6. Testing methods for other components:
a. The testing method for operating voltage drop of controlled silicon is the same as that for saturation voltage drop of common transistor in Vce (sat) step. The transistor with low voltage drop has low internal impedance and high output power. The testing method for operating current of controlled silicon is the same as that for transistor hFE step. The level of trigger current should be noted when testing controlled silicon. Insert A pole into C jack, G pole into B jack and K pole into E jack.
b. Identify the output power level of transistor , controlled silicon and field effect transistor.Use Vce (sat) steps to test the transistor of the same model. The low saturation voltage drop indicates low internal impedance and high output power.
c.To identify unidirectional controlled silicon and bidirectional controlled silicon, first use Vce (sat) or hEF steps of tester NPN to test.
d.Identify damp of transistor.
The V(br) step of the tester can test the reverse breakdown voltage of transistor with damp. Vce (sat) step can test its saturation voltage drop. No amplification value is found by testing it with all hFE steps.
Note:
When test damp transistor with damp: can test V(BR), Vce (sat) and Iceo values but hFE value.

VI. Maintenance

a.Please don't change the circuitry to ensure the precision of the tester.
b.As a precise device, this tester need water proof, moist proof and dirt proof treatment. It should be put in a dry place avoiding harmful gas. Please take out of its battery if you don't plan to use in near future.
c.The warranty period of this tester is one year commencing on the date of purchase. We offer long term maintenance service.
d.If you find anything wrong with this tester, you should stop using it immediately and send it for maintenance. Its checkout or maintenance should be performed by qualified professional maintainers or appointed maintenance departments.
e.Battery replacing steps: when undervoltage symbol appears

Table of Contents

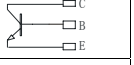
I. General Introduction

The 294 type Digital Display Transistor DC Parameter Tester developed and made by Shenzhen Duoyi Electronics Co., Ltd is mainly used for testing the DC parameters of manifold semiconductors such as diode, transistor, controlled silicon and field effect transistor. It also can be used to test the withstand voltage of capacitor, protection voltage of varistor and isolation of electrical. Meanwhile it also can test 78 and 79 series three-terminal voltage regulator. The tester has adopted the large scale integrated circuit for analogue/digital conversion. With high sensitivity and accuracy, it adopts liquid crystal display which can be read directly. With compact structure and convenient operation, it is portable and especially suitable for inspection and screening of devices and components in electronic factories as well as application of technicians engaged in electronic work, lab staff, maintainers and radio fans.

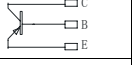
screen suggesting the replacement of battery. The undervoltage symbol will no appear if you use DC 6V 3A external electric supply.
1. Breakdown voltage V (BR)
V (BR) consists of 4 steps respectively200V and 1000V of NPN and 200V and 1000V of PNP.
NPN 200V step: there is about 270V DC voltage between C and E, C positive and E negative.
1000V step: there is about 1500V DC voltage between C and E, C positive and E negative.PNP 200V step: there is about 270V DC voltage between C and E, C negative and E positive.
1000V step: there is about 1500V DC voltage between C and E, C negative and E positive.
(1) Test transistor
The transistor consists of PNP type and NPN type. The reverse breakdown voltages of transistor are BVCBO, BVCEO, BVEBO, BVCES, and their connecting methods are as shown in the picture. Connecting the tested transistor according to its type and the picture and make sure it's good contect. Press “TEST” button and the red LED light is on indicating the generation of high voltage. Meanwhile the display shows the reading which is namely the tested breakdown voltage.
(2) Test diode
Either PNP or NPN step can be used when testing the reverse breakdown voltages of diode which should be connected according to the picture. Pay attention to the polarity of test voltage and avoid wrong connection. As to the diode with reverse voltage below 200V, the values from 200V step and 1000V step should almost be the same. Big difference indicates poor reverse breakdown feature of the diode or high leakage current. Press “TEST” button, the red LED light is on and the reading on the display is namely the tested breakdown voltage.
(3) Test light emitting diode
Either PNP or NPN step can be used when testing the forward voltage drop and reverse voltage of light emitting diode which should be connected according to the picture. Pay attention to the polarity of test voltage and avoid wrong connection.

