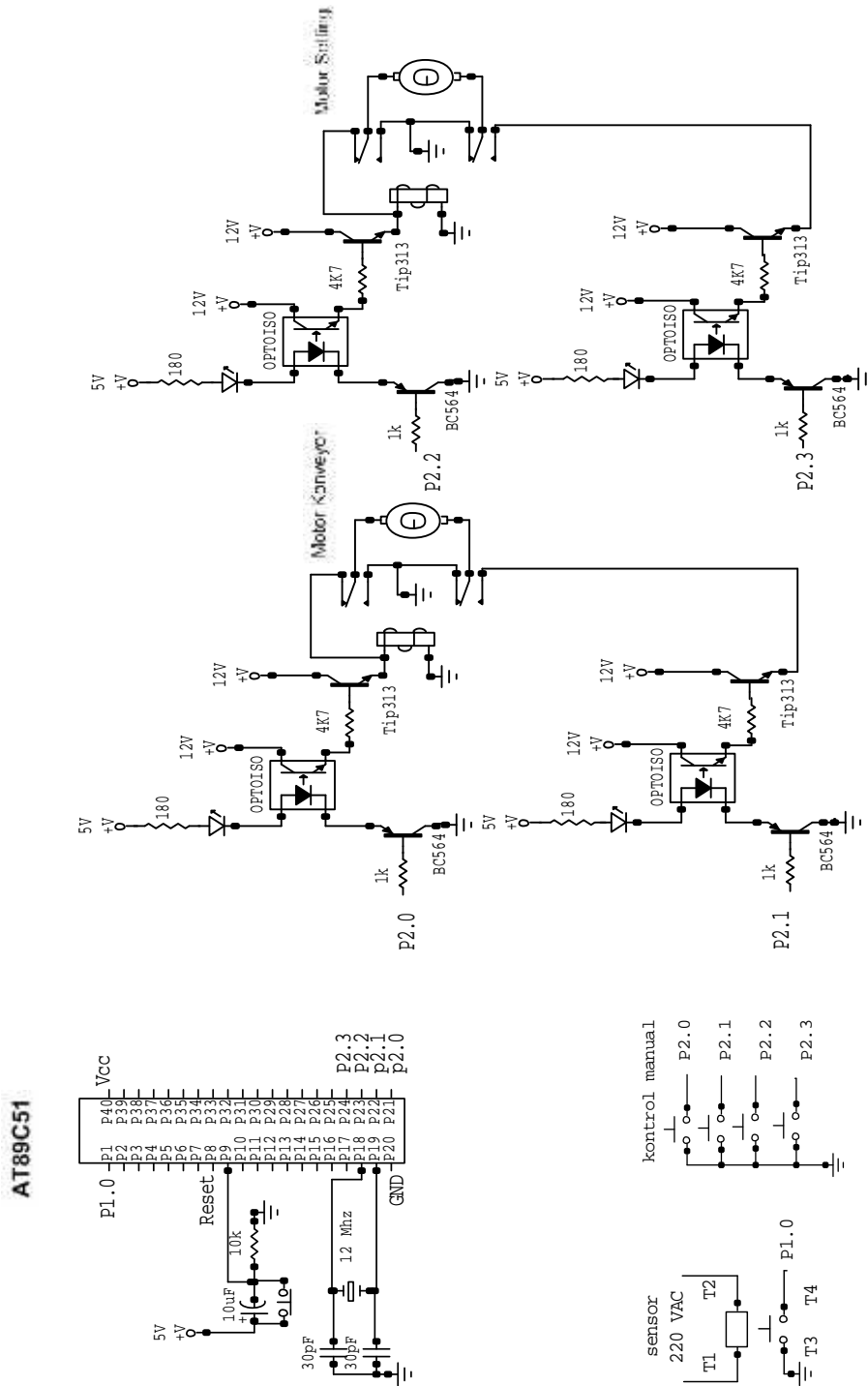


LAMPIRAN-LAMPIRAN

Lampiran 1. Rangkaian Alat Pemilihan Ketebalan Kayu



Lampiran 2. Alat Pemilihan Ketebalan Kayu



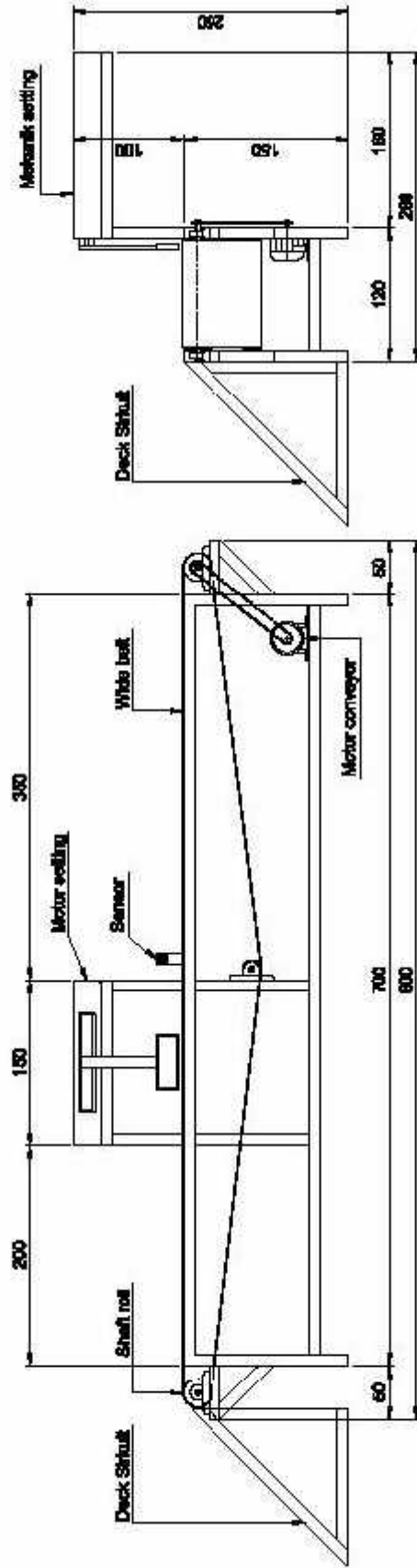
Rangkaian power supply



Rangkaian pengontrol



ALAT PEMILAHAN KETEBALAN KAYU



Lampiran 3. Tipe Sensor SunX VF-D1000T

VF SERIES

Terminal Connection Type Multi-voltage Photoelectric Sensor **Power Supply Built-in**



Easy to use terminal connection type



New convenient construction

The slanting step-wise terminal enables quick and easy connection.

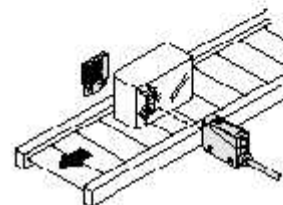


Multi-voltage

The VF series can operate at 24 to 240 V AC or 12 to 240 V DC, which makes it suitable for supply voltages all over the world

Retroreflective sensor with polarizing filters VF-PRM3

VF-PRM3 ensures reliable sensing even with shiny or specular objects traveling in any direction.



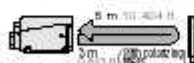
Long sensing range

The VF series ensures stable detection with its long sensing range.

Infrared-beam type



Retroreflective type



Diffuse reflective type



Timer function models

The sensing signal can be easily converted into a signal suitable for your control process. It is also suitable for PLC input

- Timer duration: 0.1 to 5 sec. (Variable)
- Operation: ON-delay, OFF-delay, ONE SHOT (Normal)

Non-contact output type available

The VF2 series which incorporates a dual circuit transistor output (NPN and PNP) is also available in the same sensor body. It is suited for fast switching sensing, or applications requiring a fast response.

