

# LAMPIRAN

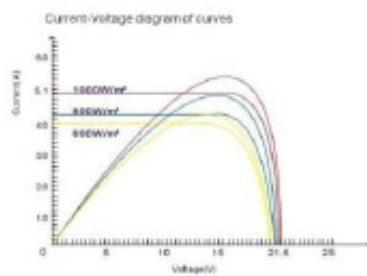
## 1. Datasheet Panel Solar Cell

### Sinkobe Solar Panel 20 WP - Monocrystalline

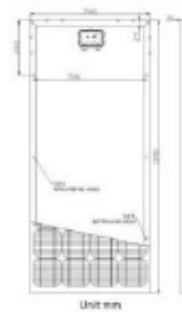
**SINKOBE**

Professional And Reliable Solar Panel Manufacturer

Characteristic	20.0 W
	+ 5%
Voltage at Max. Power	17.4V
Current At Max Power	0.86A
Open Circuit Voltage (Voc)	21.6V
Short Circuit Current (Isc)	0.95A
Operating temperature	40°C to +85°C
Maximum Series Fuse Rating	2A
Standard Test Condition	Irradiance 1000W/ , Module temperature 25°C , AM=1,5
<b>Mechanical Characteristic</b>	
Solar Cell	Monocrystalline
NO. Of Cells and Connections	36 Cells
Dimension	61.5x28.5x2.5 mm
Weight	3Kg
Junction Box	IP 54 Rated
Warranty	1 Year
Resistance	227gr steel ball fall down from 1m height and 60m/s wind
<b>Temperature coefficient</b>	
Noct	48°C to + 2°C
Current temperature coefficient	0.06 +/- 0.01% / K
Voltage temperature coefficient	-(78 +/- 10) MV/K
Power temperature coefficient	-(0.5 +/- 0.05) % / K



Mechanical Characteristics



IEC 61215 ed.2, IEC 61730  
and Safety Class II  
**SINKOBE** is ISO9001  
certified and registered.

**SINKOBE**

## 2. Datasheet Komponen IC LM358



Order this document by LM358D

# LM358, LM258, LM2904, LM2904V

## Dual Low Power Operational Amplifiers

Utilizing the circuit designs perfected for recently introduced Quad Operational Amplifiers, these dual operational amplifiers feature 1) low power drain, 2) a common mode input voltage range extending to ground/VEE, 3) single supply or split supply operation and 4) pinouts compatible with the popular MC1558 dual operational amplifier. The LM158 series is equivalent to one-half of an LM124.

These amplifiers have several distinct advantages over standard operational amplifier types in single supply applications. They can operate at supply voltages as low as 3.0 V or as high as 32 V, with quiescent currents about one-fifth of those associated with the MC1741 (on a per amplifier basis). The common mode input range includes the negative supply, thereby eliminating the necessity for external biasing components in many applications. The output voltage range also includes the negative power supply voltage.

- Short Circuit Protected Outputs
- True Differential Input Stage
- Single Supply Operation: 3.0 V to 32 V
- Low Input Bias Currents
- Internally Compensated
- Common Mode Range Extends to Negative Supply
- Single and Split Supply Operation
- Similar Performance to the Popular MC1558
- ESD Clamps on the Inputs Increase Ruggedness of the Device without Affecting Operation

### DUAL DIFFERENTIAL INPUT OPERATIONAL AMPLIFIERS

SEMICONDUCTOR  
TECHNICAL DATA

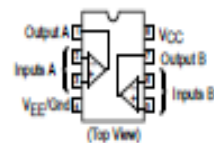


N SUFFIX  
PLASTIC PACKAGE  
CASE 628



D SUFFIX  
PLASTIC PACKAGE  
CASE 751  
(SO-8)