2. Transistor common emitter saturation voltage drop VCE (Sat)
(1) Since the battery only offer mA class current, high-power transistor using 2A and 800mA steps should use external 6V and 3A DC power supply to ensure the accuracy.
(2) Determine whether the tested transistor is PNP type or NPN type as well as its power. Turn the switch to select the corresponding range step.
(3) As shown in the picture, insert the E, B and C legs of triode into the corresponding jacks.
(4) Directly read the displayed (needn't press test button)
Note:
a.As to transistors of same model, the saturation voltage drop should be as low as possible.
b.The four steps also can be used to test the forward voltage drop of diode in low, middle and high current. The voltage drop should be as low as possible.
C.The test method for operating voltage drop of field effect transistor is the same as that of common transistor. It is tested on Vce (sat). The transistor with low voltage drop has low internal resistance and high power.

NPN

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

PNP

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

3. Transistor hFE
(1) Determine whether the tested transistor is PNP type or NPN type. Turn the switch to select the corresponding range step.
(2) As shown in the picture, insert the E, B and C legs of transistor into the corresponding jacks.
(3) Directly read the displayed (needn't press test button)
Note:
A.The hFE three steps can be used to test the operating current of field effect transistor. The test method is the same as that of common transistor for testing amplification factor. Insert D pole into C jack, G pole into B jack and S pole into E jack.

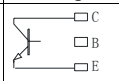
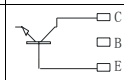
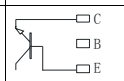
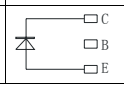
II. Common Features

1. Display: maximum reading 1999, character height 20mm
2. Sample rate: 3 times/second
3. Measuring range: manual
4. Polarity display: automatic
5. Battery undervoltage: symbol
6. Operating temperature: 0~40℃
7. Storage temperature: -10~50℃
8. Relative humidity: below 0℃~30℃ RH≤75%
   30℃~40℃ RH≤50%
9. Power supply: 1.5V×ÁAA batteries (R6AA-SUM-3) or
   DC6V 3A DC power supply
10. Static power dissipation: about 48mA
11. Dimensions: 150×100×70mm

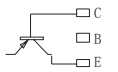
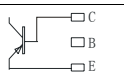
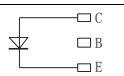
III. Technical Parameters

Test content	Measuring range	Display range	Resolution	Operating condition
Breakdown voltage V (BR)	1000V	0~1000V	1V	Breakdown current less than 1mA
	200V	0~199.9V	0.1V	Breakdown current less than 1mA
Common emitter saturation voltage drop Vce (sat)	2A (Ic)	0~6.00V	0.01V	Ic about 2000mA, Ib about 200mA
	800mA (Ic)	0~6.00V	0.01V	Ic about 800mA, Ib about 80mA
	100mA (Ic)	0~6.00V	0.01V	Ic about 100mA, Ib about 10mA
	10mA (Ic)	0~6.00V	0.01V	Ic about 10mA, Ib about 1mA
hFE	10mA (Ib)	0~199.9	0.1	Ib about 10mA
	1mA (Ib)	0~1999	1	Ib about 1mA
	10uA (Ib)	0~1999	1	Ib about 0.01mA
Transistor reverse leakage current Iceo	2000μA	0~1999μA	1μA	Vce about 27V
78 and 79 three-terminal voltage regulator	78xx/79xx	0~24.0V	0.1V	Ui about 27V

NPN

Tested parameter	Connecting method
I_{CEO}	
I_{CBO}	
I_{EBO}	
Diode reverse Iceo	

PNP

Tested parameter	Connecting method
I_{CEO}	
I_{CBO}	
I_{EBO}	
Diode reverse Iceo	

5. Three terminal voltage regulator 78 and 79 series

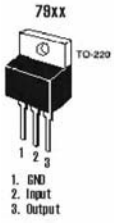
a. Make sure it is 78 type or 79 type. Turn the switch to the corresponding range step.

