrupt as well as more application related information see AN: “Designing VEML6046X00 into an Application”

2. I²C Write and Read Protocol

The VEML6046X00 has 17 register addresses responsible for operation control, parameter setup and result buffering. All registers are accessible via I²C communication. Fig. 10 shows the basic I²C communication with VEML6046X00.

The built in I²C interface is compatible with I²C modes “standard” and “fast”: 10 kHz to 400 kHz.

Please refer to the I²C specification from NXP for details.

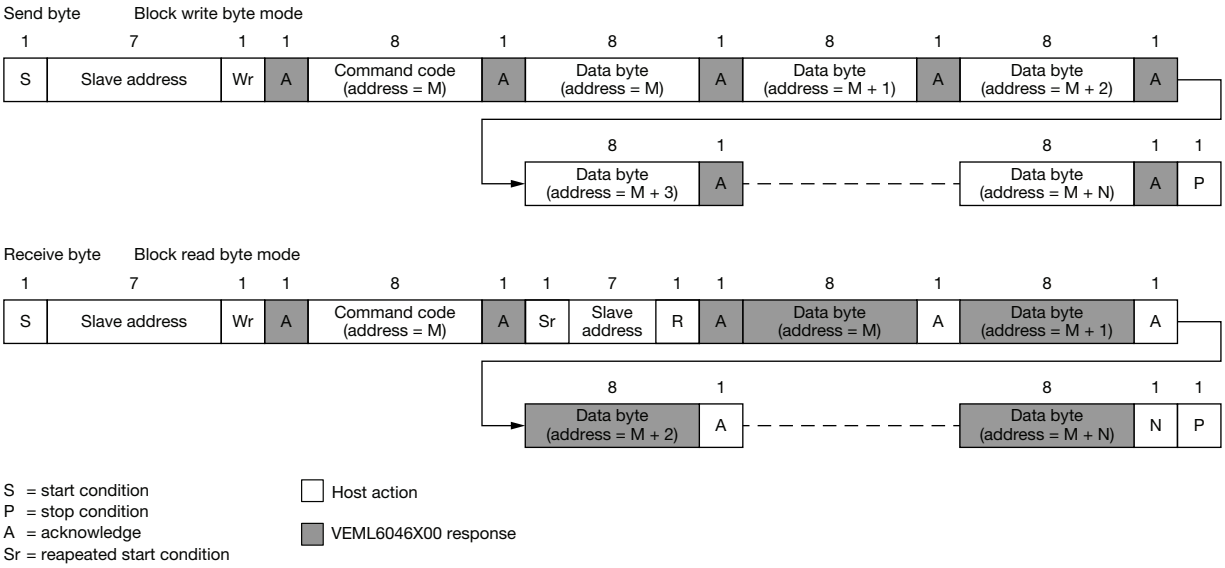


Fig. 10 - Send Byte / Receive Byte Protocol

REGISTER INFORMATION

Device Address

The VEML6046X00 is available in one preconfigured slave address. The predefined 7 bit I²C bus address is set to 0101001 = 0x29. The least significant bit (LSB) defines read or write mode. Accordingly the bus address is set to 0101 0010 = 0x52 for write and 0101 0011 = 0x53 for read.

TABLE 1 - SLAVE ADDRESS TABLE

7 BIT SLAVE ADDRESS	8 BIT SLAVE ADDRESS	
0x29	0x52 (Write)	0x53 (Read)

Register Addresses

The VEML6046X00 has 17 registers, accessible through there respective 8-bit command codes.

Note that due to the location of the two shutdown bits (RGB_ON_0 and RGB_ON_1), one in register 0x00 and the other in 0x01, it is necessary to always write to both registers at once when configuring the device.

Auto-Memorization

The VEML6046X00 stores the last measured RGB and IR data before the device is shutdown, keeping the data accessible.

When VEML6046X00 is in shutdown mode, the host can freely read this data via read command directly.