- Output: NPN universal transistor, PNP open-collector transistor
- Power supply: 12 to 24 V DC \pm 10 %

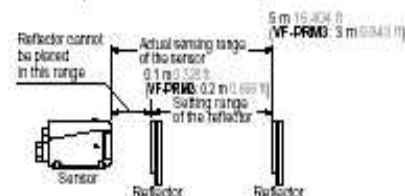
Please refer to p.1118, and contact our office for further details.

SPECIFICATIONS

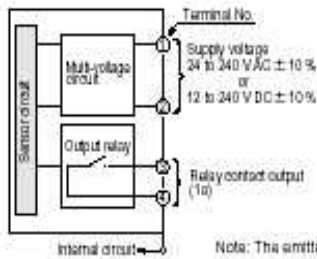
Item	Type Model No.	Thru-beam		Retroreflective			Diffuse reflective			
		VF-M10	VF-M10T	VF-RM5	VF-RM5T	VF-PRM3	VF-D500	VF-D500T	VF-D1000	VF-D1000T
Sensing range		10 m (32.808 ft)		0.1 to 0.0205 m (0.401 ft) (Note 1)			500 mm (19.685 in) (Note 2)			
Sensing object		φ20 mm φ0.787 in or more opaque object (Note 3)		φ50 mm φ1.969 in or more opaque or translucent object (Note 1)			φ50 mm φ1.969 in or more opaque, translucent or transparent object (Note 1)			
Hysteresis							15 % or less of operation distance			
Supply voltage		24 to 240 V AC ± 10 % or 12 to 240 V DC ± 10 %								
Power consumption		Emit: 3 VA or less (Average: 1.5 W or less) Receive: 2 VA or less (Average: 1.5 W or less)		3 VA or less (Average: 1.5 W or less)						
Output		Relay contact: 1a • Switching capacity: 250 V 1A AC (resistive load) 30 V 2A DC (resistive load) • Electrical life: 500,000 or more switching operations (switching frequency 3,600 operations/hour) • Mechanical life: 100 million or more switching operations (switching frequency 36,000 operations/hour)								
Output operation		Switchable either Light-ON or Dark-ON								
Response time		20 ms or less								
Operation indicator		Red LED (lights up when the output is ON)								
Sensitivity adjuster							Continuously variable adjuster			
Timer function (0.1 to 5 sec. variable)		————	Selectable ON delay, OFF-delay & ONE SHOT	————	Selectable ON delay, OFF-delay & ONE SHOT	————	Selectable ON delay, OFF-delay & ONE SHOT	————	Selectable ON delay, OFF-delay & ONE SHOT	
Environmental resistance	Pollution degree	3 (Industrial environment)								
	Protection	IP66 (IEC)								
	Ambient temperature	-10 to +60 °C +14 to +140 °F (No dew condensation or icing allowed), Storage: -20 to +70 °C -4 to +158 °F								
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH								
	Ambient illuminance	Sunlight: 11,000 lx at the light-receiving face, Incandescent light: 3,500 lx at the light-receiving face								
	EMC	EN 50081-2, EN 50082-2, EN 61000-6-2								
	Voltage withstandability	1,500 V AC for one min. between the power supply and output terminals, 1,000 V AC for one min. between the relay contact terminals								
	Insulation resistance	20 MΩ, or more, with 500 V DC megger between the power supply and output terminals, and between the relay contact terminals								
Vibration resistance	10 to 55 Hz frequency, 1.5 mm (0.059 in) amplitude in X, Y and Z directions for two hours each									
Shock resistance	100 ms ² acceleration (10 G approx.) in X, Y and Z directions for three times each									
Emitting element		Infrared LED (modulated)			Red LED (visible)		Infrared LED (modulated)			
Material		Enclosure: PBT, Lens: Acrylic (front surface of VF-PRM3: Triacetales)								
Connection method		Screw-on terminal connection								
Cable		Suitable for round cable φ6 to φ10 mm φ0.236 to φ0.394 in (Conductor cross section area: 0.25 to 0.75 mm ²)								
Cable length		Total length up to 100 m (328.084 ft) is possible with 0.3 mm ² , or more, cable type cable (thru-beam type: both emitter and receiver).								
Weight		Emitter: 75 g approx. Receiver: 95 g approx.		95 g approx.						
Accessories		MS-N70 (Sensor mounting bracket): 1 set, Gland and gland washer: 1 set, Gland packing (large / small 1 pc. each): 1 set, VF-SKG (Short-circuit metal joint): 1 pc., RF-230 (Reflector): 1 pc. for the retroreflective type sensor, Adjusting screwdriver: 1 pc. for the diffuse reflective type sensor and for sensors with timer functions (suffixed with "T") [2 sets of sensor mounting bracket, gland, gland washer and gland packing are attached for the thru-beam type sensors.]								

