

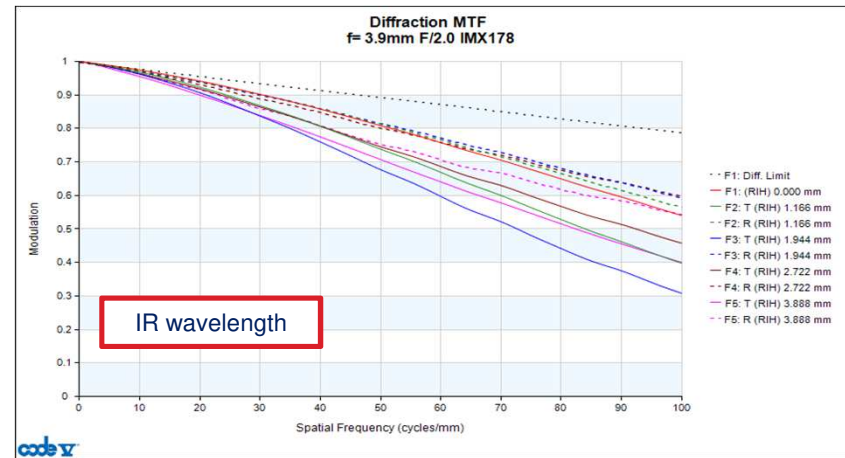
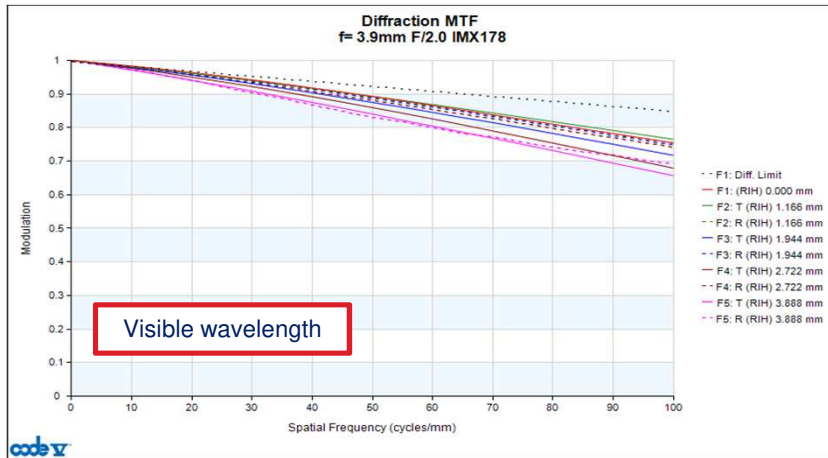


Optical Specification

	Description	3.9mm	5.0mm	7.6mm	Comment
Basic system parameters	Focal Length (EFL)	3.9mm ± 0.1mm	5.0mm ± 0.1mm	7.6mm ± 0.1mm	Effective Focal Length
	Back Focal Length (BFL)	6.1mm ± 5%	6.2mm ± 5%	6.1mm ± 5%	Distance from the rear lens
	Flange Back Length(FBL)	6.0mm ± 0.3mm	6.1mm ± 0.3mm	5.7mm ± 0.3mm	Distance from the rear barrel
	Full field Of View (FOV)	127.2°	99.4°	60.8°	Diagonal FOV
		96.1°	75.5°	47.9°	Horizontal FOV
		70.0°	55.1°	35.6°	Vertical FOV
	F-number (F/#)	2.0	2.0	2.0	± 5% (at, Infinite)
	Sensor model No.	IMX178LQJ (5M 4:3)	IMX178LQJ (5M 4:3)	IMX178LQJ (5M 4:3)	SONY
	Sensor model size	7.78mm(D) x 6.22mm(H) x 4.67mm(V)	7.78mm(D) x 6.22mm(H) x 4.67mm(V)	7.78mm(D) x 6.22mm(H) x 4.67mm(V)	Sensing area 1/2-inch CMOS
	Wavelengths	486.1nm~656.3nm / 780nm, 850nm	486.1nm~656.3nm / 780nm, 850nm	486.1nm~656.3nm / 780nm, 850nm	Visible & IR Wavelengths
	M12 Total Track Length (TTL)	30.0mm	30.0mm	30.5mm	From front surface to image plane
M12 Over All Length (OAL)	24.1mm	24.1mm	24.8mm	Lens Assembly Length	
Barrel Thread / Mount Format	M12 X P0.5 & CS-Mount	M12 X P0.5 & CS-Mount	M12 X P0.5 & CS-Mount	M12 & CS-Mount	
Lens system	Lens Number of Elements	8 components 8 elements	8 components 8 elements	7 components 7 elements	All Glass
	Coating MgF2	Element 1~8 (SLAR Coating)	Element 1~8 (SLAR Coating)	Element 1~7 (SLAR Coating)	SLR Coated Spec : Reflectivity <1% (400nm~700nm)
	Image Circle Error	>=8.0mm	>=8.0mm	>=8.0mm	Image Circle Diameter
	M12 Out diameter (OD)	Ø17.0	Ø17.0	Ø17.0	M12 Retainer OD
Optical performance	Relative Illumination	48.6%	63.0%	44.5%	At full field angle
	MTF as a function of line pairs/mm	MTF≥0.755 at 100 (LP/mm)	MTF≥0.733 at 100 (LP/mm)	MTF≥0.732 at 100 (LP/mm)	At center field
		MTF(T)≥0.657 at 100 (LP/mm)	MTF(T)≥0.640 at 100 (LP/mm)	MTF(T)≥0.607 at 100 (LP/mm)	At full field
		MTF(S)≥0.694 at 100 (LP/mm)	MTF(S)≥0.677 at 100 (LP/mm)	MTF(S)≥0.636 at 100 (LP/mm)	At full field
Optical Distortion	< -51.0%	< -34.0%	< -12.7%	At, full Field	