When VEML6046X00 wakes up, the data will be refreshed once a new measurement is made.

TABLE 2 - COMMAND CODE AND REGISTER DESCRIPTION

COMMAND CODE	DATA BYTE LOW / HIGH	REGISTER NAME	DEFAULT VALUE	FUNCTION	ACCESS
0x00	-	RGB_CONF_0	0x01	Set the integration time	Write and read
				Measurement mode of the sensor	
				Enable interupt function of the green channel	
				Switch the sensor on / off	
0x01	-	RGB_CONF_1	0x80	Switch the sensor on / off	
				GAIN and photodiode size setting	
				Interrupt persistance counter	
0x04	Low	G_THDH_L	0x00	Green channel high threshold window setting (low byte)	
0x05	High	G_THDH_H	0x00	Green channel high threshold window setting (high byte)	
0x06	Low	G_THDL_L	0x00	Green channel low threshold window setting (low byte)	
0x07	High	G_THDL_H	0x00	Green channel low threshold window setting (high byte)	
0x10	Low	R_DATA_L	0x00	Low byte of 16-bit red channel result data	Read only
0x11	High	R_DATA_H	0x00	High byte of 16-bit red channel result data	
0x12	Low	G_DATA_L	0x00	Low byte of 16-bit green channel result data	
0x13	High	G_DATA_H	0x00	High byte of 16-bit green channel result data	
0x14	Low	B_DATA_L	0x00	Low byte of 16-bit blue channel result data	
0x15	High	B_DATA_H	0x00	High byte of 16-bit blue channel result data	
0x16	Low	IR_DATA_L	0x00	Low byte of 16-bit IR channel result data	
0x17	High	IR_DATA_H	0x00	High byte of 16-bit IR channel result data	
0x18	Low	VEML6046X00_ID_L	0x01	ID code	
0x19	High	VEML6046X00_ID_H	0x00	ID code	
0x1A	Low	INT_FLAG	0x00	Reserved	
0x1B	High	INT_FLAG	0x00	Interrupt and active force mode event flag	

Notes

- Command code 0x00 default value is 0x01 = device is shutdown
- Command 0x00 and command 0x01 must be executed together, they cannot be executed independently

TABLE 3 - REGISTER NAME: RGB_CONF_0

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	RGB_IT			RGB_MODE	RGB_TRIG	G_INT	RGB_ON_0

COMMAND CODE			0x00	
BIT NAME	**FUNCTION**	**BIT**	**VALUE**	**DESCRIPTION**
Reserved	Reserved	7	0x0 (0b0)	Should be kept default
RGB_IT	Set the integration time	6 : 4	0x7 (0b111)	400 ms
			0x6 (0b110)	200 ms
			0x5 (0b101)	100 ms
			0x4 (0b100)	50 ms
			0x3 (0b011)	25 ms
			0x2 (0b010)	12.5 ms
			0x1 (0b001)	6.25 ms
			0x0 (0b000)	3.125 ms (default)
RGB_MODE	Set the measurement mode of the sensor	3	0x1 (0b1)	Active force mode
			0x0 (0b0)	Auto mode (default)
RGB_TRIG	Set the active force mode trigger; this bit will be reset to 0 after the measurement cycle	2	0x1 (0b1)	Trigger
			0x0 (0b0)	Off (default)
G_INT	Enable / disable the interrupt function of the green channel	1	0x1 (0b1)	Enable
			0x0 (0b0)	Disable (default)
RGB_ON_0	Switch the sensor on / off (RGB_ON_0 and RGB_ON_1 must be executed together to start the sensor)	0	0x1 (0b1)	Turn off the sensor (shutdown) (default)
			0x0 (0b0)	Turn on the sensor

Note

- Command code 0x00 default value is 0x01 = device is shutdown

TABLE 4 - REGISTER NAME: RGB_CONF_1							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RGB_ON_1	RGB_PDDIV	Reserved	RGB_GAIN		G_PERS		RGB_CAL
COMMAND CODE					0x01		

