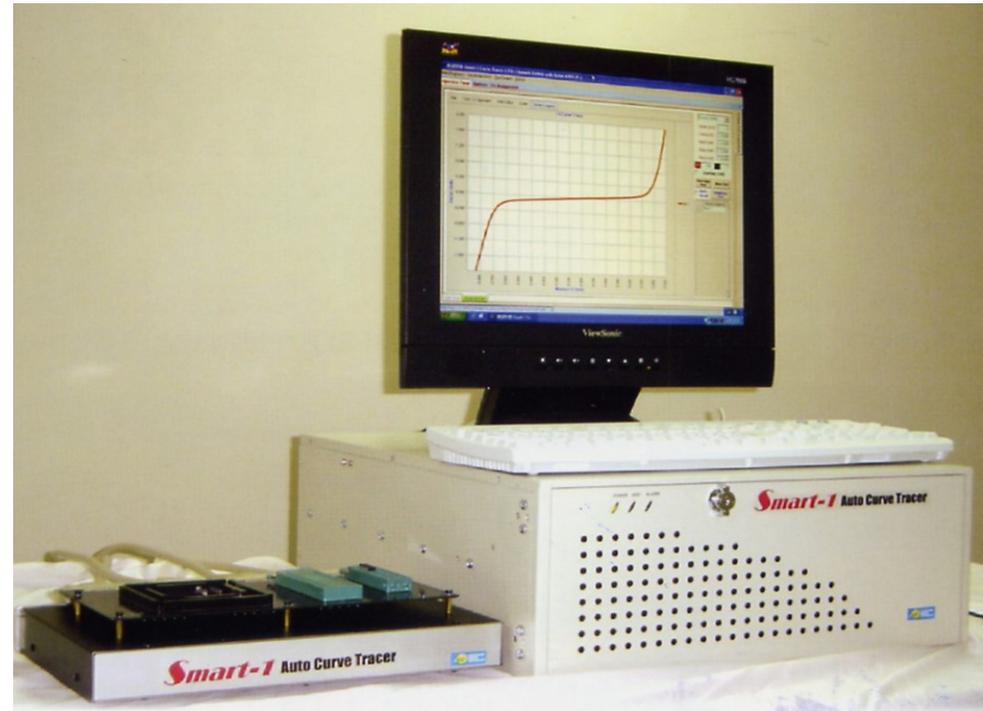


Auto curve tracer

Main Function

- *Open /Short Test*
- *I / V Curve tracer Analysis*
- *I_{dd} Measuring*
- *Power Leakage Test*