Notes: 1) The sensing range and the sensing object for the retroreflective type sensor are specified for the RF-230 reflector. Further, the sensing range is the possible setting range for the reflector. The sensor can detect an object less than 0.1 m (0.328 ft) [VF-PRM3: 0.2 m (0.656 ft)] away.

2) The sensing range of the diffuse reflective type sensor is specified for white non-glossy paper (200 X 200 mm (7.874 X 7.874 in)) as the object.
3) If slit masks (optional) are fitted, even an object of 3 X 6 mm (0.118 X 0.236 in) can be detected.



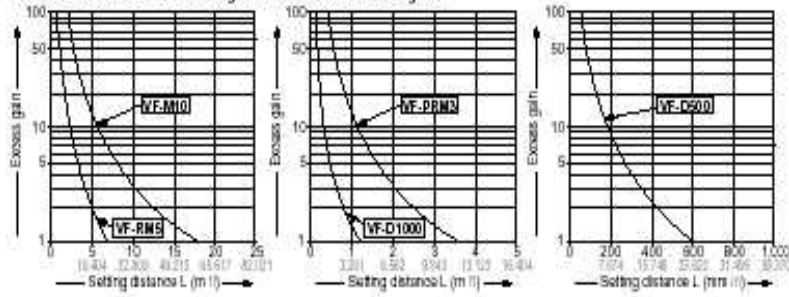
I/O CIRCUIT DIAGRAM



SENSING CHARACTERISTICS (TYPICAL)

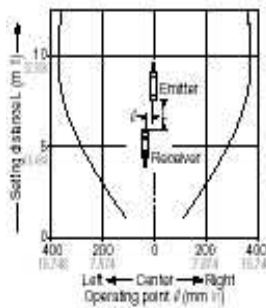
All models

Correlation between setting distance and excess gain

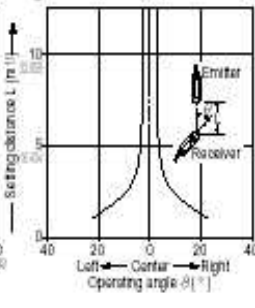


VF-M10 Thru-beam type
VF-M10T

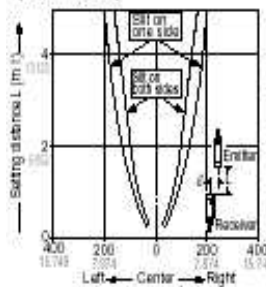
Parallel deviation



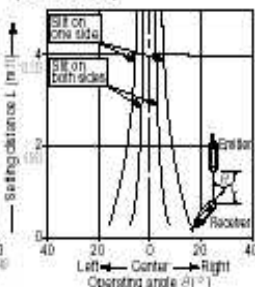
Angular deviation



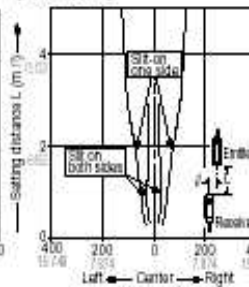
Parallel deviation with slit masks (OS-VF-6 X 12)