BIT NAME	FUNCTION	BIT	VALUE	DESCRIPTION
RGB_ON_1	Switch the sensor on / off (RGB_ON_0 and RGB_ON_1 must be executed together to start the sensor)	7	0x1 (0b1)	Turn on the sensor
			0x0 (0b0)	Turn off the sensor (shutdown) (default)
RGB_PDDIV	Set the effective photodiode size for the R,G,B and IR channel	6	0x1 (0b1)	1/2 PD used
			0x0 (0b0)	2/2 PD used
Reserved	Reserved	5	0x0 (0b0)	Should be kept default
RGB_GAIN	Set the gain of the RGB	4 : 3	0x3 (0b11)	Gain x0.5
			0x2 (0b10)	Gain x0.66
			0x1 (0b01)	Gain x2
			0x0 (0b00)	Gain x1
G_PERS	Set the amount of consecutive threshold crossing events necessary to trigger interrupt	2 : 1	0x3 (0b11)	8 times
			0x2 (0b10)	4 times
			0x1 (0b01)	2 times
			0x0 (0b00)	1 time (default)
RGB_CAL	Enable / disable internal calibration after power on	0	0x1 (0b1)	Enable (must be set to “1” when power on ready)
			0x0 (0b0)	Disable (default)

TABLE 5 - REGISTER NAME: G_THDH							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
G_THDH_L							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
G_THDH_H							

COMMAND	BIT NAME	FUNCTION	BIT	VALUE	DESCRIPTION
0x04	G_THDH_L	Set the high threshold interrupt value of the green channel	7 : 0	0 to 65 535	Low byte
0x05	G_THDH_H		7 : 0		High byte

TABLE 6 - REGISTER NAME: G_THDL							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
G_THDL_L							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
G_THDL_H							

COMMAND	BIT NAME	FUNCTION	BIT	VALUE	DESCRIPTION
0x06	G_THDL_L	Set the low threshold interrupt value	7 : 0	0 to 65 535	Low byte
0x07	G_THDL_H		7 : 0		High byte

TABLE 7 - REGISTER NAME: R_DATA							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
R_DATA_L							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
R_DATA_H							

COMMAND	BIT NAME	FUNCTION	BIT	VALUE	DESCRIPTION
0x10	R_DATA_L	Read the red channel output data	7 : 0	0 to 65 535	Low byte
0x11	R_DATA_H		7 : 0		High byte

TABLE 8 - REGISTER NAME: G_DATA							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
G_DATA_L							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
G_DATA_H							
COMMAND	**BIT NAME**	**FUNCTION**		**BIT**	**VALUE**	**DESCRIPTION**	
0x12	G_DATA_L	Read the green channel output data		7 : 0	0 to 65 535	Low byte	
0x13	G_DATA_H			7 : 0		High byte	

TABLE 9 - REGISTER NAME: B_DATA							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
B_DATA_L							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
B_DATA_H							
COMMAND	**BIT NAME**	**FUNCTION**		**BIT**	**VALUE**	**DESCRIPTION**	
0x14	B_DATA_L	Read the blue channel output data		7 : 0	0 to 65 535	Low byte	
0x15	B_DATA_H			7 : 0		High byte	

TABLE 10 - REGISTER NAME: IR_DATA							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IR_DATA_L							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IR_DATA_H							
COMMAND	**BIT NAME**	**FUNCTION**		**BIT**	**VALUE**	**DESCRIPTION**	
0x16	IR_DATA_L	Read the IR channel output data		7 : 0	0 to 65 535	Low byte	
0x17	IR_DATA_H			7 : 0		High byte	