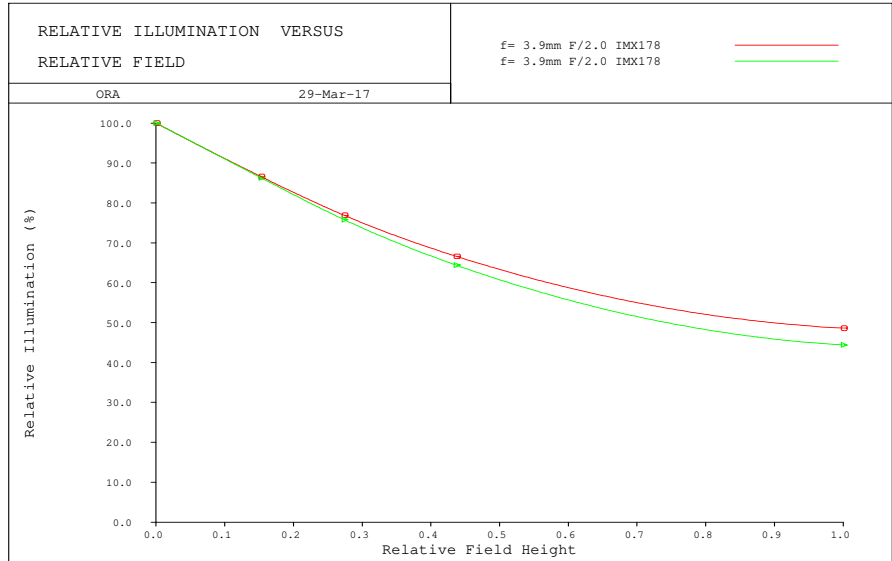
3.9mm MTF (Visible / IR)



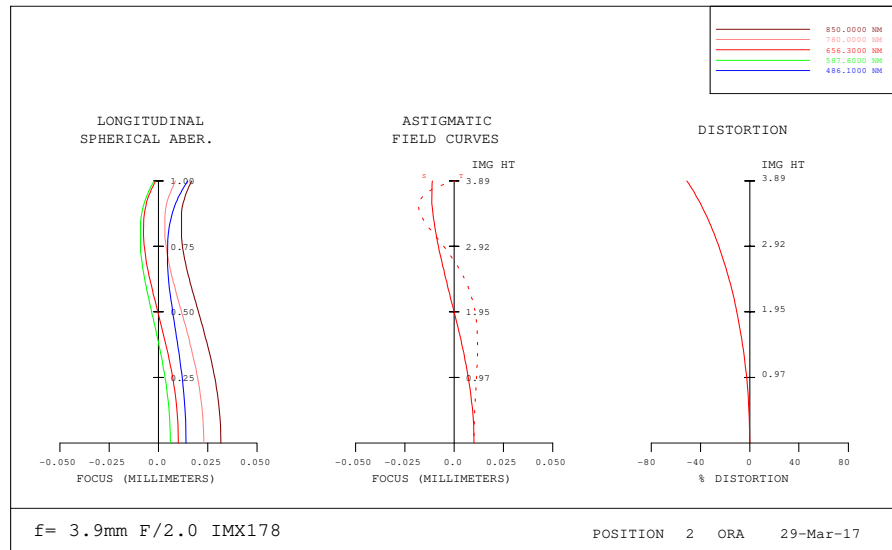
Description	Visible Wavelength (486.1nm~656.3nm)	IR Wavelength (780nm, 850nm)	Comment
MTF as a function of line pairs/mm	MTF \geq 0.755 at 100 (LP/mm)	MTF \geq 0.541 at 100 (LP/mm)	At center field
	MTF(T) \geq 0.657 at 100 (LP/mm)	MTF(T) \geq 0.401 at 100 (LP/mm)	At full field
	MTF(S) \geq 0.694 at 100 (LP/mm)	MTF(S) \geq 0.546 at 100 (LP/mm)	At full field

