

WWW.WOORIRO.CO.IT



WOORIRO COMPANY PROFILE



Welcome to Wooriro Co., Ltd. The No.1 Optical Electronics Company of Korea

Wooriro has had the key part in development of the domestic optical communication industry by succeeding in developing and producing the subminiature PLC Splitter domestically for the first time, since it was established in 1998 with the establishment of 『Wooriro Optical communication institute』 in 1999.

Especially, passive components such as PLC Splitter, AWG(Arrayed Waveguide Grating) and so on which are our main products and used for building Fiber To The Home (FTTH) have been recognized as the best technique internationally by participating in building Optical communication network not only for 3 telecommunications business operators domestically but also for the global market including U.S.A, Europe, China and so on internationally.

Recently, our company has supplied not only passive components but also high quality of active components to overseas market by succeeding in developing and producing Photo Diode technique in active device field. However, Wooriro hasn't settled for the status quo. Instead, our company has becoming the total solution company of optical communication, server storage and IOT with the new products such as smart sensors based on our consistent research and development.

Respective customers! Wooriro will lead the optical communication area by investing and renovating profusely for the future now and forever, although the world situation and condition have been changed rapidly.

Wooriro will become the great company to provide the best satisfaction and value to stockholders, executives and staff members, customers and societies through qualitative growth based on 'Respective for human's life and dignity' and 'Open-management'. We're really appreciated that you give your warm interest and support to us now and forever. Moreover, please keep your eyes on our company's growth into the best optical communication brand in the world. Thank you.

Wooriro Co., Ltd.



Company Introduction	
Company Name	Wooriro Co., Ltd.
Founded	December 29, 1998
CEO	Se-Chul Park
Location	102-22, Pyeongdongsandan 6beon-ro, Gwangsan-gu, Gwangju, 62453, Republic of Korea
Main Business Area	Optical Telecom Components - PLC Splitter and the related products - Photo Diode and the related products SI (System Integration) IOT (Internet Of Things)

Contents

PLC Line-up

- CWDM/LAN-WDM Chip 01
- DWDM Chip 02
- PLC Splitter Wafer & Chip 03
- PLC Splitter Module 05

PD Line-up

- APD Chip for OTDR 07
- APD Module for OTDR 08
- Large Area InGaAs PIN PD Chip 09
- 10Gb/s PIN Photodiode Chip 11
- 10Gb/s PIN Linear TIA ROSA 12
- 10Gb/s APD Chip, TO and ROSA 13
- 10G APD TO with Burst-mode TIA 14
- 25Gb/s PIN Photodiode Chip 15
- 25Gb/s PIN Limiting/Linear ROSA 17
- 25Gb/s APD Linear TIA ROSA 18
- 28Gb/s APD ROSA 19
- Side Illuminated Monitor PIN PD Chip 20
- 56Gbaud PIN Photodiode Chip on Carrier 21
- SPAD(Single Photon Avalanche Diode) 23

LRF Line-up

- LASER RangeFinder Receiver 24

RADAR Line-up

- LFM CW RADAR 25
- Doppler RADAR 27

CWDM / LAN-WDM Chip

CWDM Mux/Demux chips are bi-directional passive optical multiplexers and demulti-plexers allowing multiple optical signals at different wavelengths. The grating combines or separates up to 4 different wavelength signals.

■ Applications

- WDM Network
- TOSA/ROSA for 40/100Gbps Transceiver

■ Features

- Compact Size (Suitable to QSFP28 or CFP4)
- High Stability and Reliability
- Low Cost
- Mass Production Available
- Low Temperature Dependence

■ Chip View



(a) CWDM Mux

(b) CWDM Mux (U-type)

(c) CWDM Demux

(d) LAN-WDM Mux

(e) LAN-WDM Demux

■ Specifications

Parameter	Unit.	CWDM Values		LAN-WDM Values		Condition	
		Mux	Demux	Mux	Demux		
	μm	250	500	250	500	250	
Chip Size	mm	1,6x7,7	2,3x6,8 (U-Type)	1,6x9,5	3,2x7,9	4,5x9,4	Individual Case (Tolerance ±0.3mm)
Channel Spacing	nm	20		4,5			
Center Wavelength	CH 0	nm	1271		1295,56		ITU-T 694.2(CWDM) / IEEE 802.3ba (LAN-WDM)
	CH 1	nm	1291		1300,05		
	CH 2	nm	1311		1304,58		
	CH 3	nm	1331		1309,14		
Center Wavelength Accuracy	nm	±1		±0,3		@Room Temperature	
Center Wavelength Shift	nm/ °C	0,011					
Insertion Loss(Max.)	dB	3,0	2,5	3,0	2,5		
Bandwidth (Min.)	1 dB	nm	10	12	2,2	2,8	
	3 dB	nm	14	15	—	3,5	
Isolation(Min.)	dB	—	20	—	20		

DWDM Chip

■ Applications

- PON Network
- ROADM
- DWDM System
- Long Haul/Metro/Short Distance Networks



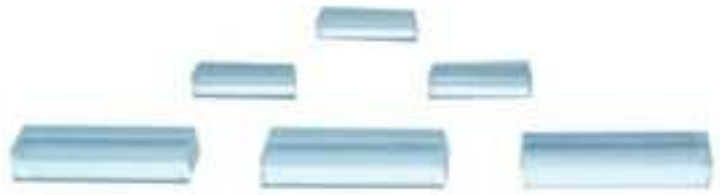
■ Features

- Compact Size
- High Stability and Reliability
- Low Cost
- Mass Production Available
- Low Temperature Dependence

■ Specifications

Parameter	Unit	Min.	Typ.	Max.	Note
Operating Wavelength	nm	1529,55		1567,13	
Input Channel			1		
Output Channel			48		
Channel Spacing	nm		0,8		100 GHz
Passband	nm	-0,1		0,1	±12,5 Ghz
Wavelength Accuracy	nm	-0,05		0,05	±50 pm
Insertion Loss	dB			4	
Loss Uniformity	dB			1	
PDL	dB			0,5	
1dB Bandwidth	nm	0,2			
3dB Bandwidth	nm	0,4			
Adjacent Channel Crosstalk	dB	25			
Non-Adj Channel Crosstalk	dB	30			
Return Loss	dB	40			

PLC Splitter Wafer & Chip



■ Features

- Efficient Structure for Easy Dicing and No Block Gap
- Optimized Waveguide Structure for Easy Fiber Alignment
- Highest Quantity & Guaranteed Yield
- Remarkable Optical Performance

