

1. OVERVIEW

The SME-08BD0 is a 3-channel optical encoder IC with analog and digital signal output.

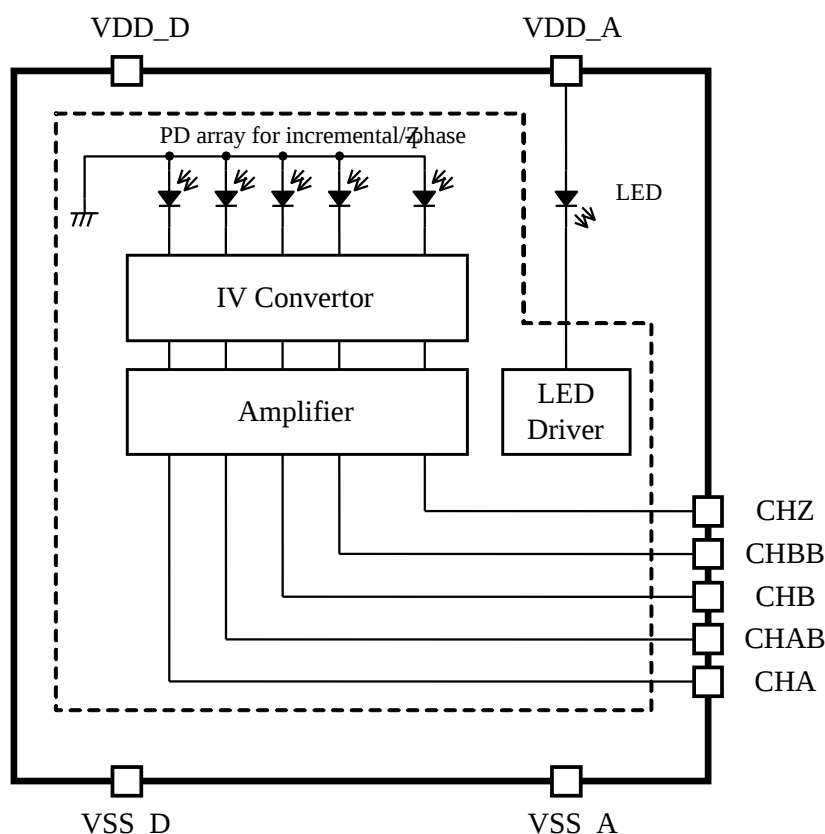
The SME-08BD0 consists of an LED and an OEIC (Opto-Electric Integrated Circuit) in a single package.

The light emitted from the LED is projected onto the code wheel, and the reflected light is received by a photodiode to detect the relative movement between the SME-08BD0 and the code wheel. In addition, Z-phase, the origin signal, is output by setting a pattern on the code wheel for origin detection.

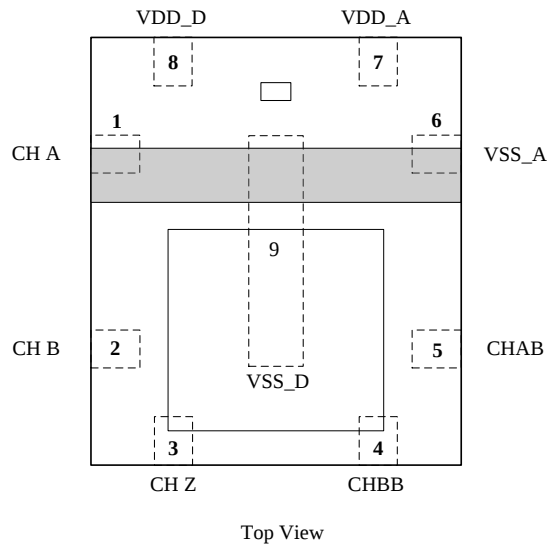
2. FEATURES

- Compact clear molded package (L=3.95mm W=3.4mm H=1.0 mm)
- 80μm resolution
- LED and OEIC fabricated in a single package
- 3-channel signal output
- 4.5 to 5.5 V supply voltage
- 27mA current consumption
- LED wavelength: 850nm

3. BLOCK DIAGRAM



4. PIN LAYOUT



5. PIN DESCRIPTION

No.	Name	I/O	Function
1	CHA	O	A-phase analog signal (A phase) output
2	CHB	O	B-phase analog signal (B phase) output
3	CHZ	O	Z-phase digital signal output
4	CHBB	O	B-phase inverting analog signal (BB phase) output
5	CHAB	O	A-phase inverting analog signal (AB phase) output
6	VSS_A	-	Ground
7	VDD_A	-	Supply voltage
8	VDD_D	-	Supply voltage
9	VSS_D	-	Ground

I/O type I: Input O: Output

6. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Conditions	Rating	Unit	note
Supply voltage	V_{DD}	VDD_A, VDD_D pins	-0.3 to 7.0	V	*1
Output voltage	V_{OUT}	CHA, CHB, CHAB, CHBB, CHZ pins	-0.3 to $V_{DD}+0.3$	V	*1,*2
Storage temperature	T_{STG}		-40 to 85	°C	*3

*1: Parameters must not exceed ratings, not even momentarily. If a rating is exceeded, there is a risk of IC failure, deterioration in characteristics, and decrease in reliability.

