

Digital Transistor  
DC Parameter Tester

OPERATING MANUAL

**MODEL : 294**

Rev.5

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## VII. Maintenance

- Don't change the inner circuit to ensure the precision of the tester.
- It should place a dry room and avoiding harmful gas, water-proof, moist-proof and dirt-proof are necessary also. Please take out its battery if you don't operate it for long term.
- The warranty period of this tester is one year commencing on the date of purchase. We offer long term maintenance service.
- You should stop using this tester immediately if you find any wrong thing, sending it to us for maintenance. Its check or maintenance should be performed by qualified professional maintainers or appointed maintenance departments.
- Battery replacing steps:  
The reading is below 4V at Vce(sat) ranges or the “” symbol appears on the LCD, Please to replace these batteries. Set the selector to “OFF” position, loosening screws on the back cover, remove the back cover. Pay attention to the polarity of battery when replace the batteries, must follow pattern showed on battery case. Then put on the back cover and tighten the screws with screwdriver.

## VIII. Accessories

- Instruction Manual, one copy
- Warranty Card/Qualification Certificate, one copy

## IX. Optional Accessories

The 6V-2A external DC adapter for this tester is optional accessory. It doesn't accompany this tester. You can order it if you need.

The company reserves the right to modify the content of the instruction manual and is not responsible for notifying its upgrade.

The company is not responsible for other loss due to use of it. The content of the instruction manual should not be the excuse of using this product for special purposes.

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## I. General Introduction

The DY294 digital display Transistor DC Parameter Tester developed and made by Shenzhen Duoyi Electronics Co., Ltd. It is mainly used for measuring the DC parameters of various semiconductors such as diode, transistor, triac and field-effect transistor. It also can be used to measure the withstand voltage of capacitor, protection voltage of varistor and insulation of electrical appliance, 78 and 79 series three-terminal voltage regulator also can be measured. Analogue- digital converter used the large scale integrated circuit with high sensitivity and accuracy. The measuring result can be read directly from liquid crystal display. It is portable with compact structure and convenient operation, especially suitable for inspecting components in electronic factories as well as application in electronic work, lab, maintainer and radio fans.

## II. Safety Symbols


 **Important safety information, refer to the manual.**

 **Dangerous voltage may be present.**

 **Double insulation.**

## VI. Operating Instruction


### WARNING!

 **Don't touch the bare “C” pole when making measurement, otherwise cause the danger of electric shock.**

**1. Set the range selector at the lowest position when the value to be measured is unknown beforehand.**

**2. Don't to insert component into socket before rotating the range selector to change functions.**

**3. Always be careful when working on V(BR) measurement. Keep fingers away the bare “C” while measuring.**

First check the battery before operating. Turn the rotary selector to any range of Vce (sat), then approx. 5.5V (negative voltage in PNP) will be displayed. This value is the approximation of the batteries. If the reading is below 6A or the “” symbol appears on the LCD, please to replace these batteries. Don't do this step if you use DC 6V 3A external electric supply.

### 1. Breakdown voltage V (BR)

NPN 200V range: There is approx. 270V DC voltage between “C” and “E”, polarity of “C” is positive.

1000V range: There is approx. 1500V DC voltage between “C” and “E”, polarity of “C” is positive.

PNP 200V range: There is approx. 270V DC voltage between “C” and “E”, polarity of “E” is positive.

1000V range: There is approx. 1500V DC voltage between “C” and “E”, polarity of “E” is positive.

### (1) Transistor

The transistor reverse breakdown voltages include BVCEO, BVEBO, BVCEs. Their connecting methods are shown on the picture, make sure it's good contact. Press “TEST” button, the red LED will light. The reading on the LCD is the result of transistor breakdown voltage.

### (2) Diode

PNP or NPN ranges can be used when measuring the diode reverse breakdown voltages. Their connecting methods are shown on the picture. Pay attention to the polarity of testing voltage and avoiding wrong connection. Press “TEST” button, the red LED will light. The reading on the LCD is the result of diode breakdown voltage.

### 2. Transistor collector-emitter saturation voltage drop VCE (Sat)

(1) External 6V 2A DC power supply should be used if measuring high power transistor at 2A or 800mA range.

(2) Determine the transistor is PNP or NPN, set the selector to corresponding range by its power.