• 3.9mm Optical Performance

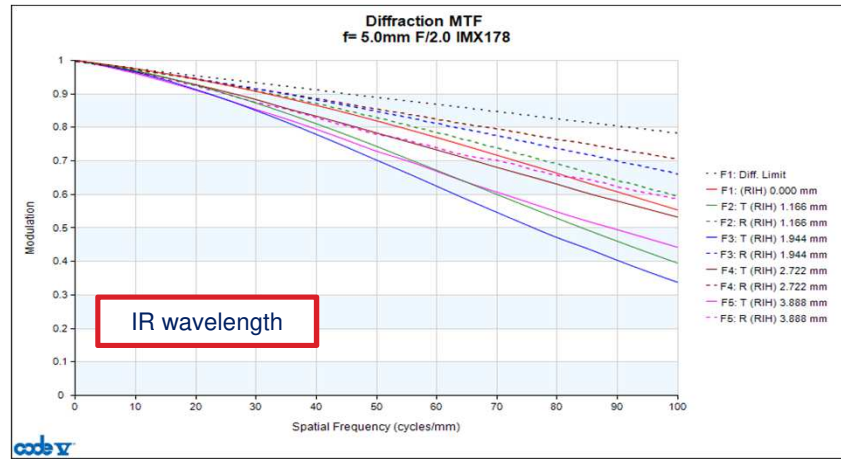
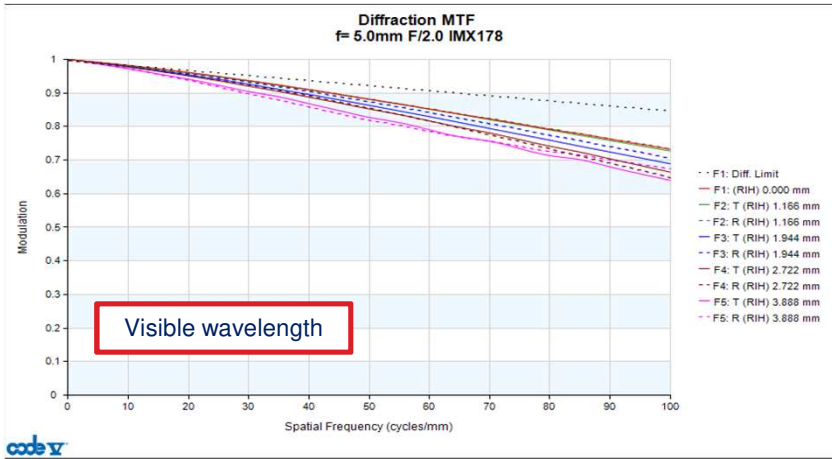
Relative Illumination



Field Curvature & Optical Distortion



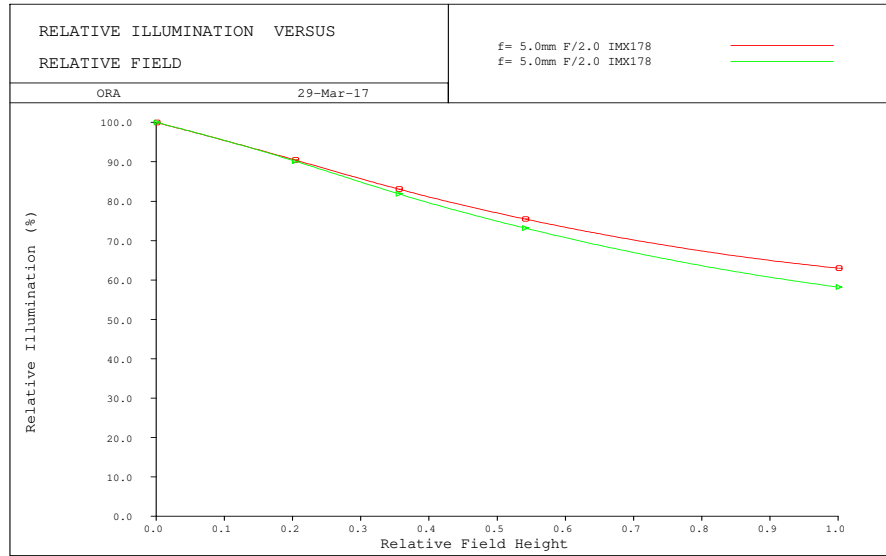
• 5.0mm MTF (Visible / IR)



