

## TL936 Motorized Telephoto Day/Night 4K Compatible Megapixel Lens



9mm



36mm

- ✓ Compatible with 4K cameras (1/2.3" Sony IMX172 for example) with **5+ megapixel resolution** for demanding applications
- ✓ **Fully motorized versions**, or combinations with zoom, focus, iris, IR cut, and limit switch
- ✓ **4x zoom**: 9-36mm for long reach and field of view optimization
- ✓ Available in DC **auto-iris** and **P-iris** versions
- ✓ IR corrected for true **Day/Night** cameras
- ✓ **Compact** design (< 50mm TTL) to fit into domes as small as 4" mini-dome size
- ✓ CS-mount and smooth D25 board mount options
- ✓ For 1/3", 1/2.7" HD, 1/2.5" and 1/2.3" 4K\* sensors

### TL936 lens family specifications

Focal length	9-36mm
Resolution	5+ megapixel
F/#	F/1.5 to close
IR Correction	Day/Night
Lens length	<50mm
Focus range	2.5m - infinity
Operating temperature	-20C to 60C (<70% humidity, non-condensing)
Storage temperature	-20C to 70C (<90% humidity, non-condensing)
CS mount slip range	320°

### Field of view for sensor sizes

Sensor size	1/3"	1/2.7" HD	1/2.5"	1/2.3" 4K*
Field of view (H)	30° - 7.1°	37° - 8.6°	36° - 8.5°	39° - 10°
Field of view (V)	22° - 5.3°	20° - 4.8°	27° - 6.3°	19° - 5.0°
Field of view (D)	38° - 8.8°	42° - 9.9°	46° - 10.6°	44° - 11°

\*4K format 4000x2000 pixels

## Lens designation

**TL936x xx -xx**

blank: CS mount  
25: smooth Ø25mm mount

A: autoiris  
P: P-iris

R3: motorized zoom, focus, iris  
R4: motorized zoom, focus, iris, IRC  
R5: motorized zoom, focus, iris, with limit switch for zoom, focus limits  
R6: motorized zoom, focus, iris, IRC, with limit switch for zoom, focus limits

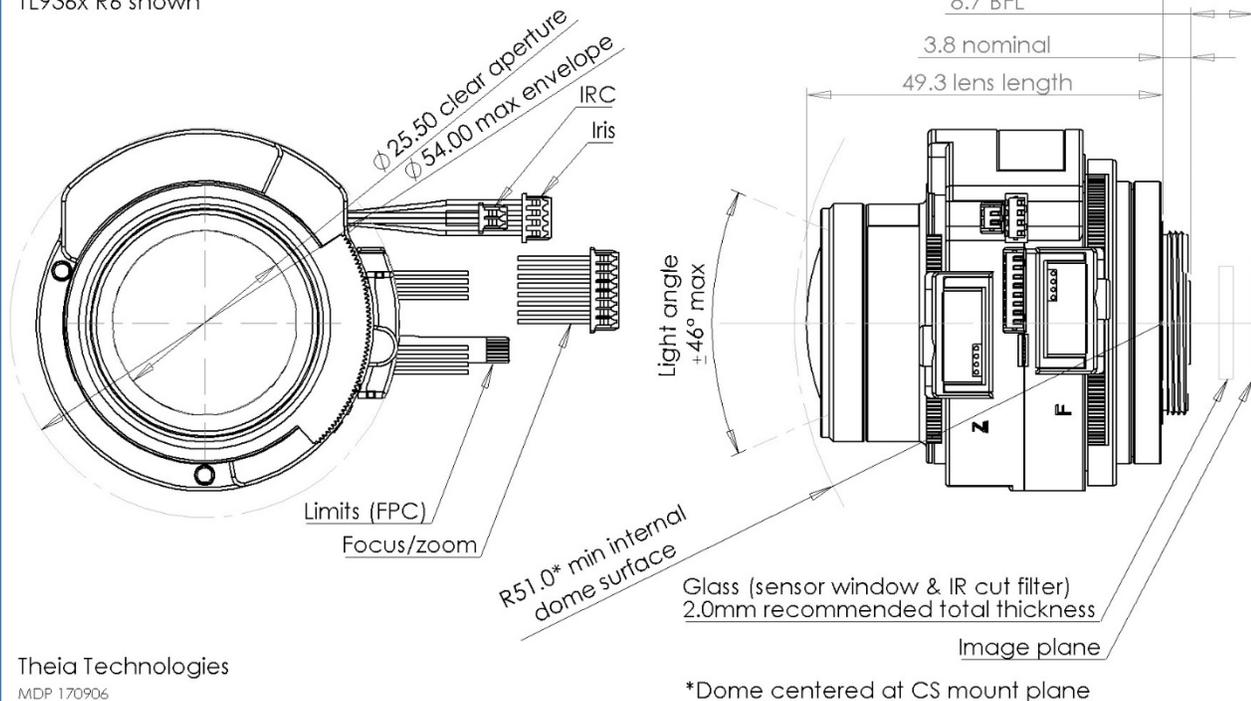
### Production versions (call for other version):

TL936A R6    TL936P R6    TL936P R6 25  
TL936A R5  
TL936A R4    TL936P R4  
                  TL936P R3

Other versions are available by special request and may be added to regular production depending on volume.