*2: V_{DD} in absolute value ratings refers to the recommended operating voltage V_{DD} value.

*3: Stored separately in Nitrogen (N_2) atmosphere or vacuum.

7. RECOMMENDED OPERATING CONDITIONS

$V_{SS}=0V$ codewheel $R_{Op}:11mm$

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Supply voltage	V_{DD}	Between VDD and VSS terminals $V_{DD_A}=V_{DD_D}$ $V_{SS_A}=V_{SS_D}$	4.5	5	5.5	V
Operating temperature	T_a	-	-40	25	85	°C
Code wheel radial misalignment	E_R		-0.2		+0.2	mm
Code wheel tangential misalignment	E_T		-0.2		+0.2	mm
Code wheel Gap	G		0.5	0.75	1.0	mm

* Operation outside the recommended operating conditions may adversely affect reliability. Use only within specified ratings

8. ELECTRIC CHARACTERISTIC

8.1. DC Characteristics

$V_{SS}=0V$ 、 $T_a=25^{\circ}C$

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Current consumption	I_{DD1}	Include LED load current At no output load	-	27	40	mA
Output signal amplitude	V_{PP}		0.8	1	1.2	V_{PP}
Output signal offset voltage	V_{OFFSET}		$0.45V_{DD}$	$0.5V_{DD}$	$0.55V_{DD}$	V
Reference voltage	V_{REF}			$0.5V_{DD}$		V

*Under our installation conditions and typical recommended operating conditions

8.2. AC Characteristics $V_{SS}=0V$ 、 $T_a=25^{\circ}C$

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Output frequency	F_{OUT}				120	kHz
Output stable latency	t_{wait}		1	-	-	ms

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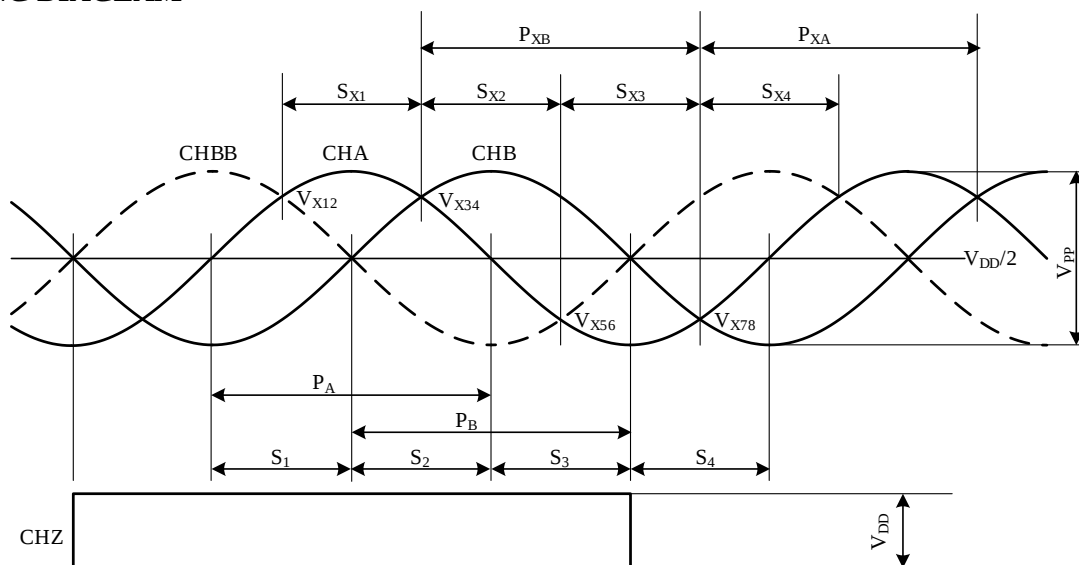
9. FUNCTIONAL DESCRIPTION

The light emitted from the LED is projected onto the code wheel, and the reflected light is received by a photodiode to detect the relative movement between the SME-08BD0 and the code wheel. In addition, Z-phase, the origin signal, is output by setting a pattern on the code wheel for origin detection.