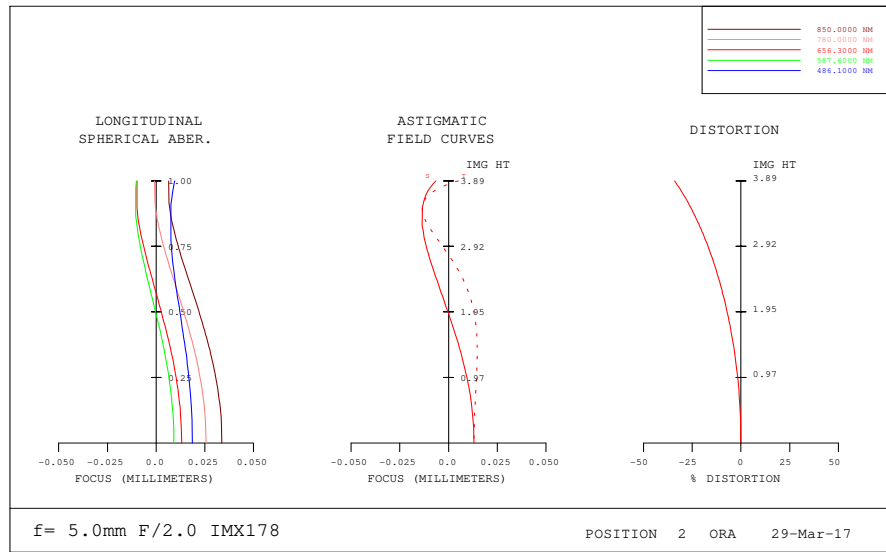
Description	Visible Wavelength (486.1nm~656.3nm)	IR Wavelength (780nm, 850nm)	Comment
MTF as a function of line pairs/mm	MTF \geq 0.733 at 100 (LP/mm)	MTF \geq 0.554 at 100 (LP/mm)	At center field
	MTF(T) \geq 0.640 at 100 (LP/mm)	MTF(T) \geq 0.442 at 100 (LP/mm)	At full field
	MTF(S) \geq 0.677 at 100 (LP/mm)	MTF(S) \geq 0.589 at 100 (LP/mm)	At full field

• 5.0mm Optical Performance

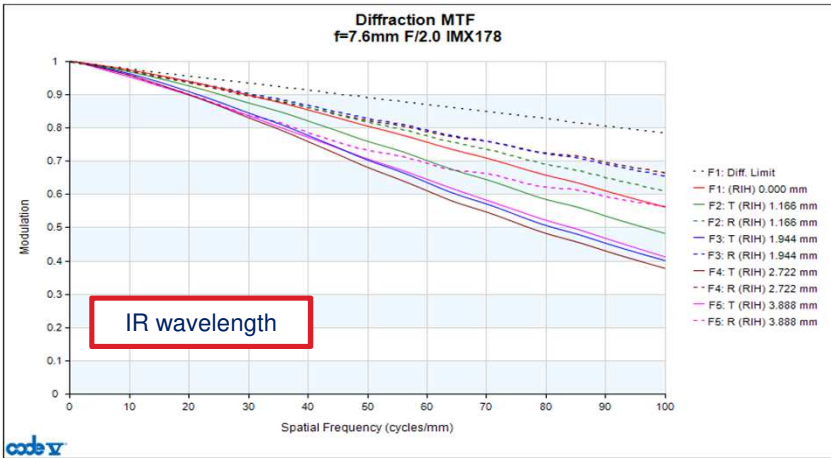
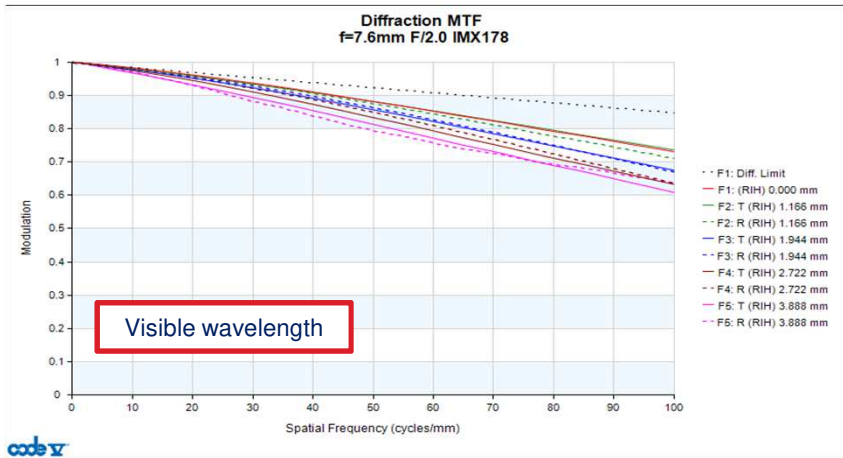
Relative Illumination