## TL936 motorized telephoto

TL936x R6 shown



Theia Technologies  
MDP 170906

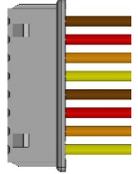


## Zoom/Focus motor specifications

Drive	Stepper motor 2 phase bipolar drive			
Operation voltage	3.3V (operating range 2.6~4.8V)			
Maximum continuous operation time (seconds) for operation voltage and ambient temperature	3.3V	4.0V	4.8V	
	20C	60s	12s	6s
	40C	35s	9s	5s
	60C	20s	6s	4s
Coil resistance	28.5Ω ±7%			
Gear ratio	1:2308			
Zoom number of steps	2994 steps between hard stops			
Zoom speed range	800pps to 1500pps*			
Zoom cam rotation	57°			
Focus number of steps	5180 steps between hard stops			
Focus speed range	1000pps to 1500pps*			
Focus cam rotation	101°			
Focus/zoom connectors	Housing: Molex 51021-0800 Terminal: Molex 50058-8000			
Cable length	150mm			

Zoom: Wide -> Tele				
Focus: Near -> ∞				
Step	A+	A-	B+	B-
0	H	L	H	L
1	L	H	H	L
2	L	H	L	H
3	H	L	L	H

Pin	Color	Function	Motor
1	Brown	A+	Focus
2	Red	A-	Focus
3	Gray	B+	Focus
4	Yellow	B-	Focus
5	Brown	A+	Zoom
6	Red	A-	Zoom
7	Gray	B+	Zoom
8	Yellow	B-	Zoom

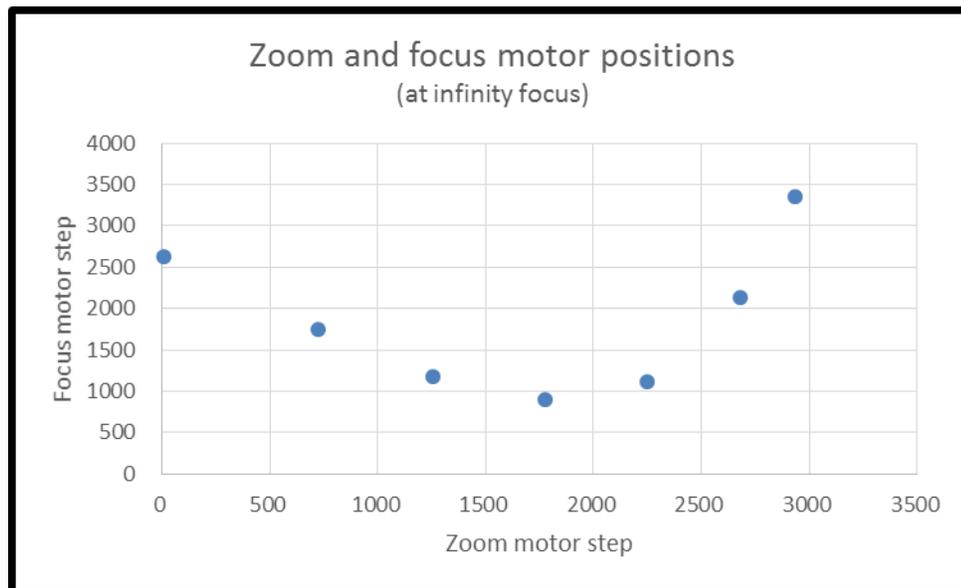


\*Do not let motor coil temperature exceed 115°C

Zoom/Focus motor map for focus at infinity

Focal length [mm]	Zoom motor note	Zoom ring rotation [deg]	Zoom motor step number [#]	Focus ring rotation [deg]	Focus motor step number [#]
9.27	Mechanical stop	0.0	0	0.0	0
	Wide end	0.2	10	51.3	2631
	PI trigger*	0.7	36		
12.19		14.10	723	34.0	1743
15.3		24.50	1256	23.1	1186
19.47		34.60	1774	17.5	898
24.56		43.80	2246	21.8	1117
30.86		52.30	2682	41.7	2138
	PI trigger*	56.70	2908		
35.45	Tele end	57.20	2933	65.4	3353
	Mechanical stop	57.40	2994	101.0	5180

\*PI: photo interrupter trigger point for applicable models TL936A R5, TL936P R5, TL936A R6, TL936P R6



## DC autoiris motor specifications

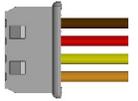
Applicable models: TL936Axx

Drive	DC
Operation voltage	3V (2.5~5.0V)
Max current consumption	26mA
Drive coil resistance	190Ω ±10%
Damper coil resistance	855Ω ±7%

Applicable models: **TL936A R4, TL936A R6**

Connector type 1	Molex
Connector type	Housing: Molex 51021-0400 Terminal: Molex 50058-8000
Cable length	150mm