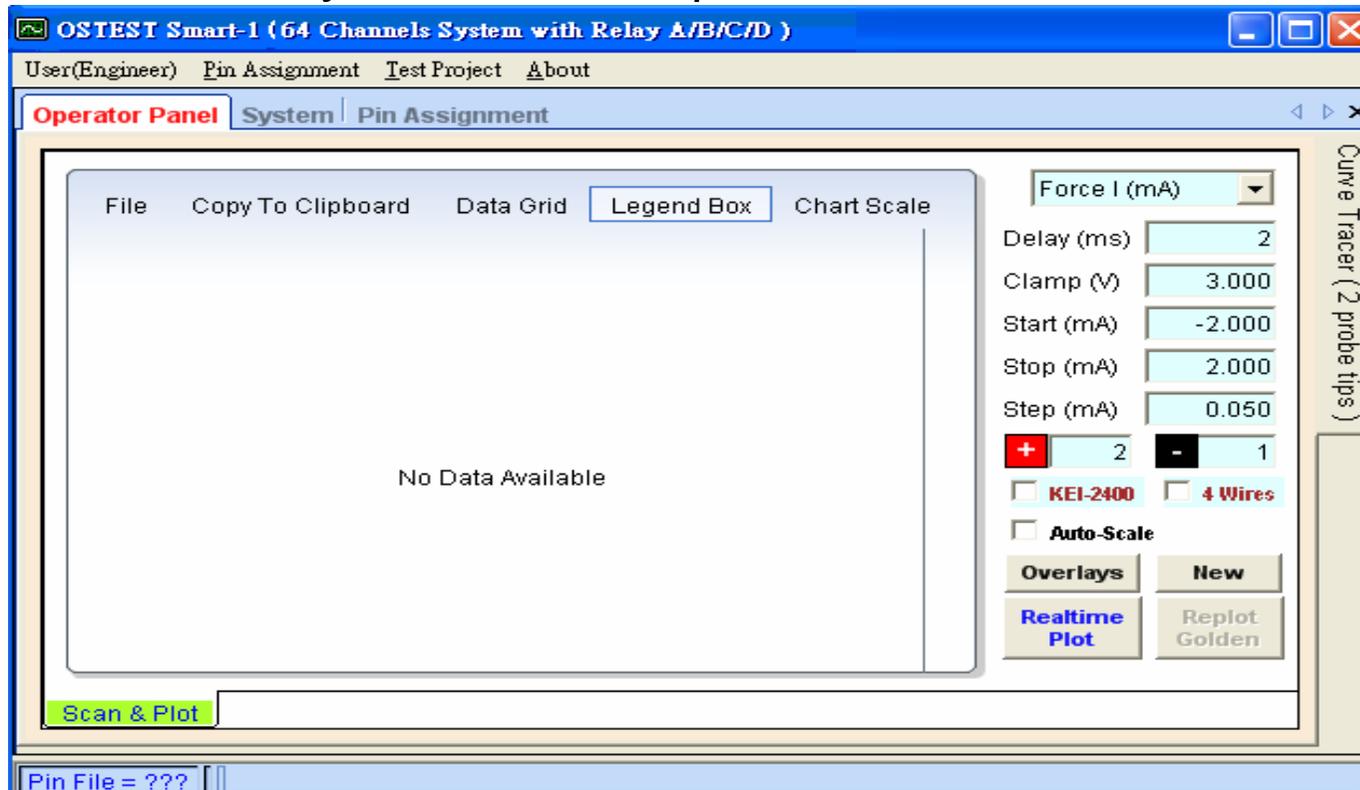


Software function

Curve Tracer (2 Probe Tips) for Failure Analysis

- On this failure analysis application, only two probe tips are need. System offers four specific channels, CH1 (F-) / CH2 (F+) / CH3 (S-) / CH4 (S+), to complete this requirement without the pin assignment definition.

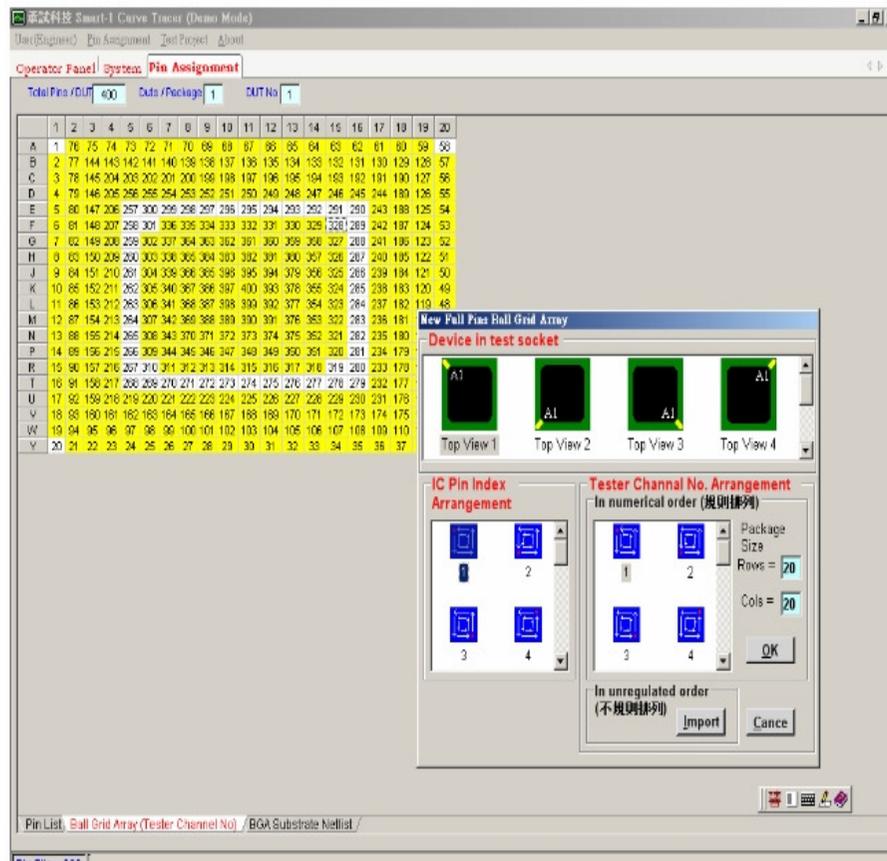
User can easy to find out fail pins I/V curve situation.