■ PLC Splitter Wafer

Types (Output Spacing)	1x2 (250 μ m)	1x4 (250 μ m)	1x8 (127 μ m)	1x8 (250 μ m)	1x16 (127 μ m)	1x32 (127 μ m)	1x64 (127 μ m)
Material	Quartz						
Size	6 Inch						
Effective Q'ty (ea)	595	746	746	445	372	162	64

■ PLC Splitter Chip

Parameter	1x2	1x3	1x4	1x6	1x8 (127 μ m)	1x8 (250 μ m)	1x12	1x16	1x24	1x32	1x64	1x128
IL _c (dB)(Max.) @1310,1550	3.5	5.7	6.7	8.8	9.8	9.8	12.2	13.0	15.5	16.2	19.5	23.5
Uni.(dB)(Max.) @1310,1550	0.5	0.6	0.5	0.7	0.6	0.6	0.8	0.7	1.2	1.0	1.5	2.0
PDL _c (dB)(Max.) @1310,1550	0.15	0.2	0.15	0.2	0.2	0.2	0.2	0.2	0.25	0.2	0.25	0.4
Size (LxW, mm)	9.8x2.1		9.0x1.8	10.1 x2.1	9.0 x1.8	11.6 x2.4	11.5 x2.1	12.7 x2.6	14.5 x4.47	16.6 x4.6	22.2 x8.66	29.8 x16.8
Thickness(mm)	2.5											
Substrate	Quartz											
End Faces	Standard : 98° (Lid Long) tilt polished / Optional : 82° (Lid Short) or 90°											
Lid	Quartz											
Operating Wavelength	1260~1650nm											

Parameter	2x2	2x4	2x8 (127 μ m)	2x8 (250 μ m)	2x16	2x32	2x64
IL _c (dB)(Max.) @1310,1550	3.8	7.2	10.4	10.4	13.7	17.0	21.0
Uni.(dB)(Max.) @1310,1550	0.8	1.1	1.2	1.2	1.6	1.8	2.0
PDL _c (dB)(Max.) @1310,1550	0.2	0.2	0.25	0.25	0.3	0.3	0.35
Size(LxW, mm)	13.2x1.8	16.3x1.8	17.5x1.8	19.3x2.4	20.5x2.6	24.1x4.6	29.5x8.66
Thickness(mm)	2.5						
Substrate	Quartz						
End Faces	Standard : 98° (Lid Long) tilt polished / Optional : 82° (Lid Short) or 90°						
Lid	Quartz						
Operating Wavelength	1260~1650nm						

PLC Splitter Module



Planar Lightwave Circuit(PLC) Splitter has one or two input port(s) and multiple output ports for the division of an optical power. Wooriro's Splitter features a highly compact package size and stable optical parameters, making them ideally suitable for Telecom, Local Area Networks (LAN) and Cable Television(CATV) networks.

Wooriro's Splitter is fully compliant with Telcordia GR-1209 &-1221 Standard.

■ Applications

- FTTx Networks(FTTH, FTTB, FTTC, etc.)
- PON(Passive Optical Networks) Systems
- Optical CATV Networks
- LAN and Telecom Networks

■ Features

- Vertically Integrated Manufacturing in-house & Core Technology
- Superior Optical Performance in Full Operating Wavelength Range
- Flexible and Versatile for All Applications
- Telcordia GR-1209-CORE & GR-1221-CORE Qualified

■ Optical Specifications

Parameter	1x2	1x3	1x4	1x6	1x8	1x12	1x16	1x24	1x32	1x64	1x128
IL _i (dB)*	≦3.8	≦6.2	≦7.2	≦9.3	≦10.5	≦12.5	≦13.6	≦15.8	≦17.0	≦20.4	≦25.0
Uni _i (dB)	≦0.6	≦0.6	≦0.6	≦0.8	≦0.8	≦0.8	≦1.0	≦1.3	≦1.3	≦1.8	≦2.5
PDL _i (dB)	≦0.15	≦0.2				≦0.2	≦0.3				≦0.4
Parameter	2x2	2x4	2x8	2x16	2x32	2x64					
IL _i (dB)*	≦4.2	≦7.6	≦10.8	≦14.0	≦17.5	≦21.0					
Uni _i (dB)	≦0.8	≦1.0	≦1.0	≦1.5	≦1.8	≦3.0					
PDL _i (dB)	≦0.2	≦0.3				≦0.4					
Return Loss(dB)	≦55										
Directivity(dB)	≦55										
Operating Wavelength	1260~1650nm										
Operating Temperature	-40~85°C										
Operating Humidity	Max, 95%RH										
Power Handling	Max, 500mW										

- * : W/O Connectors
- Connector Insertion Loss will be 0.2dB.
- Connector Type : SC, FC, LC, etc.

■ Mechanical Specifications

Types	(mm)	1x2	1x3	1x4	1x6	1x8	1x12	1x16	1x24	1x32	1x64	1x128	2x2	2x4	2x8	2x16	2x32	2x64		
Bare	H	4(128ch=4.5)																		
	W				4				7	12	23		4			7		12		
	L				40				55	60	80		50			55		70		
Integration	H				4				6	5	-		4			6		5		
	W				7		12		20	43	-		68		70	80		120		
	L				55		60		80	120	-		7		12	20		43		
Cascade	H				10				17	-			10					17		
	W				80				114	-			80					114		
	L				100				140	-			100					140		

- Bare Type : With 250um Bare Fiber for Input & Ribbon Fiber for Output
- Integration Type : With 900um Fibers for Input & Output
- Cascade Type : With 900um or 2.0mm Jacketed Fibers for Input & Output

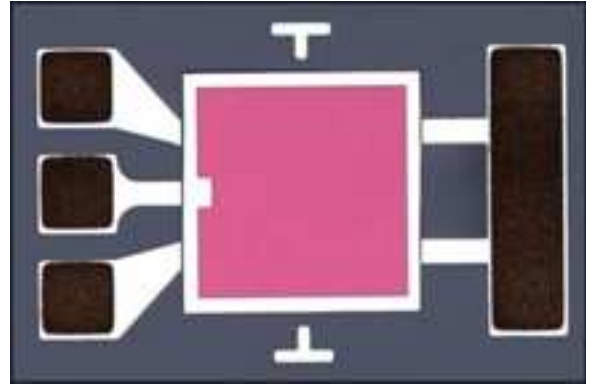
APD Chip for OTDR

■ Applications

- Optical Time Domain Reflectometry
- Optical Test Instruments
- Optical Sensor
- Long-distance Optical Communications

■ Features

- High Reliability
- Low Dark Current
- Chip-on-Carrier
- Photodiode Active Diameter : 29 μm