TABLE 11 - REGISTER NAME: VEML6046X00_ID							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
VEML6046X00_ID_L							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
VEML6046X00_ID_H							
COMMAND	**BIT NAME**		**FUNCTION**	**BIT**	**VALUE**	**DESCRIPTION**	
0x18	VEML6046X00_ID_L		Read the device ID	7 : 0	0x01 (0b00000001)	Should be kept default	
0x19	VEML6046X00_ID_H			7 : 0	0x00 (0b00000000)	Device with a slave address of 0x29	

TABLE 12 - REGISTER NAME: INT_FLAG							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved				AF_DATA_READY	G_IF_L	G_IF_H	Reserved

COMMAND	BIT NAME	FUNCTION	BIT	VALUE	DESCRIPTION
0x1A	Reserved	Reserved	7 : 0	0x00 (0b00000000)	Should be kept default
0x1B	Reserved	Reserved	7 : 4	0x0 (0b0000)	Should be kept default
	AF_DATA_READY	Data ready flag active force mode	3	0x1 (0b1)	Data ready flag available
				0x0 (0b0)	Data ready flag not available
	G_IF_L	Low threshold interupt flag	2	0x1 (0b1)	Low threshold crossing interrupt event flag for the green channel
				0x0 (0b0)	No low threshold crossing
	G_IF_H	High threshold interupt flag	1	0x1 (0b1)	High threshold crossing interrupt event flag for the green channel
				0x0 (0b0)	No high threshold crossing
	Reserved	Reserved	0	0x0 (0b0)	Should be kept default

CALCULATING THE LUX LEVEL

Command code 0x12 and 0x13 contain the results of the green channel measurement. The value of the green channel can be used to calculated the corresponding illumination. Therefor, the 16-bit code needs to be converted to a decimal value to determine the corresponding lux value. The calculation of the corresponding lux level is dependent on the programmed gain setting and the chosen integration time.

TABLE 13 - RESOLUTION AND MAXIMUM DETECTION RANGE AT RGB_PDDIV (2/2 PD USED)								
	TYPICAL RESOLUTION (lx/cnt)					MAXIMUM POSSIBLE ILLUMINATION (lx)			
	RGB_GAIN					RGB_GAIN			
IT (ms)	x2	x1	x0.66	x0.5		x2	x1	x0.66	x0.5
400	0.0053	0.0105	0.0159	0.0210		344	688	1043	1376
200	0.0105	0.0210	0.0318	0.0420		688	1376	2085	2752
100	0.0210	0.0420	0.0636	0.0840		1376	2752	4170	5505
50	0.0420	0.0840	0.1273	0.1680		2752	5505	8341	11 010
25	0.0840	0.1680	0.2545	0.3360		5505	11 010	16 682	22 020
12.5	0.1680	0.3360	0.5091	0.6720		11 010	22 020	33 363	44 040
6.25	0.3360	0.6720	1.0182	1.3440		22 020	44 040	66 727	88 079
3.125	0.6720	1.3440	2.0364	2.6880		(-) [1]	(-) [1]	(-) [1]	(-) [1]

TABLE 14 - RESOLUTION AND MAXIMUM DETECTION RANGE AT RGB_PDDIV (1/2 PD USED)								
	TYPICAL RESOLUTION (lx/cnt)					MAXIMUM POSSIBLE ILLUMINATION (lx)			
	RGB_GAIN					RGB_GAIN			
IT (ms)	x2	x1	x0.66	x0.5		x2	x1	x0.66	x0.5
400	0.0105	0.0210	0.0318	0.0420		688	1376	2085	2752
200	0.0210	0.0420	0.0636	0.0840		1376	2752	4170	5505
100	0.0420	0.0840	0.1273	0.1680		2752	5505	8341	11 010
50	0.0840	0.1680	0.2545	0.3360		5505	11 010	16 682	22 020
25	0.1680	0.3360	0.5091	0.6720		11 010	22 020	33 363	44 040
12.5	0.3360	0.6720	1.0182	1.3440		22 020	44 040	66 727	88 079
6.25	0.6720	1.3440	2.0364	2.6880		44 040	88 079	133 453	176 158
3.125	1.3440	2.6880	4.0727	5.3760		(-) [1]	(-) [1]	(-) [1]	(-) [1]