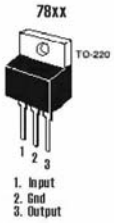
b. The 78 type and 79 type pin function is as shown in the picture. The connection method is to insert the1, 2 and 3legs of regulator into the corresponding 1, 2 and 3 jacks shown on the panel.

c. Press the test button “TEST” and directly read the displayed reading .

Note:

The C and E current of this function step is 10mA. It can be used to test the zener voltage of zener diode below 6V as well as brightness and operating voltage of light emitting diode.





b.Make sure test whether the power of tested transistor suits the test current of the step of hFE parameters before testing, don't use high current to test low power transistor. hFE consists of three steps and high power transistor can be tested step by step by the three steps. Observe the amplification linearity of the transistor and use the result to analyze the amplification feature of it. The step where the highest hFE is tested should be regarded the most efficient operating state of the transistor. During test, use low current step first, next middle current step and then high current step. If the test current increases and the amplification factor of transistor is unchanged or increases, the transistor can work in high current step. If the test current keeps increasing and the amplification factor of transistor decreases, the transistor cannot work in high current step. The continuous change of the displayed reading suggests the transistor cannot withstand the operating current of the step.

NPN

Tested parameter	Connecting method
hFE	

PNP

Tested parameter	Connecting method
hFE	

4. Transistor reverse leakage current Iceo

a. Determine whether the tested transistor is PNP type or NPN type. Turn the switch to the corresponding range step.

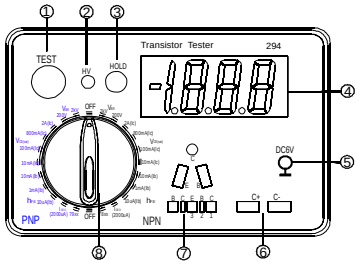
b. As shown in the picture, insert the E, B and C legs of transistor into the corresponding jacks.

c. Press the test button “TEST” and directly read the displayed reading.

Note:

Don't insert the B leg of transistor into B pole jack when testing low power transistor Iceo since induced voltage exists in lead within B pole jack causing bigger Iceo value than the real value.

IV. Introduction to Panel Functions



1. Test button: press this button and high-voltage circuit works; Press it again to cancel the generation of high voltage.This button can only be used for measurement of VBR, Iceo and three-terminal voltage regulator.
2. High-voltage indicator light: this LED is on when high-voltage circuit works.
3. Reading hold button: press this button to hold the displayed readings and meanwhile “HOLD” symbol will appear. Press this button again to cancel holding and meanwhile “HOLD” symbol will disappear.
4. Liquid crystal display screen: the characters on the reading location of tested values can only be clearly viewed in environment with light due to features of liquid crystal.
5. External electric supply socket: the specification of power supply is 6V 3A DC regulator.
6. Capacitor test socket: tested electrolytic capacitor jack
7. Transistor test socket: tested transistor jack
8. Rotary switch: power switch and measuring function Selection.

V. Operation Instruction

Before use, first please check whether the battery power is sufficient. Turn the rotary switch to any range step for testing Vce (sat) (Common emitter saturation voltage drop) and about 6V will be displayed. This value is the approximation of the battery power (negative voltage in PNP range). The remnant power of battery can thus be determined. If the battery power is insufficient, the “ LOBAT” symbol will appear on the display

Turn the rotary switch to 200V step of NPN or PNN. Insert the two pins of capacitor into C and E jacks respectively (no anode or cathode). Press the test button “TEST” and the instantly displayed reading is the breakdown voltage of the capacitor. Meanwhile, the sound of breakdown and discharge may appear. “1” is finally displayed.

(8) Test Varistor

Connect it according to the picture and turn the rotary switch to 200V step of NPN or PNN. Please select 1000V step if the operating voltage of the varistor is above 300V. Press the test button “TEST” and the displayed reading is namely the operating voltage of varistor. (9) DC voltage signal source

If a DC voltage signal is required during operation, 200V and 1000V step can output DC voltage.

NPN 200V step: there is about 270V DC voltage between C and E, C positive and E negative.

1000V step: there is about 1500V DC voltage between C and E, C positive and E negative.

PNP 200V step: there is about 270V DC voltage between C and E, C negative and E positive.