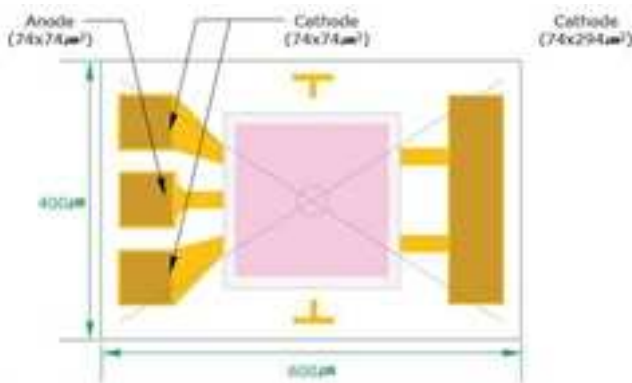
<Top view>

■ Optical and Electrical Specifications

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Operating Wavelength	λ	—	1250	—	1650	nm
Responsivity*	R	M=1, $\lambda = 1550\text{nm}$	0.7	0.8	—	A/W
Dark Current	I_d	$V_R = 0.9V_{BR}$	—	500	5000	μA
Breakdown Voltage	V_{BR}	$I_d = 100\mu\text{A}, T_C = 25^\circ\text{C}$	30	40	50	V
Temperature Coefficient	γ	$\Delta V_B / \Delta T$	—	50	—	mV/ $^\circ\text{C}$
Total Capacitance	C	f=1MHz, $V_R = 0.9V_{BR}$	—	0.2	0.25	pF

* The responsivity is the calculated value. The unity gain voltage cannot be measured for this APD.

■ Chip on Carrier Layout



<Top view>



<Bottom view>

APD Module for OTDR

■ Applications

- Optical Time Domain Reflectometry
- Optical Test Instruments
- Optical Sensor
- Long-distance Optical Communications

■ Features

- InGaAs/InP Avalanche Photodiode
- High Gain and Low Dark Current
- High Reliability
- -40 to +85°C Operation

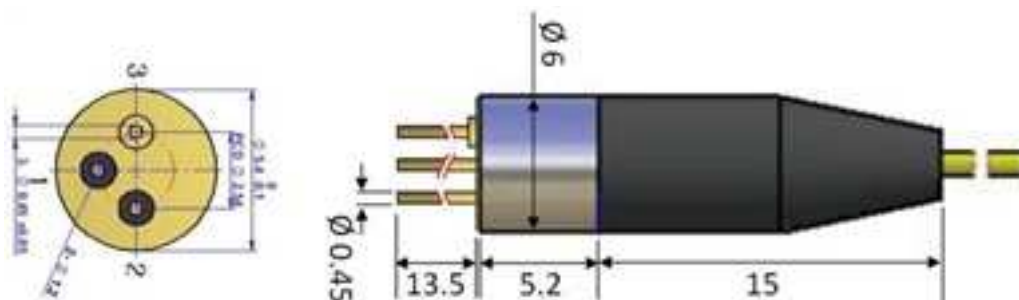


■ Optical and Electrical Specifications

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Operating Wavelength	λ	–	1250	–	1650	nm
Responsivity*	R	M=1, $\lambda = 1550\text{nm}$	0.7	0.8	–	A/W
Dark Current	I_D	$V_R = 0.9V_{BR}$	–	500	5000	μA
Breakdown Voltage	V_{BR}	$I_D = 10\mu\text{A}$, $T_C = 25^\circ\text{C}$	30	40	50	V
Temperature Coefficient	γ	$\Delta V_B / \Delta T$	–	50	–	mV/°C

* The responsivity is the calculated value. The unity gain voltage cannot be measured for this APD.

■ Dimension and PIN Configuration (unit : mm)



1. Cathode
2. Anode
3. GND

Large Area InGaAs PIN PD Chip

LAPD Chips having various diameters of $274\mu\text{m}$, 1mm, 2mm, 3mm are designed to have a good linearity up to High Power. In addition, by designing their shot noise and Jonson noise current to be lowered, it makes users to reduce minimum detectable signal, it can be used for optical power meter with wide range of input optical power.

■ Applications

- Optical Power Monitoring
- Optical Sensor

■ Features

- Low Dark Current
- Low Capacitance
- Linear Response
- Low Cost

■ Chip View



(a) MPD 300

(b) LAPD 1mm

(c) LAPD 2mm

(d) LAPD 3mm

■ Absolute Maximum Ratings

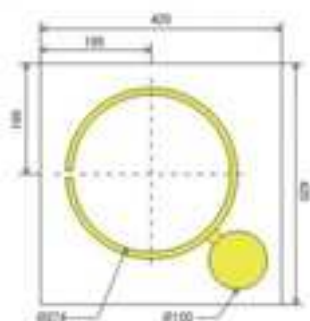
Parameter	Symbol	Rating				Unit
		MPD 300	LAPD 1mm	LAPD 2mm	LAPD 3mm	
Reverse Voltage	V_R	20	20	5	5	V
Reverse Current	I_R	10				mA
Operating Temperature	T_{OPR}	-40 to +85				$^{\circ}\text{C}$
Storage Temperature	T_{STG}	-40 to +85				$^{\circ}\text{C}$

■ Electro-Optical Specifications (TC=25 °C)

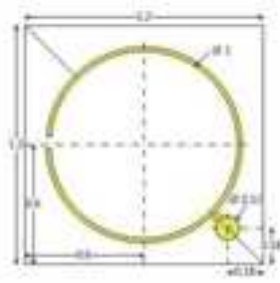
Parameter	Symbol	MPD300 / LAPD 1mm / LAPD 2mm / LAPD 3mm				Unit
		Test Condition	Min.	Typ.	Max.	
Operating wavelength	λ	–	1000	–	1650	nm
Responsivity	R	$V_R = 5V / 3V / 2V / 2V$ (@1550nm)	0.8	0.9	–	A/W
Dark current	I_D	$V_R = 5V / 3V / 2V / 2V$	–	–	5 / 10 / 50 / 200	nA
Total capacitance	C	$V_R = 5V / 3V / 2V / 2V$ (f=1MHz)	–	0.009 / 0.05 / 0.4 / 0.8	0.01 / 0.1 / 1 / 1.8	nF