Software function

Easy to set up Pin assignment :

Pin assignment is easily set by a mouse click on the window –based



Operator Panel		System		Pin Assignment		Leakage	
Total Pins / DUT		Duts / Package		DUT No			
96		1		1			
Pin No	Tester Channel	DUT					
		Ball No	Finger No	Function Name	Attribution Name		
1	1	A1		NC	IO		
2	2	A2		NC	IO		
3	3	A3		A20	IO		
4	4	A4		A11	IO		
5	5	A5		A15	IO		
6	6	A6		A14	IO		
7	7	A7		A13	IO		
8	8	A8		A12	IO		
9	9	A9		F-VSS	GND		
10	10	A10		F-VCCQ	VCC		
11	11	A11		NC	IO		
12	12	A12		NC	IO		

Software function

- **Simple O/S Inspection**
- any tested pins can be selected by software as “All-Pin”, “Pin-All” and “Pin-Pin”.

	Pin+	Pin-	Force (mA)	This Reading (V)	AutoSet Reading (V)	AutoSet Status	Judgment
1	All	1	0.100	0.5530	N.A.	N.A.	Pass
2	1	All	0.100	0.5286	N.A.	N.A.	Pass

Once COMPARE TO AUTOSET is checked after loading some test project, the Judgment is depend on what status of AutoSet is. For example, New Stauts:Open, AuotSet Status:Open, then the judgment is 'PASS'

Use ALL-TO-PIN, PIN-TO-ALL to scan "CHECK PIN NO."
The pin can be judged as Open, Pass, or shorted to some others.

Use PIN-TO-PIN to scan "CHECK PIN NO." versus each of other pins.
All pins that shorted to this specific pin can be found.