1000V step: there is about 1500V DC voltage between C and E, C negative and E positive.

You can choose the step according to your needs.

Note:

a.Since these steps step can generate and output high voltage, during test hands must go after the component has inserted and then press “TEST” button to avoid electric shock or body injury. One must cancel the “TEST” button and make sure the red LED light is off before taking the component.

b.One need not worry about transistor damage since the current is controlled within 1mA when this tester tests transistor reverse breakdown voltage. If the I_{CEO} of the tested transistor itself has exceeded 1mA, the reverse breakdown voltage of it cannot be tested. Please test the I_{CEO} of the tested transistor before testing its reverse breakdown voltage.

c.If use 200V and 1000V step to test the same transistor respectively, the tested withstand voltage of good quality transistor should be the same. If the tested voltage varies greatly, the reverse breakdown feature of the tested transistor is poor or there is a high I_{CEO}.

d.When test the reverse breakdown voltage of transistor, make sure the tested transistor is in good contact with the socket and then press the test button. Poor contact will easily cause high voltage spark and damage the tested transistor.

e. The tested capacitor has bee charged. To avoid electric shock, do not touch the metal leg of the capacitor when taking it. Discharge it outside the tester. If the charge on the capacitor is released in the tester, the tester may be damaged.

f. Since various transistors vary in PN junction technique and materials, this tester will obtain various forward voltage drop when testing the PN junction forward voltage drop of tested transistor, which can be used to identify various transistors. This tester has obtained following data for reference only:

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

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

Tested forward voltage drop of zener Diode should be 1.0V;

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

Tested normal diode voltage of bidirectional trigger diode should be about 30V;

Tested normal forward voltage drop of light emitting diode should be 1.5V~1.8V;

Turn the rotary switch to 200V step of NPN or PNN. Insert the two pins of capacitor into C and E jacks respectively (no anode or cathode). Press the test button “TEST” and the instantly displayed reading is the breakdown voltage of the capacitor. Meanwhile, the sound of breakdown and discharge may appear. “1” is finally displayed.

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You can choose the step according to your needs.

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c.If use 200V and 1000V step to test the same transistor respectively, the tested withstand voltage of good quality transistor should be the same. If the tested voltage varies greatly, the reverse breakdown feature of the tested transistor is poor or there is a high I_{CEO}.

6

d.When test the reverse breakdown voltage of transistor, make sure the tested transistor is in good contact with the socket and then press the test button. Poor contact will easily cause high voltage spark and damage the tested transistor.

e. The tested capacitor has bee charged. To avoid electric shock, do not touch the metal leg of the capacitor when taking it. Discharge it outside the tester. If the charge on the capacitor is released in the tester, the tester may be damaged.

f. Since various transistors vary in PN junction technique and materials, this tester will obtain various forward voltage drop when testing the PN junction forward voltage drop of tested transistor, which can be used to identify various transistors. This tester has obtained following data for reference only:

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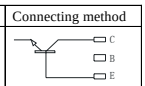
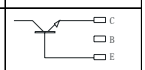
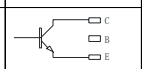
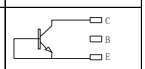
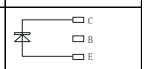
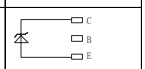
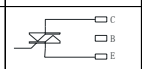
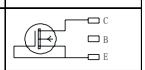
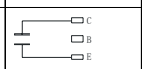
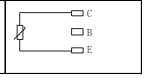
Tested normal forward voltage drop of infrared emitting diode should be 1.0V;

Tested normal diode voltage of bidirectional trigger diode should be about 30V;

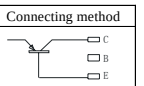
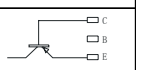
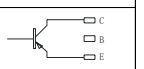
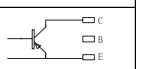
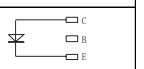
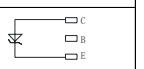
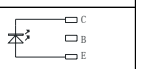
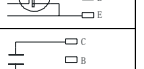
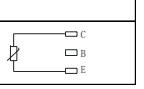
Tested normal forward voltage drop of light emitting diode should be 1.5V~1.8V;

7

NPN

Tested parameter	Connecting method
BV_{CBO}	
BV_{EBO}	
BV_{CEO}	
BV_{CES}	
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

Tested parameter	Connecting method
BV_{CBO}	
BV_{EBO}	
BV_{CEO}	
BV_{CES}	
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	

Expand its application to test the operating voltage of neon lamp, energy saving lamp and neon sign. Insert the two pins of the diode into the C and E hole of socket. Press “TEST” button, the red LED light is on and the reading on the display is the operating voltage and the diode should emit light.