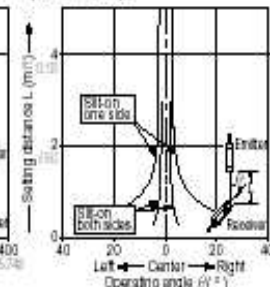
Angular deviation with slit masks (OS-VF-6 X 12)



Parallel deviation with slit masks (OS-VF-3 X 6)



Angular deviation with slit masks (OS-VF-3 X 6)

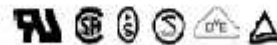


Lampiran 4. Tipe Relay G2R Omron

OMRON

Power PCB Relay G2R

- Creepage distance of 8.0 mm (0.31") min. between coil and contact.
- Dual-winding latching type available.
- Plug-in and quick-connect terminals available.
- High sensitivity (300 mW) and high capacity (10 A) types available.
- Highly stable magnetic circuit for long life endurance and excellent resistance to vibration and shock.
- Safety-oriented design assuring high surge resistance: 10,000 V/mm between coil and contacts.
- UL, USA approved, marked with CE.



Ordering Information

To order, select the part number and add the desired coil voltage rating (e.g., G2R-14-DC12).

■ Non-Latching

1-Pole - PCB Types

Type	Contact material	Contact form	Construction	Model
General purpose	AgPdCu	SPDT	Sem-sealed	G2R-1
			Sealed	G2R-14
		SPST-NO	Sem-sealed	G2R-1A
			Sealed	G2R-1A4
High-capacity		SPDT	Sem-sealed	G2R-1-E
				G2R-1A-E
High-sensitivity		SPDT	Sealed	G2R-1-H
				G2R-14-H
	SPST-NO		Sem-sealed	G2R-1A-II
			Sealed	G2R-1A4-II

1-Pole - Plug-in/Quick-connect Types

Type	Contact material	Contact form	Terminal	Model
General purpose	AgCuO	SPDT	Plug-in	G2R-1-S
LED indicator				G2R-1-SN
Surge suppression diode				G2R-1-SD
LED indicator and surge suppression diode				G2R-1-SND
Upper-mount bracket		SPDT	Quick connect	G2R-1-T
				G2R-1A-T

- Note: 1. AgPdSn and gold plated contacts available.
 2. Encased button available.
 3. For individual product, agency approvals consult factory.
 4. Class B coil insulation available.
 5. Push to test button available on plug-in type. Consult Omron for details.
 6. CE mark only on plug-in and quick connect types (G2R-Q-S).



Back Connecting Sockets/Plate

Relay	Terminal	Model	
		Socket	Socket mounting plate
G2R-1-S□□ (1-pole)	Solder	P2R-05-A	P2R-P
	PC	P2R-05P	
G2R-2-S□□ (2-pole)	Solder	P2R-08A	
	PC	P2R-08P	

Specifications

■ Contact Data

Non-latching general purpose, plug-in, plug-in operation indicator self-contained, plug-in diode self-contained and upper-mount bracket.

Load	1-pole type		2-pole type	
	Resistive load (p.f. = 1)	Inductive load (p.f. = 0.4) (L/R = 7 ms)	Resistive load (p.f. = 1)	Inductive load (p.f. = 0.4) (L/R = 7 ms)
Rated load	10 A at 250 VAC 10 A at 30 VDC	7.5 A at 250 VAC 5 A at 30 VDC	5 A at 250 VAC 5 A at 30 VDC	2 A at 250 VAC 3 A at 30 VDC
Contact material	AgCdC			
Carry current	10 A		5 A	
Max. operating voltage	360 VAC, 125 VDC			
Max. operating current	10 A		5 A	
Max. switching capacity	2,500 VA, 500 W	1,875 VA, 150 W	1,250 VA, 150 W	500 VA, 90 W
Min. permissible load	100 mA, 5 VDC		10 mA, 5 VDC	