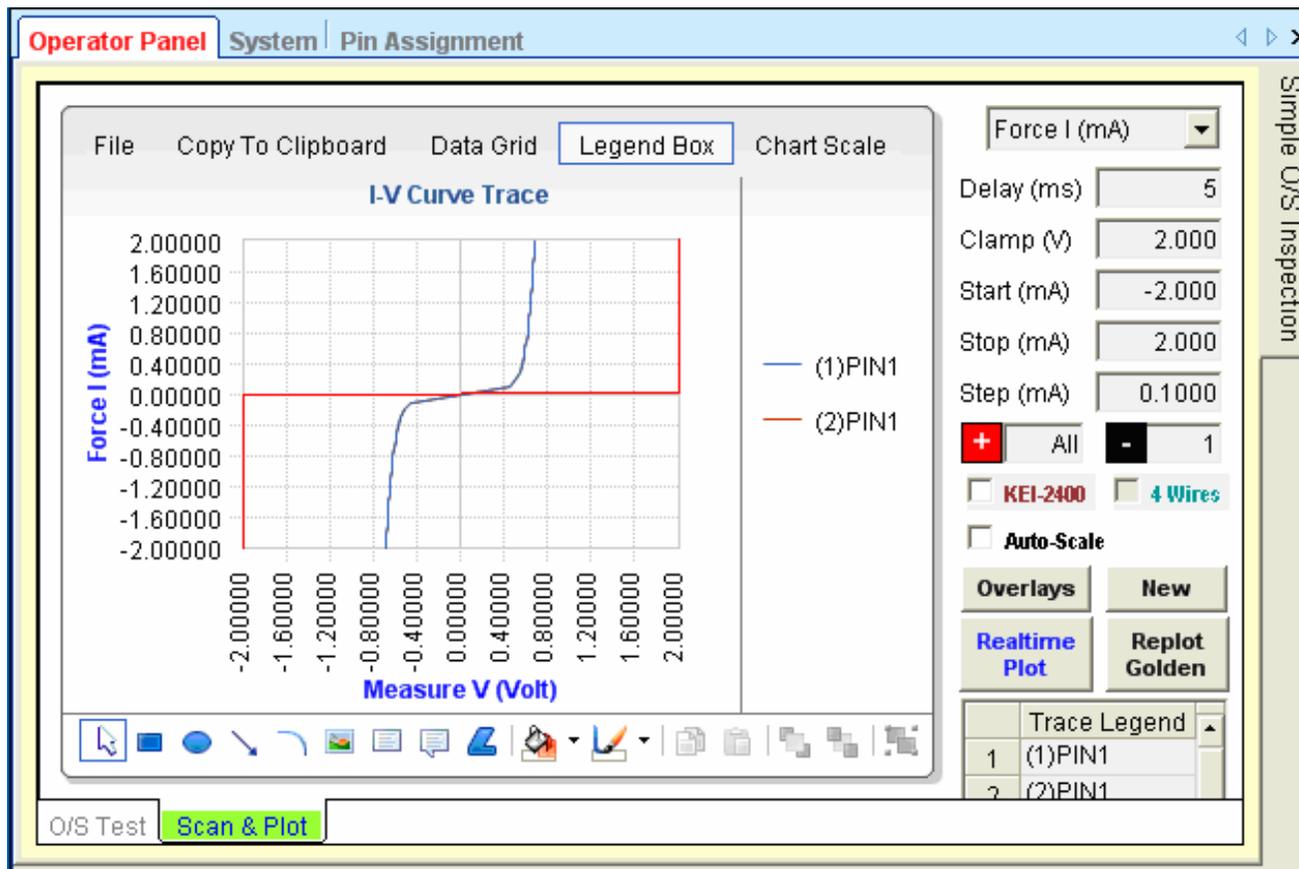
Operator Panel System Pin Assignment

Simple O/S Inspection

O/S Test Scan & Plot

Software function

- **User can memorize the I/V curve of one golden device and compare with the unknown devices, so it becomes very simple and quick to find out problem samples.**



Software function

- **‘O/S Test or Leakage test item -(Unpowered)’**
- After executing “Test Project > New Project” menu and loading the relative pin assignment file, please execute the below menu to open “O/S & LK (Unpowered)” tab.

The screenshot shows a software interface with a menu open. The menu path is: Test Project > Add O/S or Leakage Test Item -- Unpowered. The interface includes a header bar with 'User(Engineer)', 'Pin Assignment', 'Test Project', and 'About'. Below the header is an 'Operator Panel' with 'System' and 'P' buttons. A 'Total Pins / DUT' field shows '20' and 'Duts'. A table with columns 'Pin No', 'Tester Channel', and 'Ball No' is visible. The table contains two rows: (1, 1) and (2, 3). The menu items are: New Project, Open Project, Save Project, Close Project, Add O/S or Leakage Test Item -- Unpowered (highlighted), Add Idd or Leakage Test Item -- Powered, and Add Curve Tracer Item.

Pin No	Tester Channel	Ball No
1	1	
2	3	

- New Project
- Open Project
- Save Project
- Close Project
- Add O/S or Leakage Test Item -- Unpowered**
- Add Idd or Leakage Test Item -- Powered
- Add Curve Tracer Item