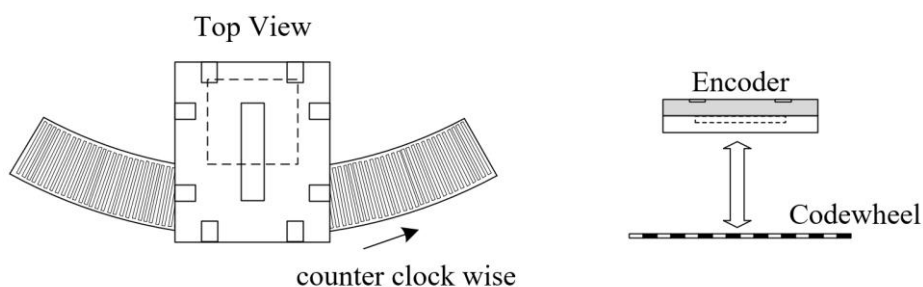
9.1. LED Auto Power Control (APC) Brightness Adjustment Function

The SME-08BD0 has a built-in automatic LED brightness adjustment function (Auto Power Control) to compensate for LED brightness variations and temperature fluctuations.

10. TIMING DIAGLAM



Direction of code wheel rotation: CCW



Parameter Definition

Parameter	Symbol	
Output signal amplitude	V_{PP}, V_{PPA}, V_{PPB}	Peak to peak signal amplitude in voltage
Output signal offset voltage	V_{OFFSET} $V_{OFFSETA}, V_{OFFSETB}$	Offset voltage of output signal (center voltage)
Maximum (Minimum) output signal amplitude voltage	$V_{PA}, V_{PB}, V_{MA}, V_{MB}$	Peak and bottom of output signal amplitude
Output signal crosspoint voltage	$V_{X12}, V_{X34}, V_{X56}, V_{X78}$	Voltage at which CHA signal crosses CHB or CHBB

Encoder Output Characteristics

Code wheel: $R_{OP} = 11\text{mm}$

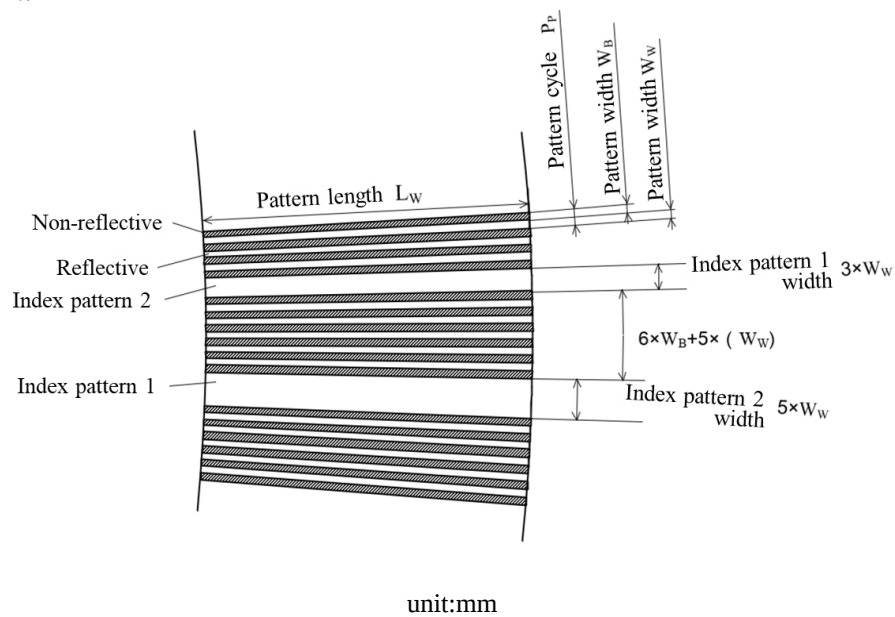
Parameter	Symbol	MIN	TYP	MAX	Unit
Z-phase pulse width	P_Z	-	430	-	$^\circ\text{e}$
State error	ΔS		± 8		$^\circ\text{e}$
	ΔS_X		± 5		$^\circ\text{e}$
Pulse width error	ΔP		± 12		$^\circ\text{e}$
	ΔP_X		± 5		$^\circ\text{e}$

*Under our installation conditions and typical recommended operating conditions

11. RECOMMENDED CODE WHEEL CONDITIONS

Parameter	Symbol	Min	Typ	Max	Unit	Note
Pattern width ratio (reflective/non-reflective)	W_W/W_B	0.9	1	1.1		
Incremental pattern cycle	P_P		80		μm	
Incremental pattern width	W_W, W_B		40		μm	
Pattern length	L_W	1.8	-	-	mm	
Reflectance (reflective part)	R_F	60	-	-	%	
Reflectance (non-reflective part)		-	-	10	%	