■ Mechanical Specifications

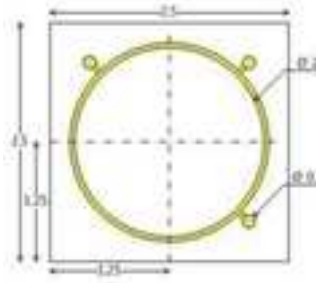
Parameter	Symbol	Chip Type				Unit
		MPD 300	LAPD 1mm	LAPD 2mm	LAPD 3mm	
Light Receiving Area Diameter	D	0.275	1.0	2.0	3.0	mm
Chip Size	S_C	0.42x0.42	1.2x1.2	2.5x2.5	3.4x3.4	mm ²
Bonding Pad Diameter	S_P	0.1	0.12	0.1	0.15	mm
Chip Thickness	t	125±15	200±15	200±15	250±15	μm



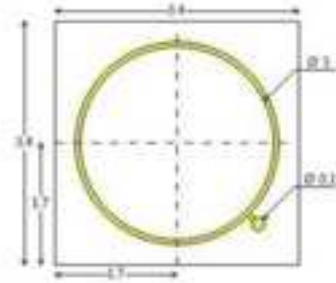
(a) mPD 300



(b) LaPD 1mm



(c) LaPD 2mm



(d) LaPD 3mm

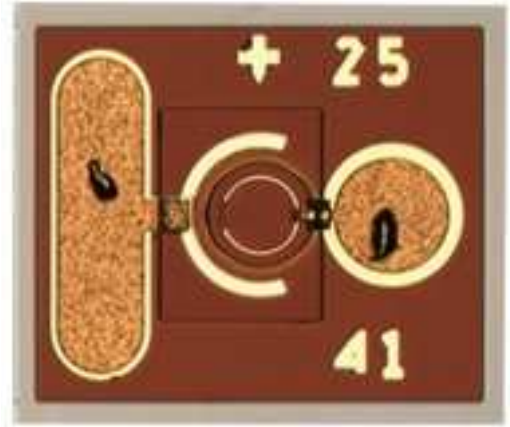
10Gb/s PIN Photodiode Chip

■ Applications

- 2.5 ~ 10Gbps optical receiver for long-distance optical communication

■ Features

- Low Dark Current
- Low Capacitance
- Linear Response
- High Reliability
- Available Light Receiving Area : 32, 40, 50, 54 μ m



■ Electro-Optical Specifications (TC=25 °C)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Dark current	I_b	$V_R = 5V$	–	1	5	nA
Capacitance	C	$V_R=5V$	–	0.25	0.3	pF
Responsivity	R	$V_R = 5V$ (@1550nm)	0.9	1.0	–	A/W
Sensitivity	dBm	¹⁾ 10.3125Gbps, ER=3.8dB ²⁾ 2.488Gbps, ER=10dB	–	-16.2 -30.5	–	dBm
Operating wavelength ³⁾	λ	–	1100	–	1650	nm

- 1) Sensitivity will be different depending on TIA. Measurement Condition : 10.3Gb/s & 10^{-12} BER
- 2) Coupled with Super TIA for G-PON Application. Measurement Condition : 2.5Gb/s & 10^{-10} BER
- 3) Can be operated at the Wavelength range between 1100nm and 1650nm with different responsivity.



10Gb/s PIN Linear TIA ROSA

■ Applications

- 10G Ethernet
- Serial data systems up to 11.3Gbps
- 10GBASE-LRM for SFP+

■ Features

- LC receptacle with Single Mode Fiber Stub
- Standard TO-46 package with hermetic sealing
- XMD-MSA compliant ROSA
- Differential outputs and Automatic gain control(AGC)



■ Specifications

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
RSSI responsivity	I_{MON}	$V_{CC}=3.3V$, 1mW to 1.3mW, $\lambda =1550nm$	0.8	0.9		A/W
RSSI offset current	I_{OFFSET}	$V_{CC}=3.3V$, no light			50	nA
Optical Wavelength Range	λ	—	1250		1650	nm
Sensitivity	P_S	9.95Gbps NRZ, PRBS= $2^{31}-1$, BER= 1×10^{-12} , ER=11.3dB, $\lambda =1550nm$		-20	-18.5	dBm
Maximum Overload	P_{MAX}	ER=11.3dB, $\lambda =1550nm$	2.5			dBm
TIA Supply Voltage	V_{CC}	—	2.97	3.3	3.63	V
TIA Supply Current	I_{CC}	—	44	58	72	mA
Differential Transimpedance	Z_T	At sensitivity	2.4	4.0	6.0	k Ω
Low Frequency Cut-off	f_{CL}	—		42	80	kHz
Maximum Output Voltage	V_{OUT}	Differential			500	mVp-p
Output Impedance	Z_O	Single-ended		50		Ω

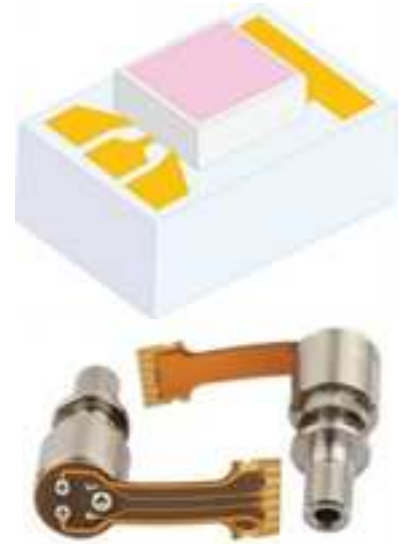
10Gb/s APD Chip, TO and ROSA

■ Applications

- 5G front Haul / Long Haul Network
- 10G PON

■ Features

- InGaAs/InP Avalanche Photodiode
- Low Dark Current
- High Reliability
- Excellent Maximum Damage Level : $\geq 4\text{dBm}$
- -40 to $+85^\circ\text{C}$ Operation
- Robust ESD Performance : $>900\text{V}@\text{APD Chip}$
- APD Chip with Integrated Lens for Ball Lens Coupling Is Also Available.