Non-latching high capacity 1-pole type

Load	Resistive load (p.f. = 1)	Inductive load (p.f. = 0.4) (L/R = 7 ms)
Rated load	16 A at 250 VAC 16 A at 30 VDC	8 A at 250 VAC 8 A at 30 VDC
Contact material	AgCdC	
Carry current	16 A	
Max. operating voltage	380 VAC, 125 VDC	
Max. operating current	16 A	
Max. switching capacity	4,000 VA, 480 W	2,000 VA, 240 W
Min. permissible load	100 mA, 5 VDC	

Non-latching high-sensitivity

Load	1-pole type		2-pole type	
	Resistive load (p.f. = 1)	Inductive load (p.f. = 0.4) (L/R = 7 ms)	Resistive load (p.f. = 1)	Inductive load (p.f. = 0.4) (L/R = 7 ms)
Rated load	5 A at 250 VAC 5 A at 30 VDC	2 A at 250 VAC 5 A at 30 VDC	3 A at 250 VAC 3 A at 30 VDC	1 A at 250 VAC 1.50 A at 30 VDC
Contact material	AgCdC			
Carry current	5 A		3 A	
Max. operating voltage	360 VAC, 125 VDC			
Max. operating current	5 A		3 A	
Max. switching capacity	1,250 VA, 150 W	600 VA, 90 W	750 VA, 90 W	250 VA, 45 W
Min. permissible load	100 mA, 5 VDC		10 mA, 5 VDC	



■ Characteristics

Item		Non-latching	Latching
Contact resistance		100 mΩ	
Operate (set) time		15 ms. max.	20 ms. max.
Release (reset) time		AC: 10 ms max. DC: 5 ms max.	20 ms max.
Bounce time	Operate	---	Mean value approx. 8 ms
	Release	---	Mean value approx. 8 ms
Operating frequency	Mechanica	18,000 operations/hour	
	Electrical	1,900 operations/hour (under rated load)	
Insulation resistance		1,000 MΩ min. (at 500 VDC)	
Dielectric strength		5,000 VAC, 50/60 Hz for 1 minute between coil and contacts	
		1,000 VAC, 50/60 Hz for 1 minute across contacts of same pole	
		3,000 VAC, 50/60 Hz for 1 minute between contact sets, 2-pole non-latching	
		1,000 VAC, 50/60 Hz for 1 minute between set and reset coils of dual coil latching	
Vibration	Mechanical durability	10 to 55 Hz; 1.50 mm (0.06) double amplitude	
	Malfunction durability	10 to 55 Hz; 1.50 mm (0.06) double amplitude	
Shock	Mechanical durability	1,000 m/s ² (approx. 100G)	
	Malfunction durability	200 m/s ² (approx. 20 G) when energized 100 m/s ² (approx. 10 G) when de-energized	500 m/s ² (approx. 50 G) at set 100 m/s ² (approx. 10 G) at reset
Ambient temperature		-40 to 70°C (-40 to 158°F)	
Humidity		35% to 85% RH	
Service life	Mechanica	AC: 10,000,000 operations min. DC: 20,000,000 operations min. (at 18,000 operations/hour)	10,000,000 operations min. (at 18,000 operations/hour)
	Electrical	See 'Characteristics Data'	
Weight:		Approx. 17 g (0.60 oz.)	Approx. 17 g (0.60 oz.)

Note: Data shown are of initial value.

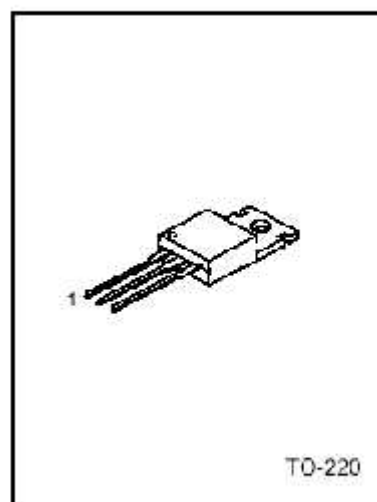
Lampiran 5. Tipe Transistor D313

UTC D313 NPN EPITAXIAL PLANAR TRANSISTOR

NPN EPITAXIAL PLANAR TRANSISTOR

DESCRIPTION

The UTC D313 is designed for use in general purpose amplifier and switching applications.