Note

[1] For integration time of 3.125 ms the maximum count level is no longer 16 bit, so, half the integration time no longer leads to double the max. lux level

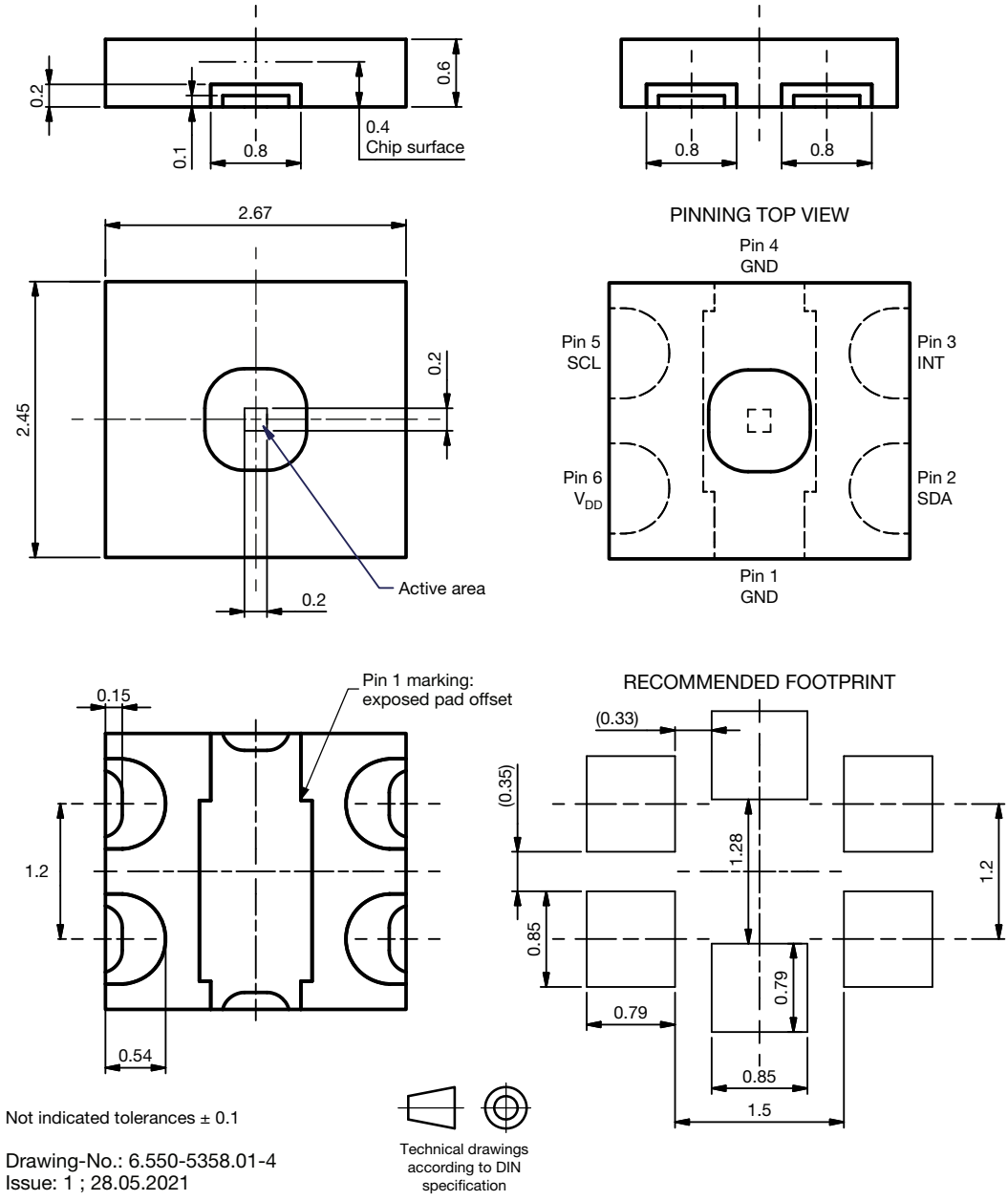
HANDLING INSTRUCTION

Special care must be taken into consideration when handling the VEML6046X00. VEML6046X00 is sensitive to dust and scratches, proper optical device handling procedures are recommended.