■ Optical and Electrical Specifications

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Responsivity	R	$1\mu\text{W}$, 1550nm, $V_R=0.95V_{BR}$	–	6	–	A/W
Dark Current	I_D	$V_R=0.9V_{BR}$	–	1	20	nA
Operating Wavelength	λ	–	1250	–	1650	nm
Sensitivity	P_S	10.3125Gb/s, PRBS= $2^{-31}-1$, ER=6dB, $\lambda =1550\text{nm}$	–	-25.5	-24	dBm
Overload	P_{MAX}		-3	–	–	dBm
TIA Supply Current	I_{CC}	1310nm, $V_R=2.5\text{V}$	–	27	38	mA
Breakdown Voltage	V_{BR}	Dark Current, $I_D=10\text{nA}$	24	30	36	V
Temperature Coefficient	γ	$\Delta V_B / \Delta T$	–	90	–	mV/ $^\circ\text{C}$

10Gb/s APD TO with Burst-mode TIA

■ Applications

- IEEE 802.3av 10G-EPON OLT

■ Features

- Standard TO-46 package with aspherical lens cap
- Selection between 10G mode or 1G/10G mode



■ Optical and Electrical Specifications

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
TIA supply voltage	V_{CC}	—	2.97	3.3	3.63	V
TIA supply Current	I_{CC}	$V_{CC}=3.3V$		40		mA
Transimpedance	Z_T	Differential (50Ω on each output)		2		kΩ
APD Breakdown voltage	V_{BR}	$I_d=10\mu A$	23	27	31	V
APD dark current	I_d	$0.9 V_{BR}$			500	nA
Sensitivity	p_s	CM* 10,3125Gbps NRZ, PRBS=2 ³¹ -1, BER=1×10 ⁻³ , ER=6dB, λ =1310nm		-32	-31	dBm
Overload	p_{max}	CM* 10,3125Gbps NRZ, PRBS=2 ³¹ -1, BER=1×10 ⁻³ , ER=6dB, λ =1310nm	-5			dBm
Temperature coefficient of V_{BR}	γ	Operating case temperature		28	35	mV/°C
Optical Wavelength Range	λ	—	1260		1640	nm
Responsivity	R	λ =1310nm, Pin=50uW, Vapd=0.95VB	9	10.5		A/W

* Be measured at continuous mode, not burst mode

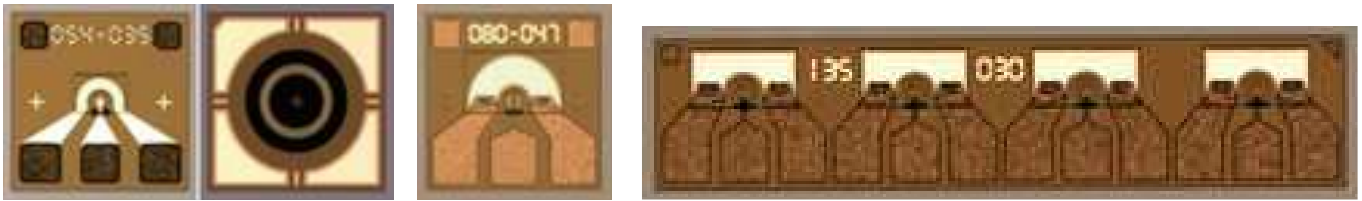
25Gb/s PIN Photodiode Chip

■ Applications

- Receiver for 100GbE and OTU4
- Datacom and Telecom up to 28Gb/s

■ Features

- InGaAs/InP PIN-PD with bottom-integrated lens or top illumination
- Coplanar GSG contact pads
- Highly reliable semi-planar structure
- Low cost



(a) Bottom Illumination with Integrated Lens (Single)

(b) Top Illumination (Single)

(c) Top Illumination (4ch Array)

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Reverse Voltage	V_R	20	V
Reverse Current	I_R	2	mA
Forward Current	I_F	10	mA
Optical Input Power	P_{Max}	5	dBm
Operating Temperature	T_{OPR}	-40 to +85	°C
Storage Temperature	T_{STG}	-40 to +125	°C

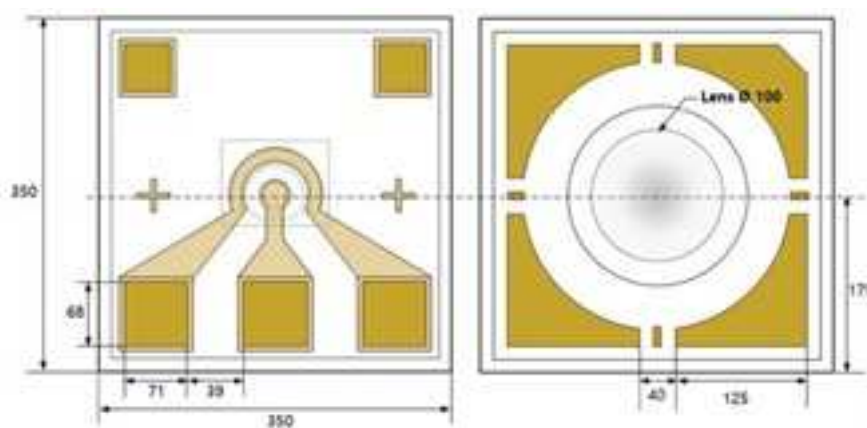
■ Electro-Optical Specifications (TC=25 °C)

Parameter	Symbol	Test Condition	Lens / Top(single) / Top(4ch array)			Unit
			Min.	Typ.	Max.	
Operating Wavelength	λ	–	1100	–	1640	nm
Responsivity	R	$V_R = 2.5V$ (@1310nm)	–	0.8	–	A/W
Dark current	I_D	$V_R = 5.0V$	–	1	10	nA
Bandwidth	BW	-3dB electrical, $P_{in} = -10dBm$	–	22	–	GHz
Total capacitance	C	$f = 1MHz, V_R = 2.5V$	–	0.08/0.11/0.11	0.15	pF

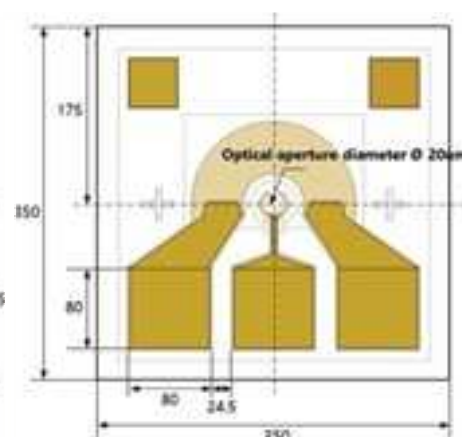
■ Mechanical Specifications

Parameter	Symbol	Chip Type			Unit
		Lens	Top(Single)	Top(4ch Array)	
PD active diameter	D	20	20	20	μm
Lens radius of curvature	R	95 ± 15	—	—	μm
Lens diameter	—	100	—	—	μm
Photodiode pitch	—	—	—	250	μm
Chip size	S _c	350 × 350	350 × 350	1,040 × 250	μm ²
Chip thickness	t	180 ± 15	150 ± 20	150 ± 20	μm
Bonding pad diameter	S _P	68 × 71	80 × 80	70 × 70	μm