1:BASE 2:COLLECTOR 3:EMITTER

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V _{CB0}	60	V
Collector-Emitter Voltage	V _{CEO}	60	V
Emitter-Base Voltage	V _{EB0}	5	V
Collector Current	I _C	3	A
Storage Temperature	T _{STG}	-55 - +150	°C
Junction Temperature	T _J	150	°C

ELECTRICAL CHARACTERISTICS (T_a=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Collector-Base Breakdown Voltage	BV _{CB0}	I _C =1mA	60			V
Collector-Emitter Breakdown Voltage	BV _{CEO}	I _C =10mA	60			V
Emitter-Base Breakdown Voltage	BV _{EB0}	I _E =100μA	5			V
Collector Cut-Off Current	I _{CB0}	V _{CB} =20V, I _E =0			0.1	μA
Emitter Cut-Off Current	I _{EB0}	V _{EB} =4V, I _C =0			1.0	μA
Collector-Emitter Saturation Voltage	V _{CE(SAT)}	I _C =2A, I _B =0.2A			1.0	V
Base-Emitter On voltage	V _{BE(ON)}	V _{CE} =2V, I _C =1A			1.5	V
DC Current Gain	h _{FE}	I _C =1A, V _{CE} =2V I _C =0.1A, V _{CE} =2V	40		320	

CLASSIFICATION ON h_{FE}

RANK	C	D	E	F
RANGE	40-80	80-120	100-200	150-320

Lampiran 6. Tipe Transistor BC564

BC556/557/558/559/560

PNP EPITAXIAL
SILICON TRANSISTOR

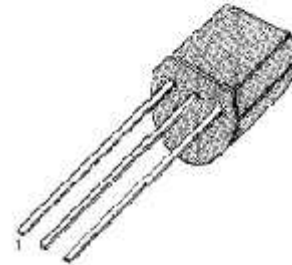
SWITCHING AND AMPLIFIER

- HIGH VOLTAGE: BC556, $V_{CE(sat)} = -65V$
- LOW NOISE: BC550, BC560
- Complementary: BC546 ... BC550

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ C$)

Characteristic	Symbol	Rating	Unit
Collector-Base Capacitance : BC556	V_{CB}	-80	V
: BC557/560		-50	V
: BC558/559		-30	V
Collector-Emitter Voltage : BC556	V_{CE}	-65	V
: BC557/560		-45	V
: BC558/559		-30	V
Emitter-Base Voltage	V_{EB}	-5	V
Collector Current (DC)	I_C	-100	mA
Collector Dissipation	P_C	500	mW
Junction Temperature	-	150	$^\circ C$
Storage Temperature	-stc	-65 ~ 150	$^\circ C$

TO-92



1 Collector 2. Base 3. Emitter

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ C$)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector Cut-Off Current	I_{CBO}	$V_{CB} = -30V, I_E = 0$			-15	nA
DC Current Gain	β_{FE}	$V_{CE} = -5V, I_C = 2mA$	110		900	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = -10mA, I_B = -0.5mA$		-90	-300	mV
		$I_C = -100mA, I_B = -5mA$		-250	-550	mV
Collector-Base Saturation Voltage	$V_{BE(sat)}$	$I_C = -10mA, I_B = -0.5mA$		-700		mV
		$I_C = -100mA, I_B = -5mA$		-900		mV
Base-Emitter On Voltage	$V_{BE(on)}$	$V_{CE} = -5V, I_C = -2mA$	-600	-660	-750	mV
		$V_{CE} = -5V, I_C = -10mA$			-300	mV
Current Gain Bandwidth Product	F	$V_{CE} = -5V, I_C = -10mA$		150		V/Hz
Collector-Base Capacitance	C_{CB}	$V_{CB} = -10V, f = 1MHz$			8	pF
Noise Figure	NF	$V_{CE} = -5V, I_C = 200\mu A$ $F = 1KHz, R_G = 2K\Omega$		2	10	dB
		$V_{CE} = -5V, I_C = 200\mu A$ $R_G = 2K\Omega$		1	4	dB
		$F = 30 \sim 15000MHz$		1.2	4	dB
				1.2	2	dB