(4) Test field effect transistor

The field effect transistor consists of N channel and P channel. A short circuit should be formed between G and S pole. Otherwise, the transistor can easily be damaged. Connect it according to the picture. Pay attention to the polarity of test voltage and avoid wrong connection. Press “TEST” button, the red LED light is on and the reading on the display is namely the tested breakdown voltage.

(5) Test controlled silicon

The connecting method for reverse breakdown voltage test of controlled silicon is as shown in the picture. Press “TEST” button, the red LED light is on and the reading on the display is namely the tested breakdown voltage.

(6) Test isolation of electrical appliance

Connect the C and E pole of socket to the 2 test terminal of the electrical appliance through lead. Select 1000V step of VBR and press the test button. The tester provides about 1500V DC voltage. If the electrical appliance is in good isolation, near 1500V reading will appear. If it can not tolerate 1500V voltage, the tested electrical appliance will be disrupted or broken down. The readings on the display will jump or be “000”.

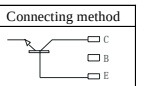
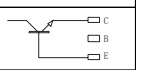
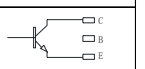
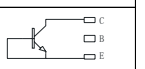
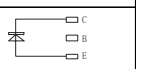
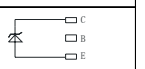
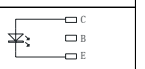
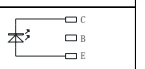
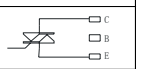
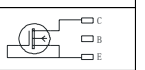
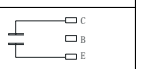
(7) Test withstand voltage of capacitor

a. Test withstand voltage of electrolytic capacitor:

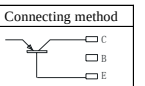
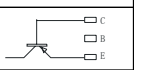
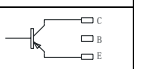
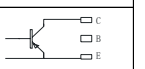
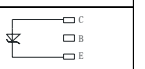
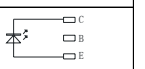
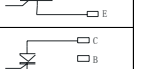
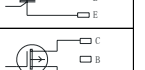
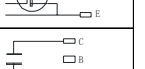
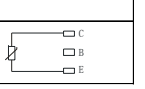
Turn the rotary switch to 200V step of NPN. Insert the electrolytic anode into capacitor jack C+ and cathode into capacitor jack C-. Press the test button “TEST” and the displayed reading will rise gradually till it cannot climb any more. The final reading is the electrolytic capacitor withstand voltage. The quality is better that the faster the electrolyte with the same capacitance is charged. The tantalum capacitor will be damaged when exceeding the withstand voltage.

b. Test withstand voltage of porcelain, terylene, mica and monolithic capacitor:

NPN

Tested parameter	Connecting method
BV_{CBO}	
BV_{EBO}	
BV_{CEO}	
BV_{CES}	
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

Tested parameter	Connecting method
BV_{CBO}	
BV_{EBO}	
BV_{CEO}	
BV_{CES}	
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	

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b. Test withstand voltage of porcelain, terylene, mica and monolithic capacitor:

on LCD, you should replace the inner battery immediately lest the measuring precision is affected. Turn the power switch to “OFF” position, take off the 2 fixing screws on the back cover, remove the back cover and replace the old battery with the new. Pay attention to the battery polarity. Then put on the back cover and fix the screws.

VII. Accessories

1. Instruction Manual
2. Battery 1.5V AA 4pcs

X. Optional Accessories

The 6V/3A external DC adaptor for this tester is optional for purchase. 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.

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Digital Transistor
DC Parameter Teste

OPERATING MANUAL

MODEL：294

Rev. 3.0

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