(3) Connecting methods are shown on the picture, insert the E, B and C legs of transistor into the corresponding socket.





(4) Directly read the LCD, needn't press “TEST” button.

### Notice:

a. The saturation voltage drop is more lower, the transistor is more better for same model.

b. These ranges also can be used to measuring the forward voltage drop of diode in low, middle and high current condition. The voltage drop is more lower, the diode is more better. The value of zener diode which is less than 5V also can be measured by these ranges.

c. The method to measure voltage drop of field-effect transistor is the same as transistor.

PNP		NPN	
Tested parameter	Connecting method	Tested parameter	Connecting method
Vce (Sat)		Vce (Sat)	
Diode Forward voltage drop		Diode Forward voltage drop	

### 3. Transistor hFE

(1) Determine the transistor is PNP or NPN.

(2) Set the selector to corresponding range by its power or to the lowest range if its power is unknown.

(3) Connecting methods are shown on the picture, insert the E, B and C legs of transistor into the corresponding sockets.


(4) Directly read the LCD, needn't press “TEST” button.

### Notice:

a. These ranges can be used to measure the operating current gain of field-effect transistor. The method is the same as transistor. Insert D leg into “C” socket, G leg into “B” socket and S leg into “E” socket.

b. Make sure the power of transistor before measuring, don't use high current range to measure low power transistor. High power transistor can be measured step by step from the lowest

### III. Features

1. Display : max. reading 1999, digit height 20mm
2. Sample rate : 3 times/second
3. Measuring method : Dual-slop integration A/D converter
4. Polarity display : automatic
5. Low battery : “” appears on the LCD
6. Operating temperature: 0~40°C , 75% Relative humidity
7. Storage temperature: -10~50°C , 80% Relative humidity
8. Power supply: R6P(AA) (1.5V)×4 batteries or DC6V 3A DC power supply
9. Static power dissipation: approx. 48mA
11. Dimensions: 150×100×70mm
12. Weight: approx 670g (including batteries)

### IV. Electrical Specification

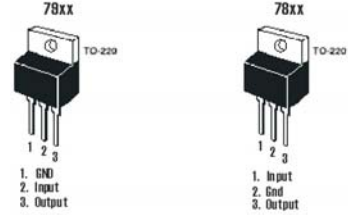
Parameter	Measuring range	Display	Resolution	Operating condition
V <sub>(BR)</sub> Breakdown voltage	1000V	0~1000	1V	Breakdown current less than 1mA
	200V	0~199.9	0.1V	Breakdown current less than 1mA
V <sub>ce (sat)</sub> Collector-emitter saturation voltage drop	2A (I <sub>c</sub> )	0~6.00	0.01V	I <sub>c</sub> approx. 2000mA I <sub>b</sub> approx. 200mA
	800mA (I <sub>c</sub> )	0~6.00	0.01V	I <sub>c</sub> approx. 800mA I <sub>b</sub> approx. 80mA
	100mA (I <sub>c</sub> )	0~6.00	0.01V	I <sub>c</sub> approx. 100mA I <sub>b</sub> approx. 10mA
	10mA (I <sub>c</sub> )	0~6.00	0.01V	I <sub>c</sub> approx. 10mA I <sub>b</sub> approx. 1mA
hFE DC Current Gain	10mA (I <sub>b</sub> )	0~199.9	0.1	I <sub>b</sub> approx. 10mA
	1mA (I <sub>b</sub> )	0~1999	1	I <sub>b</sub> approx. 1mA
	10uA (I <sub>b</sub> )	0~1999	1	I <sub>b</sub> approx. 0.01mA
I <sub>ceo</sub> Reverse leakage current	2000 μ A	0~1999	1 μ A	Testing voltage approx. 27V
78 or 79 three-terminal voltage regulator	78xx/79xx	0~24.0	0.1V	Testing voltage approx. 27V

### 5. Three terminal voltage regulator 78 or 79 series

1. Make sure it is 78 type or 79 type. Set the selector to the corresponding range.
2. The pin function of 78 and 79 is shown in the picture. The connected method is to insert the 1, 2 and 3 leg of regulator into the corresponding “1”, “2” and “3” socket on the panel.
3. Press the “TEST” button , directly read the displayed reading .