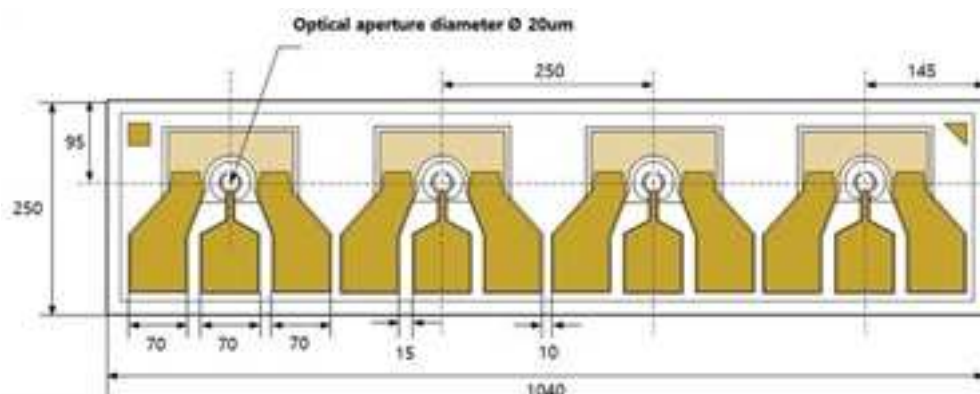
■ (a) Bottom Illumination with Integrated Lens (Single)



■ (b) Top Illumination (Single)



■ (c) Top Illumination (4ch Array)



(unit : μm)

25Gb/s APD Linear TIA ROSA

■ Applications

- 53–56GBaud Ethernet PAM4 Module

■ Features

- Single Channel 28Gb/s Avalanche Photodiode and 56GBaud Linear TIA
- Wide Wavelength Range: 1250 to 1650nm
- TIA Automatic Gain Control / TIA Output Amplitude Adjust
- Low Power Consumption 192mW (dark)
- LC Receptacle / TO–46 Package with Hermetic Sealing



■ Optical and Electrical Specifications (TC=25°C)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Responsivity	R	1310nm, 1μW, 0.9V _{BR}		6		A/W
Dark current	I _d	0.9V _{BR}		0.5	2.5	μA
Optical Wavelength Range	λ	-	1250		1650	nm
NRZ sensitivity	P _s	25.78Gb/s, PRBS=2 ³¹ -1, ER=5dB, λ=1310nm, 1E-12		-18.5	-17	dBm
NRZ Overload	P _{MAX}		-4			dBm
PAM4 sensitivity	-	26.6Gbaud, TDECQ=2.3dB, Outer ER=7.5dB, λ=1309nm, 5E-5		-19.5		dBm
TIA Supply Current	I _{CC}	V _{CC} =3.3V		58	72	mA
Breakdown Voltage	V _{BR}	I _d =10μA	22	28	33	V
Temperature Coefficient of V _{BR}	γ	-20°C to +85°C		30		mV/°C

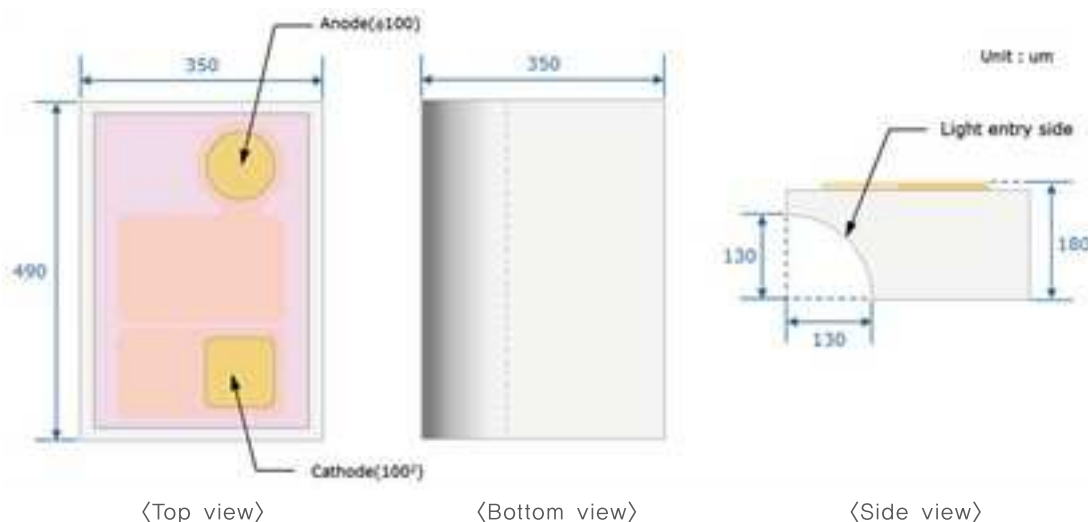
Side Illuminated Monitor PIN PD Chip

■ Applications

- Back facet monitoring of edge emitting lasers

■ Features

- Side illuminated InGaAs/InP monitor photodiode
- Low dark current



■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Reverse Voltage	V_R	20	V
Forward Current	I_F	10	mA
Operating Temperature	T_{OPR}	-40 to +85	°C
Storage Temperature	T_{STG}	-40 to +125	°C

■ Electro-Optical Specifications (TC=25°C)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Operating wavelength	λ	—	1000	—	1640	nm
Responsivity *	R	$V_R = 2.5V$ (@1550nm)	—	0.7	—	A/W
Dark current	I_D	$V_R = 5.0V$	—	1	10	nA
Total capacitance	C	f=1MHz, $V_R=2.5V$	—	7	—	pF

*Depend on optical coupling efficiency

56Gbaud PIN Photodiode Chip on Carrier

■ Applications

- Single λ 100bps receiver / 4 λ 400GbE TRx

■ Features

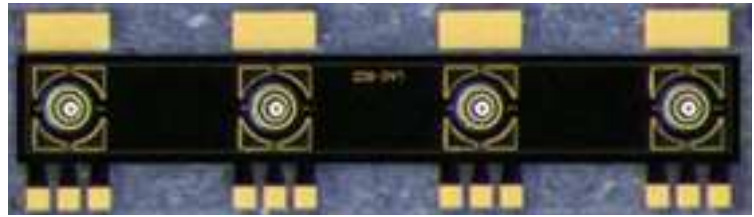
- InGaAs/InP PIN PD with bottom integrated lens
- Semi-planar structure for high reliability
- Coplanar GSG contact pads
- 4ch array type with 250 μ m & 750 μ m pitch
- Low dark current



(a) Single



(b) 4ch Array (250 μ m pitch)



(c) 4ch Array (750 μ m pitch)

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Reverse Voltage	V_R	10	V
Reverse Current	I_R	2.5	mA
Forward Current	I_F	10	mA
Optical Input Power	P_{Max}	5	dBm
Operating Temperature	T_{OPR}	-40 to +85	$^{\circ}$ C
Storage Temperature	T_{STG}	-40 to +125	$^{\circ}$ C