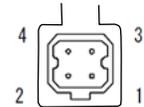
Pin	Color	Function
1	Brown	Control -
2	Red	Control +
3	Yellow	Drive +
4	Orange	Drive -



Applicable models: **TL936A R3, TL936A R5**

Connector type 2	CCTV
Connector type	Housing: EYC 221
Cable length	300mm

Pin	Function
1	Control -
2	Control +
3	Drive +
4	Drive -



## P-iris motor specifications

Applicable models: TL936Pxx

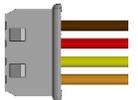
Drive	Stepper motor 2 phase bipolar drive
Operating voltage	4V (2.7~5.0V)
Number of steps	Step 1: stop Step 2: Full open Step 72: Full close Step 75: stop
Basic step angle	18°
Maximum response freq.	200 pps
Coil resistance	30Ω ±10% (each phase)

P-iris: open->close					
Step	A+	A-	B+	B-	
0	H	L	H	L	
1	L	H	H	L	
2	L	H	L	H	
3	H	L	L	H	

Applicable models: **TL936P R4, TL936P R6**

Connector type 1	Molex
Connector type	Housing: Molex 51021-0400 Terminal: Molex 50058-8000
Cable length	150mm

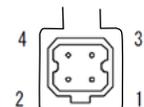
Pin	Color	Function
1	Brown	B+
2	Red	B-
3	Yellow	A+
4	Orange	A-



Applicable models: **TL936P R3, TL936P R5**

Connector type 2	CCTV
Connector type	Housing: EYC 221
Cable length	300mm

Pin	Function
1	B+
2	A+
3	A-
4	B-



### P-iris motor map

Step	Aperture Size [mm <sup>2</sup> ]	F/#
1	95.0	1.54
5	90.8	1.54
10	82.1	1.61
15	72.8	1.71
20	63.4	1.83
25	54.0	1.98
30	44.9	2.17
35	36.0	2.42

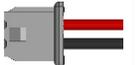
Step	Aperture Size [mm <sup>2</sup> ]	F/#
40	27.7	2.76
45	20.0	3.24
50	13.2	3.98
55	7.5	5.30
60	3.1	8.20
65	0.8	15.71
70	0.1	56.29
72	0.0	Closed

### IR Cut specifications

Applicable models: TL936AR4, TL936AR6, TL936PR4, TL936PR6

Electrical specifications	
Drive	DC
Operating voltage	4.0V
Drive coil resistance	130Ω ±10%
Connector type	Housing: Molex 51021-0200 Terminal: Molex 50058-8000
Cable length	150mm
Optical specifications for IR filter (Day)	
Cut-on wavelength	405nm ±10nm
Visible transmission	430-610nm
Cut-off wavelength	650nm ±10nm
IR transmission	<5% max 700-1000nm <10% ave 1000-1100nm
Optical specifications for clear filter (Night)	
Visible transmission	400-1050nm

Mode	Pin 1	Pin 2
Day (IR filter)	L	H
Night (clear filter)	H	L
Wire color	Red	Black

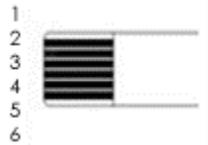


### Zoom/Focus limit switch

Applicable models: TL936AR5, TL936AR6, TL936PR5, TL936PR6

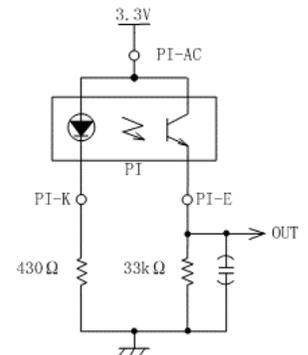
Type	Photo interrupter phototransistor
Part model	Sharp GP1S396HCPSF
Operating voltage	3.3V
Output level	>2.2V HIGH <0.6V LOW
Connector type	FPC cable
Board-side mating connector type (not supplied)	Molex 52746-0671 Molex 52745-0697 Molex 52559-0652
Cable length	90mm

Pin*	Function	Motor
1	Emitter	Focus
2	Anode/Collector	
3	Cathode	
4	Emitter	Zoom
5	Anode/Collector	
6	Cathode	



\*cable side pin designation matches Molex 52746-0671 connector (contacts on bottom)

Recommended circuit for each photo interrupter



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**Revisions**

<b>Version</b>	<b>Change</b>	<b>Reason</b>
160104	Changed DC iris damper coil resistance	Corrected error
	Changed IR cut pin-out	Changed to match industry standard
	Updated production version list	Added new models
160113	Added motor energizing time maximums	Clarification to prevent focus/zoom motor overheating
	Updated temperature spec	Consistent with motor supplier specification
161107	Changed drawing	Added 2mm glass to drawing
170109	Changed PI FPC pin-out	To match bottom side contacts connector; top side connector may have been discontinued
170906	Added pictures and drawings of different lens versions	
180117	Corrected FPC pinout	Pinout numbering was reversed
181206	Motor speed	Updated focus/zoom motor speeds, recommended speeds were not specified. Updated P-iris speed
	Added QR code	Linked to TL936 webpage