### PIN CONNECTIONS



### ORDERING INFORMATION

Device	Operating Temperature Range	Package
LM2904D	$T_A = -40^\circ\text{C}$ to $+105^\circ\text{C}$	SO-8
LM2904N		Plastic DIP
LM2904VD	$T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$	SO-8
LM2904VN		Plastic DIP
LM258D	$T_A = -25^\circ\text{C}$ to $+85^\circ\text{C}$	SO-8
LM258N		Plastic DIP
LM358D	$T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$	SO-8
LM358N		Plastic DIP

### MAXIMUM RATINGS ( $T_A = +25^\circ\text{C}$ , unless otherwise noted.)

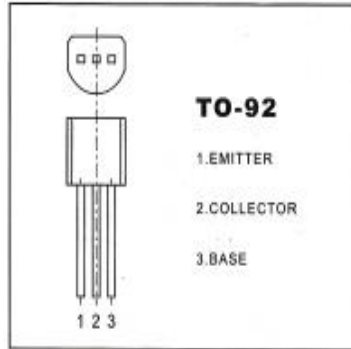
Rating	Symbol	LM258 LM358	LM2904 LM2904V	Unit
Power Supply Voltages				Vdc
Single Supply	VCC	32	28	
Split Supplies	VCC, VEE	$\pm 16$	$\pm 13$	
Input Differential Voltage Range (Note 1)	VDR	$\pm 32$	$\pm 28$	Vdc
Input Common Mode Voltage Range (Note 2)	VICR	-0.3 to 32	-0.3 to 28	Vdc
Output Short Circuit Duration	tSC	Continuous		
Junction Temperature	$T_J$	150		$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55 to +125		$^\circ\text{C}$
Operating Ambient Temperature Range	$T_A$			$^\circ\text{C}$
LM258		-25 to +85	-	
LM358		0 to +70	-	
LM2904		-	-40 to +105	
LM2904V		-	-40 to +125	

NOTES: 1. Split Power Supplies.

2. For Supply Voltages less than 32 V for the LM258/358 and 28 V for the LM2904, the absolute maximum input voltage is equal to the supply voltage.

### 3. Datasheet Transistor C945

## C945 TRANSISTOR(NPN)



### FEATURES

#### Power dissipation

$P_{CM}$ : 0.4W ( $T_{amb}=25^{\circ}C$ )

#### Collector current

$I_{CM}$ : 0.15 A

#### Collector-base voltage

$V_{(BR)CBO}$ : 60 V

#### Operating and storage junction temperature range

$T_j, T_{stg}$ :  $-55^{\circ}C$  to  $+150^{\circ}C$

### ELECTRICAL CHARACTERISTICS

( $T_{amb}=25^{\circ}C$  unless otherwise specified)

Parameter	Symbol	Test conditions	MIN	MAX	UNIT
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C=1000\mu A, I_E=0$	60		V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C=0.1 mA, I_E=0$	50		V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E=100\mu A, I_C=0$	5		V
Collector cut-off current	$I_{CBO}$	$V_{CE}=60 V, I_E=0$		0.1	$\mu A$
Collector cut-off current	$I_{CER}$	$V_{CE}=55 V, R=10 M\Omega$		0.1	$\mu A$
Emitter cut-off current	$I_{EBO}$	$V_{EB}=5 V, I_C=0$		0.1	$\mu A$
DC current gain	$h_{FE(1)}$	$V_{CE}=6 V, I_C=1 mA$	70	700	
	$h_{FE(2)}$	$V_{CE}=6 V, I_C=0.1 mA$	40		
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C=100 mA, I_E=10 mA$		0.3	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C=100 mA, I_E=10 mA$		1	V
Base-emitter voltage	$V_{BE}$	$I_C=310 mA$		1.4	V
Transition frequency	$f_T$	$V_{CE}=6 V, I_C=10 mA$ $f=30 MHz$	150		MHz

### CLASSIFICATION OF $h_{FE(1)}$

Rank	O	Y	GR	BL
Range	70-140	120-240	200-400	350-700

#### 4. Dokumentasi Kegiatan