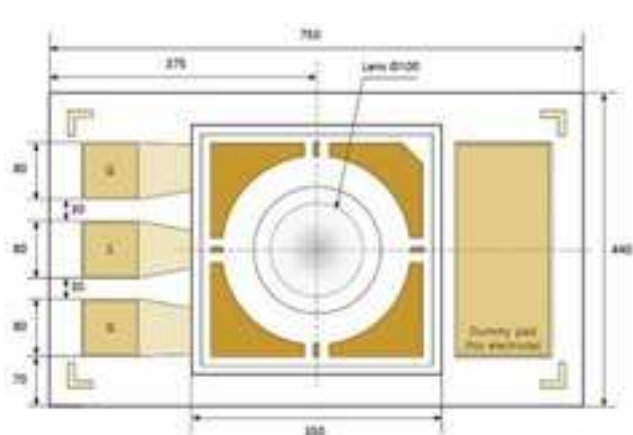
■ Electro-Optical Specifications (TC=25 $^{\circ}$ C)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Operating wavelength	λ	—	1100	—	1640	nm
Responsivity*	R	$V_R=2.5V$ (@1310nm)	—	0.8	—	A/W
Dark current	I_D	$V_R=5.0V$	—	0.1	10	nA
Bandwidth	BW	-3dB Electrical, $P_{in}=-10$ dBm	—	39	—	GHz
Total capacitance	C	$f=1$ MHz, $V_R=2.5V$	—	0.08	—	pF

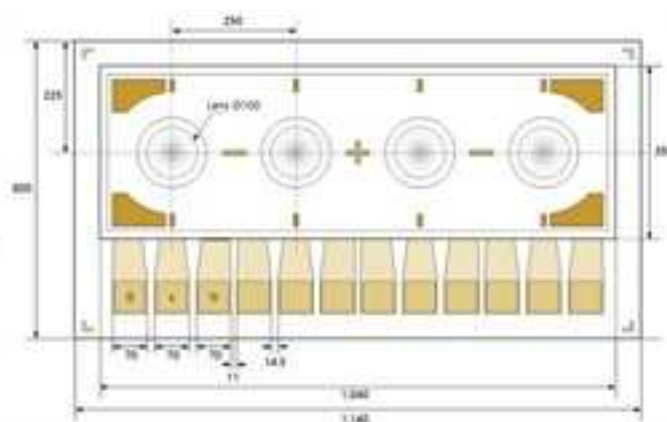
*Depend on optical coupling efficiency

■ Mechanical Specifications

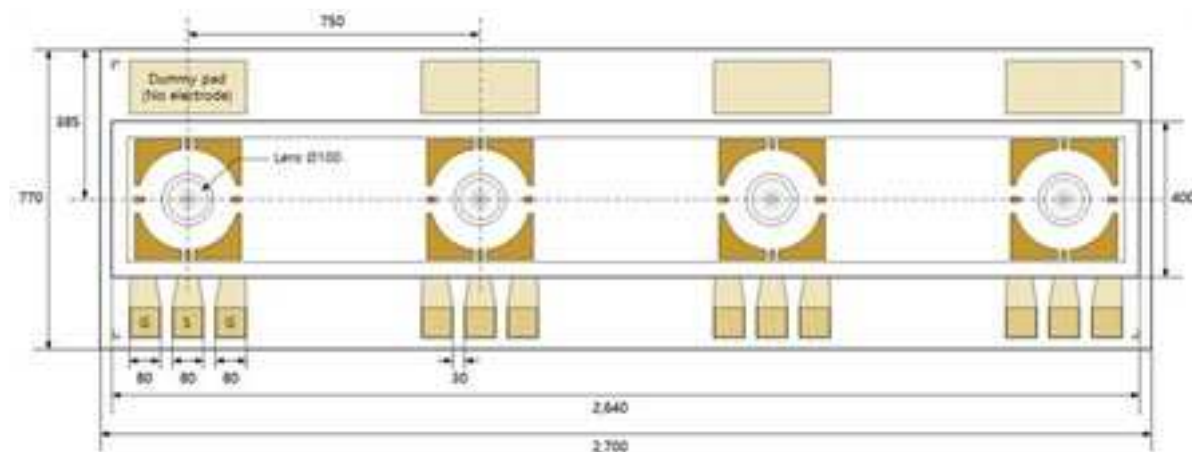
Parameter	Symbol	Chip type			Unit
		Single	4ch Array (250 μ m pitch)	4ch Array (750 μ m pitch)	
PD active diameter	D	12	12	12	μ m
Lens radius of curvature	R	85 \pm 15	85 \pm 15	85 \pm 15	μ m
Lens diameter	—	100	100	100	μ m
Photodiode pitch	—	—	250	750	μ m
Chip size	S _c	350x350	1,040 x 350	2,640 x 400	μ m ²
Carrier size	S _{coc}	750x440	1,140 x 600	2,700 x 770	μ m ²
Chip thickness	t	180 \pm 15	180 \pm 15	180 \pm 15	μ m
Carrier thickness	t _c	150 \pm 15	150 \pm 15	150 \pm 15	
Bonding pad diameter	S _p	80x80	70 x 70	80 x 80	μ m ²



(a) Single type



(b) 4ch Array type (250 μ m pitch)



(c) 4ch Array type (750 μ m pitch)

(unit: μ m)

SPAD(Single Photon Avalanche Diode)

■ Applications

- Single Photon Counting
- Quantum Cryptography
- Optical Time Domain Reflectometry
- Laser Range Finder
- Fundamental Studies in Quantum Physics
- QKD(Quantum Key Distribution)
- SPD(Single Photon Detector)



■ Features

- InGaAs/InP Avalanche Photodiode
- Optimized for 1000 to 1600nm Wavelength
- 10MHz~1GHz Gating Frequency Operation
- Built-in 3stage-TEC (Thermo-Electro Cooler)



■ Specifications (P: Premium Grade/S: Standard Grade)

Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Linear Mode (+25°C)	Breakdown Voltage	V_B	$I_D = 100 \mu A$	50	70	90	V
	Capacitance	C	$F = 1 \text{ MHz}, V_{PD}=0.9V_B$	–	0.25	–	pF
	Temperature Dependence of V_B	γ	Between $-40^\circ C$ and $85^\circ C$, linear approximation	–	0.11	–	V/K
Geiger Mode (-40°C)	AfterPulse Probabilility	APP	10MHz Gate Frequency 2ns Gate Pulse 20% PDE	–	–	10	%
	Dark Count Rate	DCR		–	0.5(P) 2.0(S)	–	KHz
	Detection Efficiency	PDE		–	20	–	%