Field Curvature & Optical Distortion



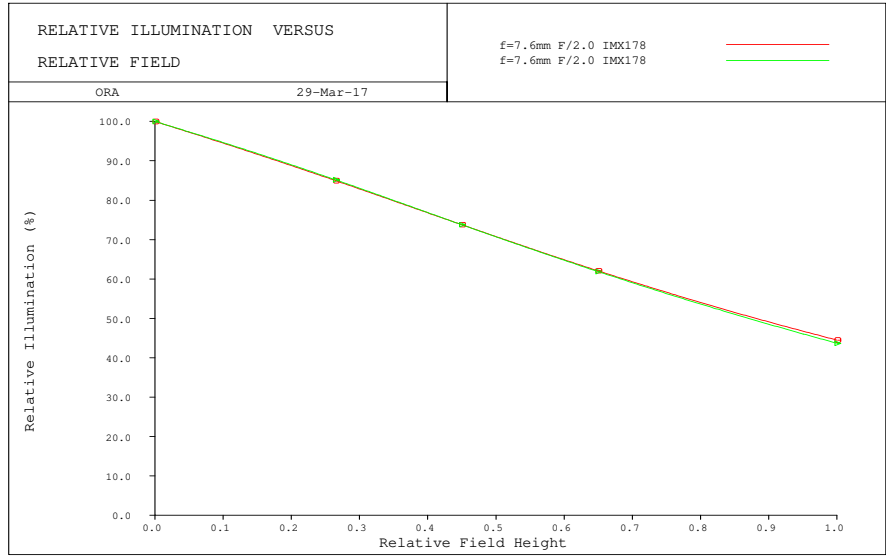
• 7.6mm MTF (Visible / IR)



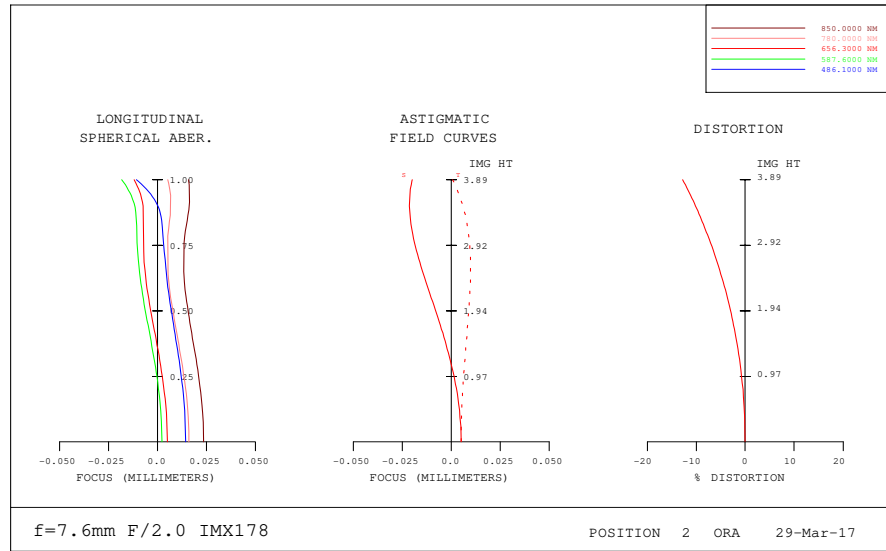
Description	Visible Wavelength (486.1nm~656.3nm)	IR Wavelength (780nm, 850nm)	Comment
MTF as a function of line pairs/mm	MTF≥0.732 at 100 (LP/mm)	MTF≥0.563 at 100 (LP/mm)	At center field
	MTF(T)≥0.607 at 100 (LP/mm)	MTF(T)≥0.412 at 100 (LP/mm)	At full field
	MTF(S)≥0.636 at 100 (LP/mm)	MTF(S)≥0.563 at 100 (LP/mm)	At full field