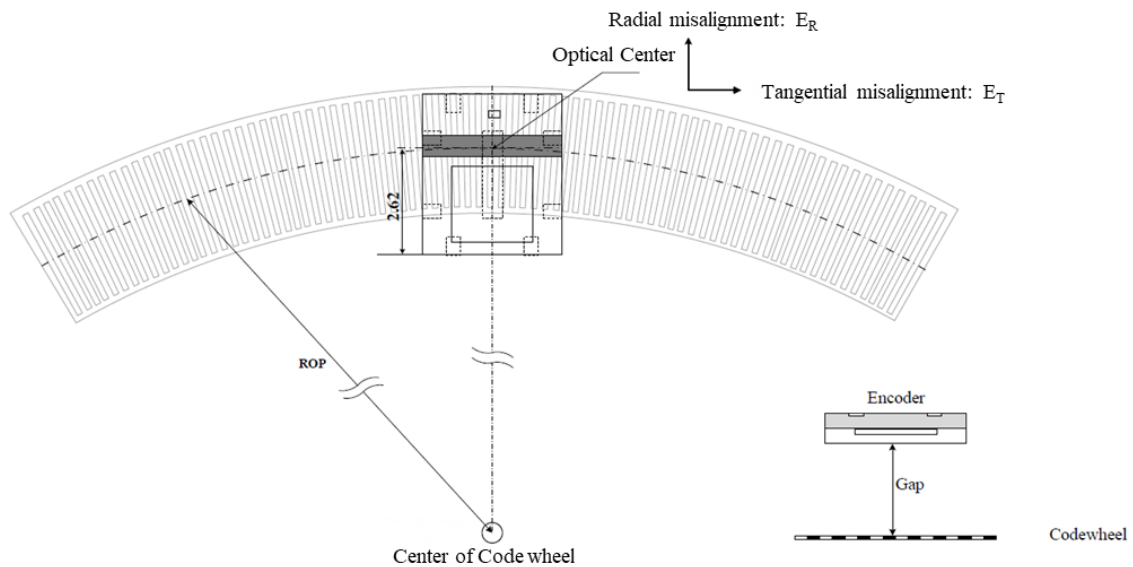
$$R_{OP} = (PPR * P_P) / 2\pi$$



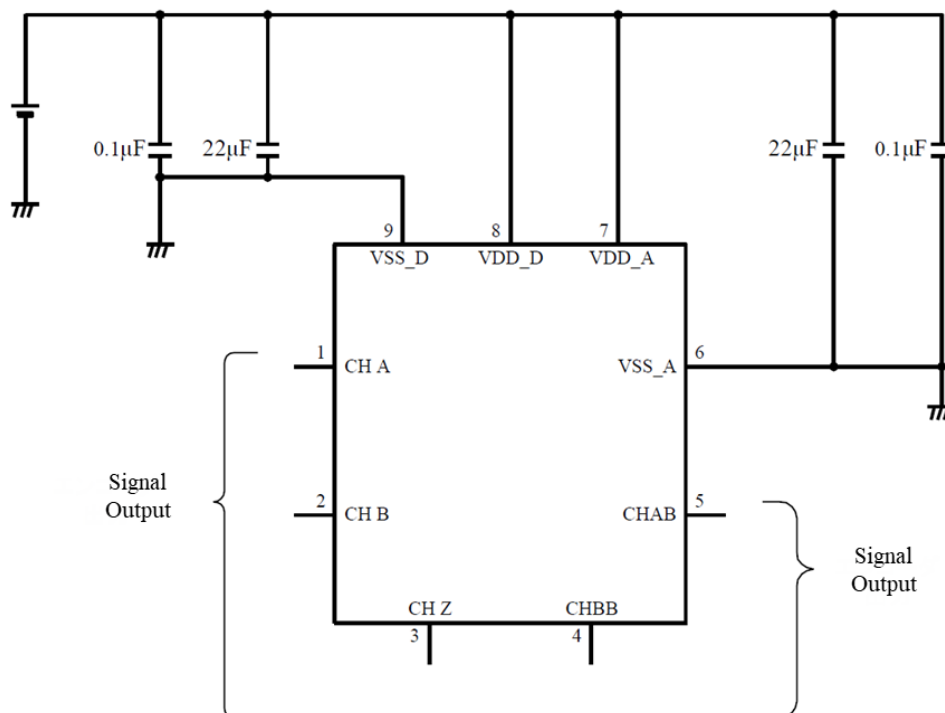
12. CODE WHEEL MOUNTING CONDITIONS

The optical center of the encoder IC should be aligned with the ROP.