Notice:

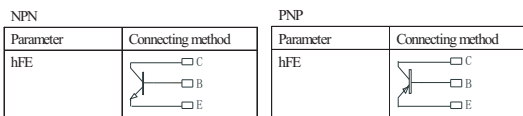
The operating current is approx. 10mA between “C” and “E” socket.



### 6. The methods for other components:

1. The measuring method for operating voltage drop of triac is the same as to measure saturation voltage drop of transistor at V<sub>ce (sat)</sub> ranges. The transistor with low voltage drop has low internal impedance and its output power is high. The measuring method for operating current of triac is the same as transistor hFE ranges. The level of trigger current should be careful when measuring triac. Insert A leg into “C” socket, G leg into “B” socket and K leg into “E” socket.
2. To identify the output power level of transistor or triac or field-effect transistor  
Use V<sub>ce (sat)</sub> range to measure the same model component , Internal impedance is more smaller and its output power is more higher if the saturation voltage drop is more lower
3. To identify unidirectional triac or bidirectional triac  
First use V<sub>ce (sat)</sub> or hFE ranges of NPN , then change to V<sub>ce (sat)</sub> or hFE ranges of PNP. The triac can work fine both side, it is bidirectional triac, otherwise is unidirectional triac.
4. To identify damped transistor.  
The reverse breakdown voltage, saturation voltage drop can be measured, but hFE can not be measured, it is damped transistor.

range. The highest hFE reading should be regarded the most efficient operating state of transistor. First operating at low current range during measuring, then increases range till to the highest range.  
The transistor can not work in high current range if the reading decreases but increasing range. The transistor can not withstand the operating current if the reading is instable.

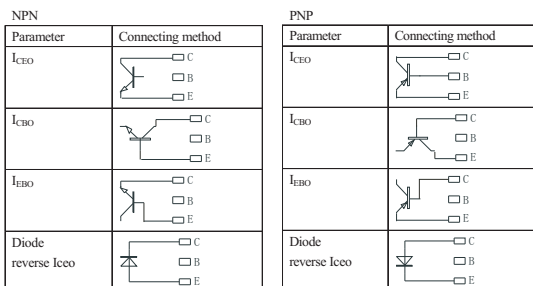


### 4. Transistor reverse leakage current I<sub>ceo</sub>

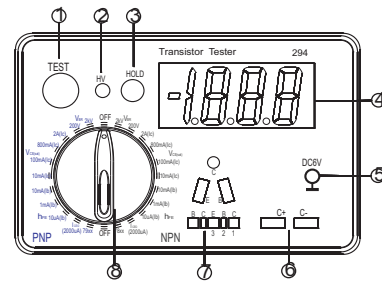
1. Determine the transistor is PNP or NPN.
2. Set the selector to the corresponding range.
3. Connecting methods are shown on the picture, insert the E, B and C leg of transistor into the corresponding socket.
4. Press the “TEST button” , directly read the displayed reading.

Notice:

Don't insert the B leg of transistor into “B” socket when measuring low power transistor. Because induced voltage exists in lead within B socket maybe causing bigger I<sub>ceo</sub> value than the real value.



### V. Front Panel



1. Test button: High-voltage circuit works when press this button. Loose it to cancel high voltage. The button is used for measuring V<sub>(BR)</sub>, I<sub>ceo</sub> and three-terminal voltage regulator only.
2. High-voltage indicator: The LED is light when high-voltage circuit works.
3. Reading hold button: Press the button to hold the readings, meanwhile “HOLD” symbol will appear on LCD. Press the button once again to cancel holding , meanwhile “HOLD” symbol will disappear.
4. Liquid crystal display: The digits can be clearly displayed .
5. External power supply socket: The specification of power supply is 6V-3A DC regulator.
6. Capacitor socket: electrolytic capacitor input.
7. Transistor socket: transistor input.
8. Rotary selector: Power switch and measuring parameter selection.