• 7.6mm Optical Performance

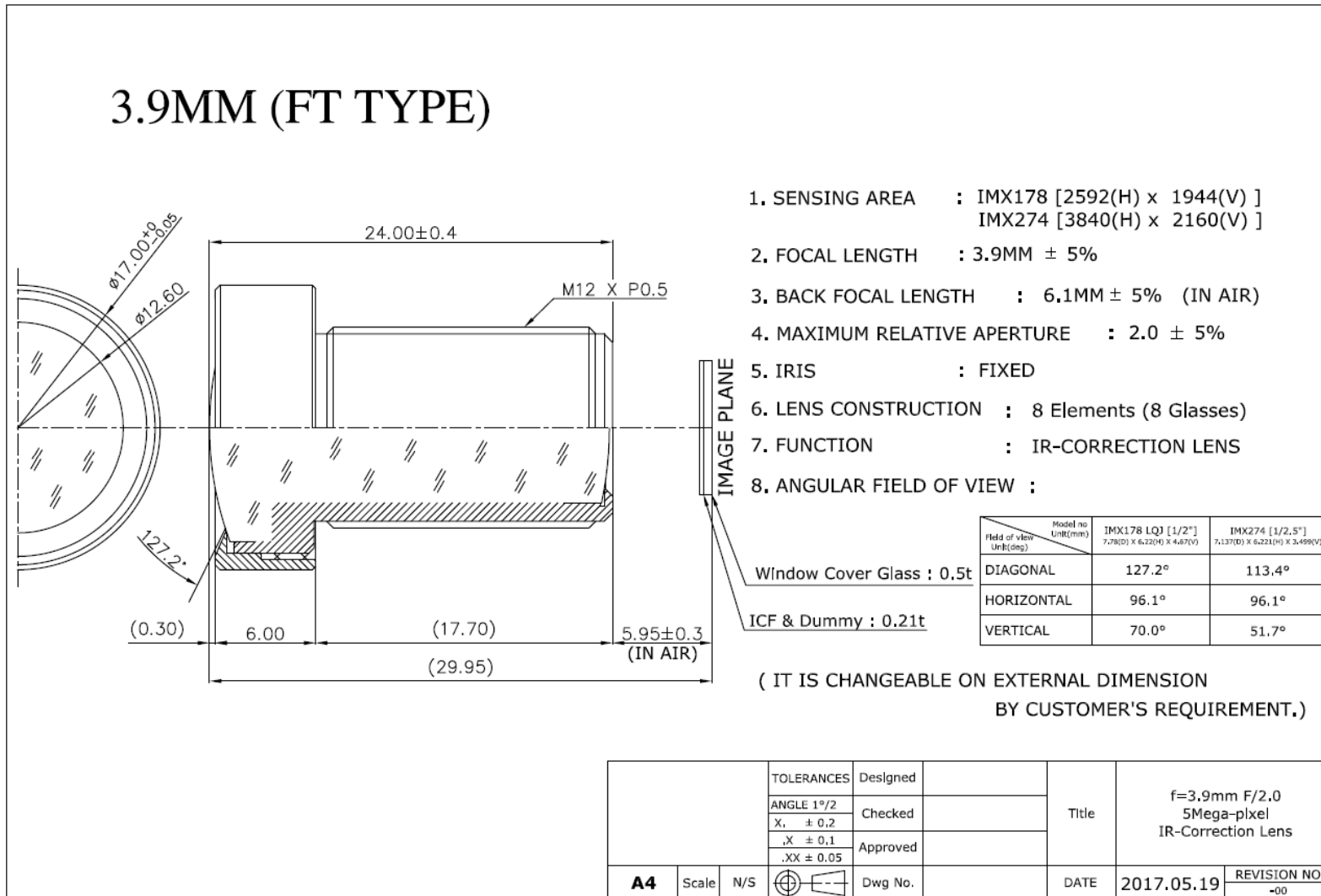
Relative Illumination



Field Curvature & Optical Distortion

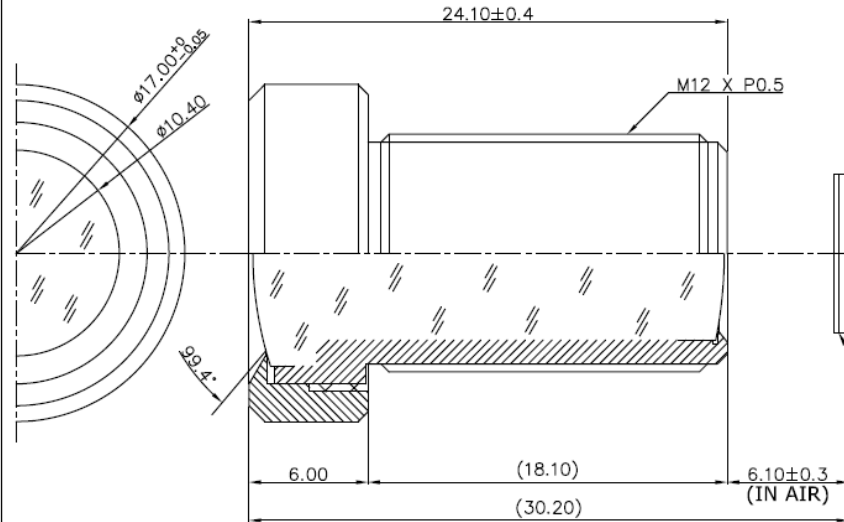


• V-553.9-5MP-VIS-IR M12 Optical system 2D Lay out (f=3.9mm)



V-555.0-5MP-VIS-IR M12 Optical system 2D Lay out (f=5.0mm)

5.0MM (FT TYPE)



1. SENSING AREA : IMX178 [2592(H) x 1944(V)]
IMX274 [3840(H) x 2160(V)]
2. FOCAL LENGTH : 5.0MM ± 5%
3. BACK FOCAL LENGTH : 6.2MM ± 5% (IN AIR)
5. IRIS : FIXED
4. MAXIMUM RELATIVE APERTURE : 2.0 ± 5%
6. LENS CONSTRUCTION : 8 Elements (8 Glasses)
7. FUNCTION : IR-CORRECTION LENS
8. ANGULAR FIELD OF VIEW :