LASER RangeFinder Receiver

■ Features

- 5ns~28ns Input Pulse
- InGaAs APD Chip
- Integrated CMOS TIA and LOGIC
- Providing TPT(Time Programmed Threshold) Mode
- Internally Adjusted and Temperature Compensated APD Bias
- Standard TO-8, FR4 PCB and Quartz Window



■ Specifications

Parameter		Performance	Test Conditions
PD	Type	InGaAs APD	—
	Diameter/Cap	200um/2.5 pF	—
	Leakage Current	Compensated	—
Operating Wavelength		1550nm	
MDS (Minimum Detectable Signal)		10nW (Typ.) 15nW (Max.)	@5ns Pulse, MR=5A/W, SNR=3.3 (PD=50%, FAR =0.1%) Noise= 4. 0mVrms Max
Multiple Target Resolution		200ns (Max.)	@100uW and 5ns Pulse, Successive Pulses with Same Amplitude
Time Programmed Threshold		Enabled	External Circuit Needed
Dynamic Range		1:55,000	From Noise Level to 100uW
Power Consumption		3.3V / 17mA	—
Output		CMOS with 15nS Duration	—
Walk Error		10ns (Typ.) 20ns (Max.)	@5ns Pulse
Weight		3g	—

Parameter	Symbol	Rating	Unit
TIA Supply Voltage	V _{DD}	3.6	V
APD Supply Voltage	V _{HV}	75	V
Optical Input Power	P _{opt}	1	mW
Operating Temperature	T _c	-32 to +64	°C
Storage Temperature	T _{STG}	-40 to +85	°C

LFMCW RADAR

Wooriro's LFMCW RADAR(Model name : WDR210) is released to be used for 2D position and movement detection. The small form factor and high performance provides a tracking solution for many applications.



■ Applications

- Low Cost, Low Power consumption
- High Performance 2D Position and Velocity Detection
- Blind Spot Detection for Vehicles
- Energy Saving of Indoor/Outdoor Lamps by movement detection

■ Features

- 24GHz ISM-band FMCW Radar
- Single Tx and Dual Rx Patch Antenna
- Single Wide-range Input Power Supply
- Small Form Factor and Flexible Interfaces Including Wireless or Wired Communications for Easy Applications
- Dual Rx Enables to Detect 2D Position and Velocity of Targets
- Tracking Capability Enables Classifications of Motions and then Minimizing False Alarms

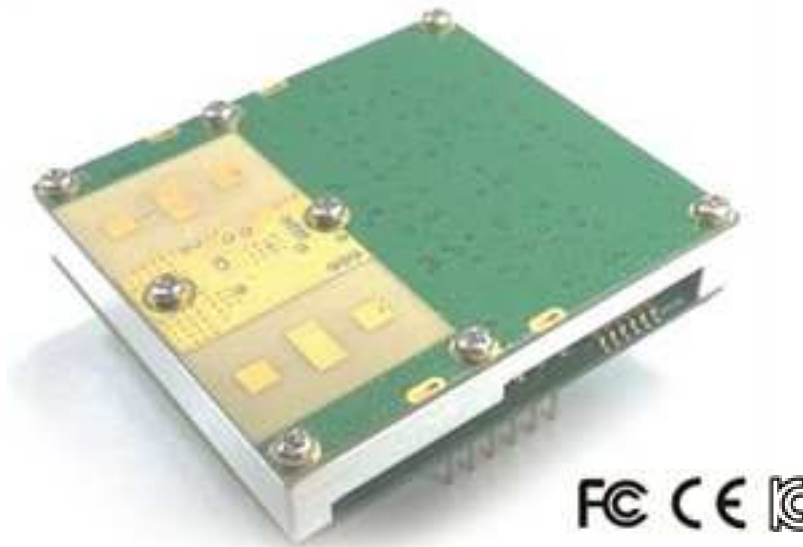
■ Specifications

Parameter	Symbol	Rating	Unit
Supplied Voltage	V _{DC}	+12	VDC
Operating Temperature	T _C	-40 to +85	°C
Storage Temperature	T _{STG}	-50 to +130	°C

Parameter	Performance	Test Conditions
Tx Frequency	24GHz ISM band	24.05~24.25GHz (EU/South Korea) 24.0~24.25 GHz (North America)
Output EIRP	18dBm(Max.)	Adjustable
Detection	Range	30m/60m(Max.)
	Range Resolution	75cm
		60cm
	Angle	80°
Angle Resolution	±5° (Max.)	Human Body/Vehicles EU/South Korea North America Horizontal
Data Update	10Hz(Max.)	
Size	111.1 X 118.6 X 36.4 (mm)	
Interface	RS485	Option, CAN2.0 or UART
Supply Voltage	+12VDC	
Power Consumption	2W(Max.)	
Water Proof	IP66	

Doppler RADAR

Wooriro's Doppler RADAR(Model name : WDR300) is released to be used for monotonic movement detection. The small form factor provides a low cost solution for many applications.



■ Applications

- Low Cost, Low Power consumption
- High Performance Monotonic Movement Detection
- Industrial Sensor System
- Energy Saving of Indoor/Outdoor Lamps by movement detection

■ Features

- 24GHz ISM-band CW Doppler Radar
- Dual 3 Patch Antenna
- Single 5VDC power supply
- Small Form Factor and Flexible Interfaces Including Wireless or Wired Communications for Easy Applications
- Quadrature demodulation for robust and radial velocity detection (approaching and receding)
- Long range movement detection and low power consumption
- Target classification (monotonic movement detection for low velocity movement)
- Minimized false alarms caused by random and/or periodic motion, which is essential in outdoor applications

■ Specifications

Parameter	Symbol	Rating	Unit
Supplied Voltage	V _{DC}	+5	VDC
Operating Temperature	T _C	-40 to +85	°C
Storage Temperature	T _{STG}	-50 to +130	°C

Parameter	Performance	Test Conditions
Tx Frequency	24.05~24.25GHz	ISM Band
Output EIRP	13dBm(Max.)	
Antenna	Beam Width	60° x 35°
	Polarization	Linear
Velocity	0.4km/h~200km/h	
Data Update*	0.5Hz 10Hz	Low Speed Mode High Speed Mode
Size	50 X 45 X 10 (mm)	
Interface	Header 6pin	
Supply Voltage	+5 VDC	
Power Consumption	1.0W	

* Target classification algorithm is applied only for low speed mode measurement.



📍 102-22, Pyeongdongsandan 6beon-ro,
Gwangsan-gu, Gwangju,
62453, Republic of Korea

✉ support@wooriro.com

🌐 www.wooriro.com