NPN	
Parameter	Connecting method
BV <sub>CEO</sub>	
BV <sub>EB0</sub>	
BV <sub>CE0</sub>	
BV <sub>CES</sub>	
Diode Reverse breakdown voltage	
zener diode zener voltage	
light emitting diode forward voltage drop	
light emitting diode reverse voltage	
Bidirectional controlled silicon Breakdown voltage	
unidirectional controlled silicon Breakdown voltage	
N-MOS transistor Withstand voltage test	
porcelain capacitor terylene capacitor mica capacitor monolithic capacitor Withstand voltage test	
Varistor operating voltage	

PNP	
Parameter	Connecting method
BV <sub>CEO</sub>	
BV <sub>EB0</sub>	
BV <sub>CE0</sub>	
BV <sub>CES</sub>	
Diode reverse breakdown voltage	
zener diode zener voltage	
light emitting diode forward voltage drop	
light emitting diode reverse voltage	
Bidirectional controlled silicon Breakdown voltage	
unidirectional controlled silicon Breakdown voltage	
P-MOS transistor Withstand voltage test	
porcelain capacitor terylene capacitor mica capacitor monolithic capacitor Withstand voltage test	
Varistor operating voltage	

### (3) Light-emitting diode

PNP or NPN ranges can be used when measuring the forward voltage drop and reverse voltage of light-emitting diode. Their connecting methods are shown on the picture. Pay attention to the polarity of testing voltage and avoiding wrong connection. It is also applicable to measure the operating voltage of neon lamp, energy-saving lamp. Insert the two pins of the diode into the "C" and "E" hole of socket. Press "TEST" button, the red LED will light. The reading on the LCD is the result of light-emitting diode operating voltage and it should emit light.

### (4) Field-effect transistor

The field effect transistor is divided into N channel and P channel. A short circuit should be formed between G and S pin. Otherwise the transistor can easily be damaged. Their connecting methods are shown on the picture. Pay attention to the polarity of testing voltage and avoiding wrong connection. Press "TEST" button, the red LED will light. The reading on the LCD is the result of field effect transistor breakdown voltage.

### (5) Triac

Connecting method of the triac reverse breakdown voltage is shown on the picture. Press "TEST" button, the red LED will light. The reading on the LCD is the result of triac breakdown voltage.

### (6) Insulation of electrical appliance

Use lead to connect "C" and "E" to the terminals of the electrical appliance and select 1000V range. Press "TEST" button, the tester will output approx. 1500V DC voltage. If the electrical appliance insulation is good, approx. 1500V reading will appear. The readings on the LCD will flash or be "000" if it can not withstand 1500V voltage.

### (7) Withstand voltage of capacitor

a. Withstand voltage of electrolytic capacitor:  
Set the selector to 200V range. Insert the anode into "C+" socket and cathode into "C-" socket. Press "TEST" button, the displayed reading will raise gradually till it cannot climb any more. The final reading is withstand voltage of electrolytic capacitor. The quality is better that fast charge for same capacitance. Be careful that the tantalum capacitor would be damaged when exceeding the withstand voltage.

b. Withstand voltage of porcelain, terylene, mica capacitor:  
Set the selector to 200V range. Insert the capacitor into "C" and "E" socket. Press the "TEST" button, the first

NPN	
Parameter	Connecting method
BV <sub>CEO</sub>	
BV <sub>EB0</sub>	
BV <sub>CE0</sub>	
BV <sub>CES</sub>	
Diode Reverse breakdown voltage	
zener diode zener voltage	
light emitting diode forward voltage drop	
light emitting diode reverse voltage	
Bidirectional controlled silicon Breakdown voltage	
unidirectional controlled silicon Breakdown voltage	
N-MOS transistor Withstand voltage test	
porcelain capacitor terylene capacitor mica capacitor monolithic capacitor Withstand voltage test	
Varistor operating voltage	

PNP	
Parameter	Connecting method
BV <sub>CEO</sub>	
BV <sub>EB0</sub>	
BV <sub>CE0</sub>	
BV <sub>CES</sub>	
Diode reverse breakdown voltage	
zener diode zener voltage	
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Varistor operating voltage	

### (3) Light-emitting diode

PNP or NPN ranges can be used when measuring the forward voltage drop and reverse voltage of light-emitting diode. Their connecting methods are shown on the picture. Pay attention to the polarity of testing voltage and avoiding wrong connection. It is also applicable to measure the operating voltage of neon lamp, energy-saving lamp. Insert the two pins of the diode into the "C" and "E" hole of socket. Press "TEST" button, the red LED will light. The reading on the LCD is the result of light-emitting diode operating voltage and it should emit light.