Window Cover Glass : 0,5t
ICF & Dummy : 0.21t

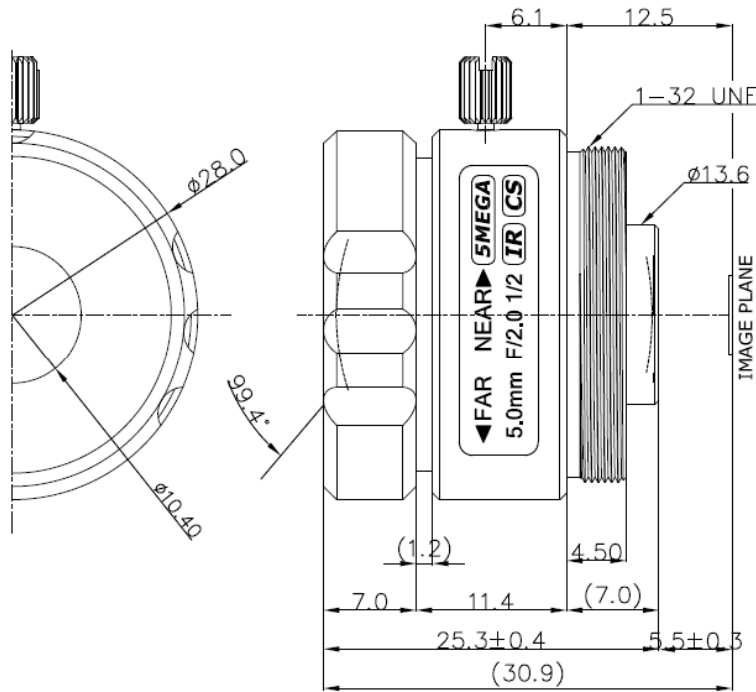
Field of view Unit(deg)	Model no Unit(mm)	IMX178 LQ1 [1/2"] 7,78(D) X 6,22(H) X 4,67(V)	IMX274 [1/2,5"] 7,137(D) X 6,221(H) X 3,498(V)
DIAGONAL		99,4°	88,9°
HORIZONTAL		75,5°	75,5°
VERTICAL		55,0°	40,7°

(IT IS CHANGEABLE ON EXTERNAL DIMENSION
BY CUSTOMER'S REQUIREMENT.)

TOLERANCES			Designed	Title	f=5.0mm F/2.0 5Mega-pixel IR-Correction Lens
ANGLE 1°/2			Checked		
X, ± 0,2			Approved		
.X ± 0,1 .XX ± 0,05					
A4	Scale	N/S	Dwg No.	DATE	2017.05.19
					REVISION NO. -00

- V-555.0-5MP-VIS-IR 1/2 Optical system 2D Lay out (f=5.0mm)


5.0MM (CS-MOUNT)



1. SENSING AREA : IMX178 [2592(H) x 1944(V)]
IMX274 [3840(H) x 2160(V)]
2. FOCAL LENGTH : 5.0MM ± 5%
3. BACK FOCAL LENGTH : 6.2MM ± 5% (IN AIR)
4. MAXIMUM RELATIVE APERTURE : 2.0 ± 5%
5. IRIS : FIXED
6. LENS CONSTRUCTION : 8 Elements (8 Glasses)
7. FUNCTION : IR-CORRECTION LENS
8. ANGULAR FIELD OF VIEW :

Field of view Unit(deg)	Model no Unit(mm)	IMX178 LQ [1/2"] 7.78(H) X 6.22(V) X 4.67(V)	IMX274 [1/2.5"] 7.137(H) X 6.221(H) X 3.499(V)
DIAGONAL		99.4°	88.9°
HORIZONTAL		75.5°	75.5°
VERTICAL		55.1°	40.7°

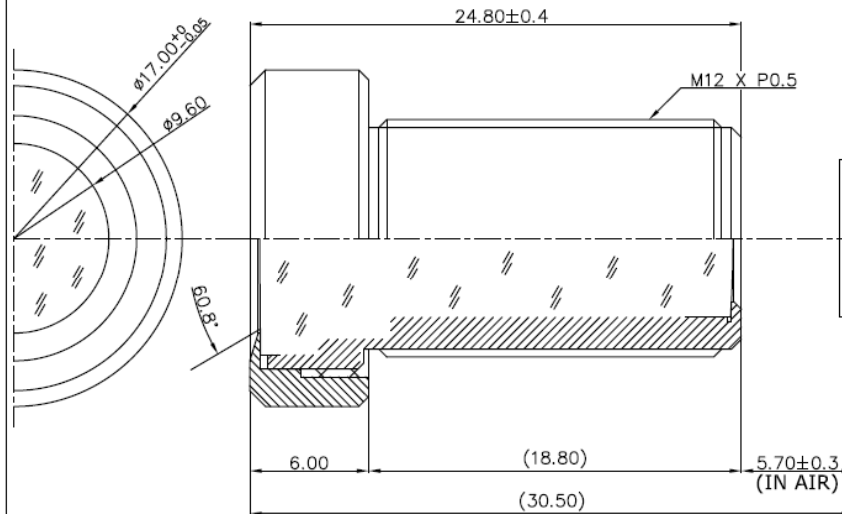
(IT IS CHANGEABLE ON EXTERNAL DIMENSION
BY CUSTOMER'S REQUIREMENT.)