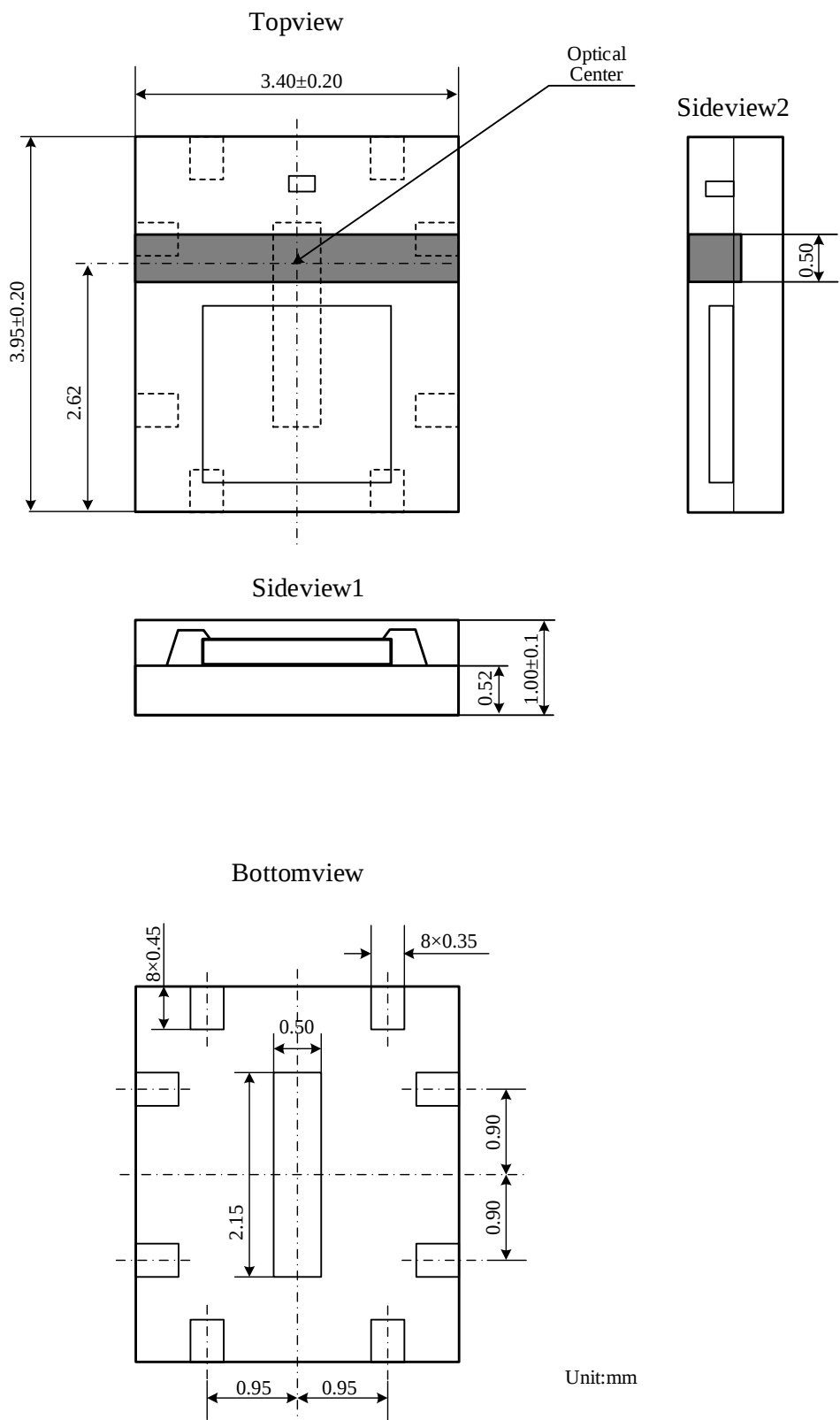
Please evaluate the mounting conditions thoroughly before setting the encoder IC.



13. TYPICAL APPLICATIONS



14. PACKAGING DIMENSIONS



15. USAGE AND PRECAUTIONS

This product is designed and manufactured to the generally accepted standards of reliability as expected for use in general electronic and electrical equipment, such as personal equipment, machine tools, and measurement equipment. This product is not designed and manufactured to be used in any other special equipment requiring extremely high level of reliability and safety, such as aerospace equipment, nuclear power control equipment, medical equipment, transportation equipment, disaster prevention equipment, security equipment.

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