### (4) Field-effect transistor

The field effect transistor is divided into N channel and P channel. A short circuit should be formed between G and S pin. Otherwise the transistor can easily be damaged. Their connecting methods are shown on the picture. Pay attention to the polarity of testing voltage and avoiding wrong connection. Press "TEST" button, the red LED will light. The reading on the LCD is the result of field effect transistor breakdown voltage.

### (5) Triac

Connecting method of the triac reverse breakdown voltage is shown on the picture. Press "TEST" button, the red LED will light. The reading on the LCD is the result of triac breakdown voltage.

### (6) Insulation of electrical appliance

Use lead to connect "C" and "E" to the terminals of the electrical appliance and select 1000V range. Press "TEST" button, the tester will output approx. 1500V DC voltage. If the electrical appliance insulation is good, approx. 1500V reading will appear. The readings on the LCD will flash or be "000" if it can not withstand 1500V voltage.

### (7) Withstand voltage of capacitor

a. Withstand voltage of electrolytic capacitor:  
Set the selector to 200V range. Insert the anode into "C+" socket and cathode into "C-" socket. Press "TEST" button, the displayed reading will raise gradually till it cannot climb any more. The final reading is withstand voltage of electrolytic capacitor. The quality is better that fast charge for same capacitance. Be careful that the tantalum capacitor would be damaged when exceeding the withstand voltage.

b. Withstand voltage of porcelain, terylene, mica capacitor:  
Set the selector to 200V range. Insert the capacitor into "C" and "E" socket. Press the "TEST" button, the first

displayed reading is the breakdown voltage of the capacitor. The sound of breakdown or discharge may be happened. "1" is finally displayed. A high value resistor or a small value varistor can be parallel connected between "C" and "E" socket to reduce measuring voltage for capacitor with small withstand voltage, so that the capacitor can not be damaged.

**(8) Varistor**

Set the selector to 200V range, connecting methods are shown on the picture. Please select 1000V range if the operating voltage of the varistor is exceeding 300V. Press the "TEST" button, the reading is the result of varistor operated voltage.

**(9) DC voltage signal source**

It can also output DC voltage if a DC voltage signal is required during working.

NPN 200V range: There is approx. 270V DC voltage between "C" and "E", the polarity of "C" is positive.

1000V range: There is approx. 1500V DC voltage between "C" and "E", the polarity of "C" is positive.

PNP 200V range: There is approx. 270V DC voltage between "C" and "E", the polarity of "E" is positive.

1000V range: There is approx. 1500V DC voltage between "C" and "E", the polarity of "E" is positive.

**Notice:**

- a. There is high-voltage during measuring, hands must go after the component has inserted, then press "TEST" button. To avoid electric shock or body injury; it must do to loose the "TEST" button and make sure the red LED light is off before taking out the component.
- b. Do not worry about transistor damage because of the measuring current is less than 1mA when the tester measure transistor reverse breakdown voltage. If itself leakage current of transistor has exceeded 1mA, the reverse breakdown voltage cannot be measured. Please measure the ICEO of transistor first.
- c. Make sure that the transistor contact with the socket is good and then press the "TEST" button. Poor contact will easily cause high voltage spark and damage the transistor.

d. The capacitor which be measured has been charged. To avoid electric shock, do not touch the metal leg of the capacitor when taking out it.

e. This tester will obtain various value of forward voltage drop when measuring various transistors which PN junction is different materials. This can be used to identify various components. This tester has obtained following data for reference only:

PN junction forward voltage drop of germanium transistor should be 0.1~0.3V.

PN junction forward voltage drop of silicon transistor should be 0.4~0.6V.

Forward voltage drop of zener Diode should be 1.0V;

Normal forward voltage drop of infrared emitting diode should be 1.0V;

Normal voltage of bidirectional trigger diode should be about 30V;

Normal forward voltage drop of light-emitting diode should be 1.5V~1.8V;

displayed reading is the breakdown voltage of the capacitor. The sound of breakdown or discharge may be happened. "1" is finally displayed. A high value resistor or a small value varistor can be parallel connected between "C" and "E" socket to reduce measuring voltage for capacitor with small withstand voltage, so that the capacitor can not be damaged.

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Normal forward voltage drop of infrared emitting diode should be 1.0V;

Normal voltage of bidirectional trigger diode should be about 30V;

Normal forward voltage drop of light-emitting diode should be 1.5V~1.8V;