			TOLERANCES	Designed			Title	f=5,0mm F/2.0 5Mega-pxel IR-Correction Lens
			ANGLE 1°/2	Checked				
			X, ± 0.2	Approved				
			.X ± 0.1 .XX ± 0.05					
A4	Scale	N/S		Dwg No.	DATE	2017.06.29	REVISION NO. -00	



- V-557.6-5MP-VIS-IR M12 Optical system 2D Lay out (f=7.6mm)

7.6MM (FT TYPE)



1. SENSING AREA : IMX178 [2592(H) x 1944(V)]
IMX274 [3840(H) x 2160(V)]
2. FOCAL LENGTH : 7.6MM ± 5%
3. BACK FOCAL LENGTH : 6.1MM ± 5% (IN AIR)
4. MAXIMUM RELATIVE APERTURE : 2.0 ± 5%
5. IRIS : FIXED
6. LENS CONSTRUCTION : 7 Elements (7 Glasses)
7. FUNCTION : IR-CORRECTION LENS
8. ANGULAR FIELD OF VIEW :

Window Cover Glass : 0,5t
ICF & Dummy : 0,21t

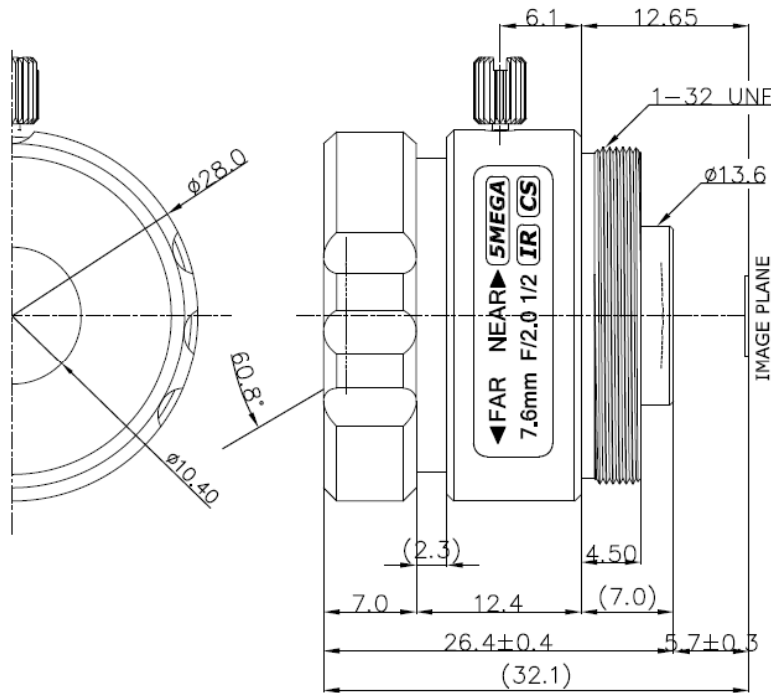
Field of view Unit(deg)	Model no Unit(mm)	IMX178 LQJ [1/2"] 7,79(H) X 6,22(V) X 4,67(V)	IMX274 [1/2.5"] 7,137(H) X 6,221(H) X 3,499(V)
DIAGONAL		60.8°	55.4°
HORIZONTAL		47.9°	47.9°
VERTICAL		35.6°	26.6°

(IT IS CHANGEABLE ON EXTERNAL DIMENSION
BY CUSTOMER'S REQUIREMENT.)

TOLERANCES			Designed		Title	f=7,6mm F/2,0 5Mega-pxel IR-Correction Lens
ANGLE 1°/2			Checked			
X _c ± 0,2			Approved			
.X ± 0,1 .XX ± 0,05						
A4	Scale	N/S	Dwg No.	DATE	2017.05.19	REVISION NO. -00

- V-557.6-5MP-VIS-IR 1/2 Optical system 2D Lay out (f=7.6mm)

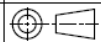
7.6MM (CS-MOUNT)



- SENSING AREA : IMX178 [2592(H) x 1944(V)]
IMX274 [3840(H) x 2160(V)]
- FOCAL LENGTH : 7.6MM ± 5%
- BACK FOCAL LENGTH : 6.1MM ± 5% (IN AIR)
- MAXIMUM RELATIVE APERTURE : 2.0 ± 5%
- IRIS : FIXED
- LENS CONSTRUCTION : 7 Elements (7 Glasses)
- FUNCTION : IR-CORRECTION LENS
- ANGULAR FIELD OF VIEW :

Field of view Unit(deg)	Model no Unit(mm)	IMX178 LQ [1/2"] 7.78(D) X 6.22(H) X 4.67(V)	IMX274 [1/2.5"] 7.137(D) X 6.221(H) X 3.499(V)
DIAGONAL		60.8°	55.4°
HORIZONTAL		47.9°	47.9°
VERTICAL		35.6°	26.6°

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			TOLERANCES	Designed		Title	f=7.6mm F/2.0 5Mega-pixel IR-Correction Lens	
			ANGLE 1°/2	Checked				
			.X ± 0.2	Approved				
			.XX ± 0.05					
A4	Scale	N/S		Dwg No.		DATE	2017.06.29	REVISION NO. -00