 h_{FE} CLASSIFICATION

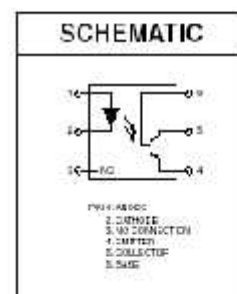
Classification	A	B	C
h_{FE}	110-220	200-450	420-900

Lampiran 7. Tipe Optoisolator 4N25

FAIRCHILD
SEMICONDUCTOR

**GENERAL PURPOSE 6-PIN
PHOTOTRANSISTOR OPTOCOUPLERS**

4N25 4N37	4N26 H11A1	4N27 H11A2	4N28 H11A3	4N35 H11A4	4N36 H11A5
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DESCRIPTION

The general purpose optocouplers consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 6 pin dual in-line package.

FEATURES

- Also available in white package by specifying -M suffix, eg. 4N25-M
- UL recognized (File # E90700)
- VDE recognized (File # 94768)
 - Add suffix V for white package (e.g., 4N25V-M)
 - Add suffix 300 for black package (e.g., 4N25,300)

APPLICATIONS

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs



GENERAL PURPOSE 6-PIN PHOTOTRANSISTOR OPTOCOUPLEDERS

4N25	4N26	4N27	4N28	4N35	4N36
4N37	H11A1	H11A2	H11A3	H11A4	H11A5

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise specified)

INDIVIDUAL COMPONENT CHARACTERISTICS

Parameter	Test Conditions	Symbol	Min	Typ*	Max	Unit
EMITTER						
Input Forward Voltage	($I_F = 10\text{ mA}$)	V_F		1.18	1.50	V
Reverse Leakage Current	($V_R = 6.0\text{ V}$)	I_R		0.00	10	μA
DETECTOR						
Collector-Emitter Breakdown Voltage	($I_C = 1.0\text{ mA}$, $I_F = 0$)	BV_{CEO}	50	100		V
Collector-Base Breakdown Voltage	($I_C = 100\text{ }\mu\text{A}$, $I_F = 0$)	BV_{CBO}	70	120		V
Emitter-Collector Breakdown Voltage	($I_E = 100\text{ }\mu\text{A}$, $I_F = 0$)	BV_{ECO}	7	10		V
Collector-Emitter Dark Current	($V_{CE} = 10\text{ V}$, $I_F = 0$)	I_{CEO}			50	nA
Collector-Base Dark Current	($V_{CB} = 10\text{ V}$)	I_{CBO}			20	nA
Capacitance	($V_{CE} = 0\text{ V}$, $f = 1\text{ MHz}$)	C_{CE}		8		pF

ISOLATION CHARACTERISTICS

Characteristic	Test Conditions	Symbol	Min	Typ*	Max	Units
Input-Output Isolation Voltage	(Non-'M' Black Package) ($f = 60\text{ Hz}$, $t = 1\text{ min}$)	V_{ISO}	5300			$V_{ac}(rms)$
	('M' White Package) ($f = 60\text{ Hz}$, $t = 1\text{ sec}$)		7500			$V_{ac}(pk)$
Isolation Resistance	($V_{IO} = 500\text{ VDC}$)	R_{ISO}	10^{11}			Ω
Isolation Capacitance	($V_{IO} = 8\text{ V}$, $f = 1\text{ MHz}$)	C_{ISO}		0.5		μF
	('M' White Package)			0.2	2	μF

Note

* Typical values at $T_A = 25^\circ\text{C}$