The optical surface of the device must be kept clean for optimal performance in both prototyping with the device and mass production manufacturing procedures. Tweezers with plastic or rubber contact surfaces are recommended to avoid scratches on the optical surface. Avoid manipulation with metal tools when possible. The optical surface must be kept clean of fingerprints, dust, and other optical-inhibiting contaminants. If the device optical surface requires cleaning, the use of isopropyl alcohol is recommended. A few gentle brushes with a soft swab are appropriate. Avoid potentially abrasive cleaning and manipulating tools and excessive force that can scratch the optical surface.

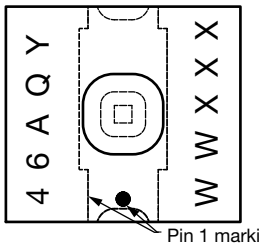
If the VEML6046X00 performs less than optimally, inspect the optical surface for dirt, scratches, or other optical artifacts. VEML6046X00 is a cost effective solution of RGB sensor with I2C bus interface. The standard serial digital interface is easy to access RGB and IR data without complex calculation and programming by external controller. Beside the digital output also a flexible programmable interrupt pin is available.

PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.550-5358.01-4
Issue: 1 ; 28.05.2021

MARKING AND PIN 1 IDENTIFICATION



46: device type
A: address option (0)
Q: qualification (0 = AECQ100)
Y: year
WW: week
XXX: lot number

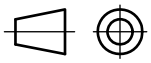
Pin 1 marking
dotmarking on top side
elongated feature on bottom side

TAPE AND REEL DIMENSIONS in millimeters

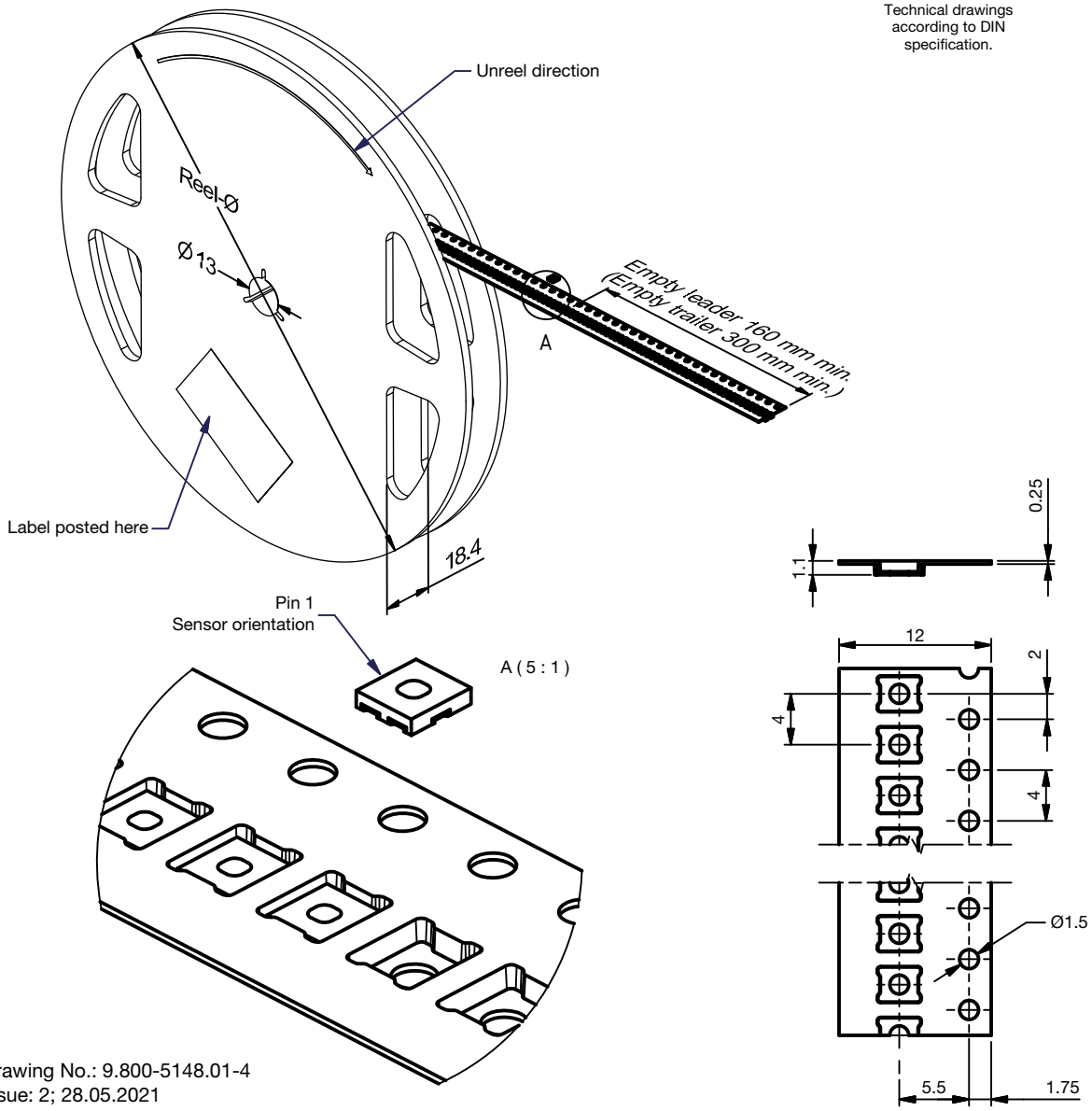
Reel-Size:
VEML60xx: Ø180 mm ± 2 mm = 3000 pcs.
VEML60xx-GS 15: Ø330 mm ± 2 mm = 10 000 pcs.

Reel-design is representative for different types.

Non tolerated dimensions ± 0.1 mm



Technical drawings according to DIN specification.



Drawing No.: 9.800-5148.01-4
Issue: 2; 28.05.2021

DRYPACK

Devices are packed in moisture barrier bags (MBB) to prevent the products from moisture absorption during transportation and storage. Each bag contains a desiccant.

FLOOR LIFE

Floor life (time between soldering and removing from MBB) must not exceed the time indicated on MBB label:

Floor life: 4 weeks

Conditions: T_{amb} < 30 °C, RH < 60 %

Moisture sensitivity level 2a, according to J-STD-020E.

DRYING

In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-020E or label. Devices taped on reel dry using recommended conditions 192 h at 40 °C (+ 5 °C), RH < 5 %.

REFLOW SOLDER PROFILE

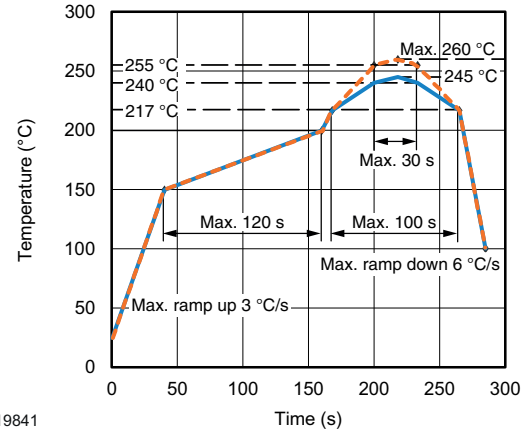


Fig. 11 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020E

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