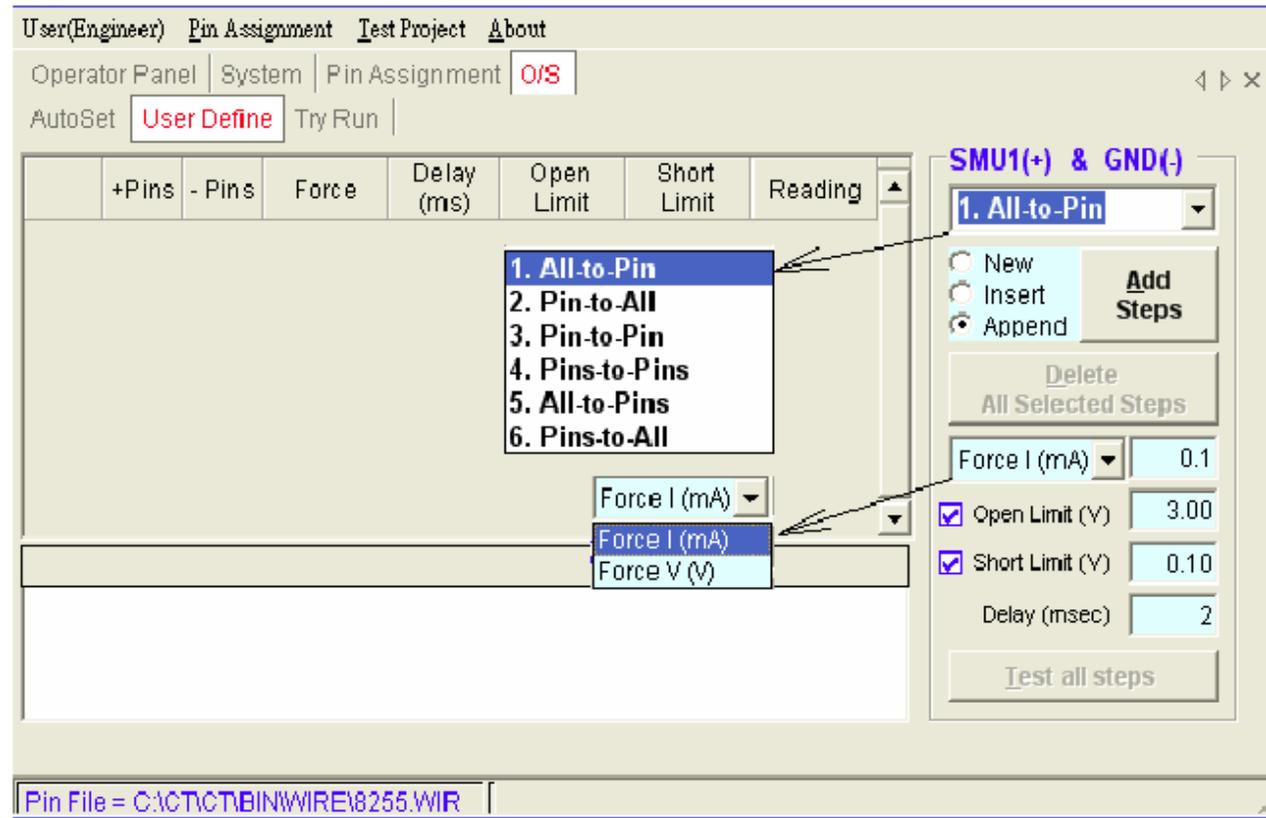
Software function

Open /short test :

- Autoset
- (1).All to pin
- (2).pin to All
- (3) Pin to pin

- User define

- (1).All to Pin
- (2).Pin to All
- (3).Pins to Pins
- (4).Pins to Pins
- (5).All to pins
- (6).Pins to All



Software function

- Autoset

Most of user from the IC packaging manufactory click “AutoSet” button to create test steps that learn from the golden device according to the test condition (Current source, Diode High limit, Diode Low Limit, Power short limit, Source delay time) you set.
Max. Current Source =10mA, $0.01V \leq \text{Diode Low Limit} < \text{Diode High Limit} \leq 9V$,
Clamping Voltage = Diode High Limit + 0.5V

The screenshot shows a software window titled "Operator Panel | System | Pin Assignment | O/S & LK (Unpowered)". The "AutoSet" tab is active, showing a table of test results and configuration options.

	Pin Index	Channel No.	All ->Pin (V)	Pin ->All (V)	Bypass
1	1	1	0.553	0.529	
2	2	3	0.577	0.576	
3	3	5	0.571	0.541	
4	4	7	0.579	0.596	
5	5	9	0.506	0.536	
6	6	11	0.577	0.559	
7	7	13	0.530	0.565	
8	8	15	0.528	0.582	
9	9	17	0.599	0.523	
10	10	19	0.598	0.553	
11	11	20	0.600	0.502	
12	12	18	0.510	0.580	
13	13	16	0.505	0.538	
14	14	14	0.595	0.540	
15	15	12	0.516	0.565	
16	16	10	0.541	0.533	
17	17	8	0.521	0.558	
18	18	6	0.546	0.526	
19	19	4	0.538	0.592	
20	20	2	0.588	0.510	

Configuration options on the right:

- O/S Test Condition**
 - Diode Function**
 - Isrc (mA): 0.100
 - High Limit (V): 1.00
 - Low Limit (V): 0.20
 - Power Short**
 - Isrc (mA): 0.200
 - Short Limit (Ohm): 100
 - Delay Time (msec): 2.0
 - Discharge per test
 - Buttons: Delete, AutoSet (circled in red)
- Pins (Normal Diode Pass)**
 - 1-20
 - Pin Index dropdown
 - Buttons: Save, About

At the bottom, a status bar shows "Open Pass Low Short Power Not Short" with "Pass" highlighted in red.

Software function

- **Unpowered Leakage Test (Force 0.2~0.4V, Short Limit < 0.05mA) for the I/O pins with ESD diode inside.**
- **Ground Pins → I/O Pins, I/O Pins → Power Pins**
- ***One example to setup unpowered leakage test steps is as below.***

The screenshot displays a software interface for configuring a test. At the top, there are tabs for 'AutoSet', 'User Define', and 'Try Run'. The main area contains a table with the following data:

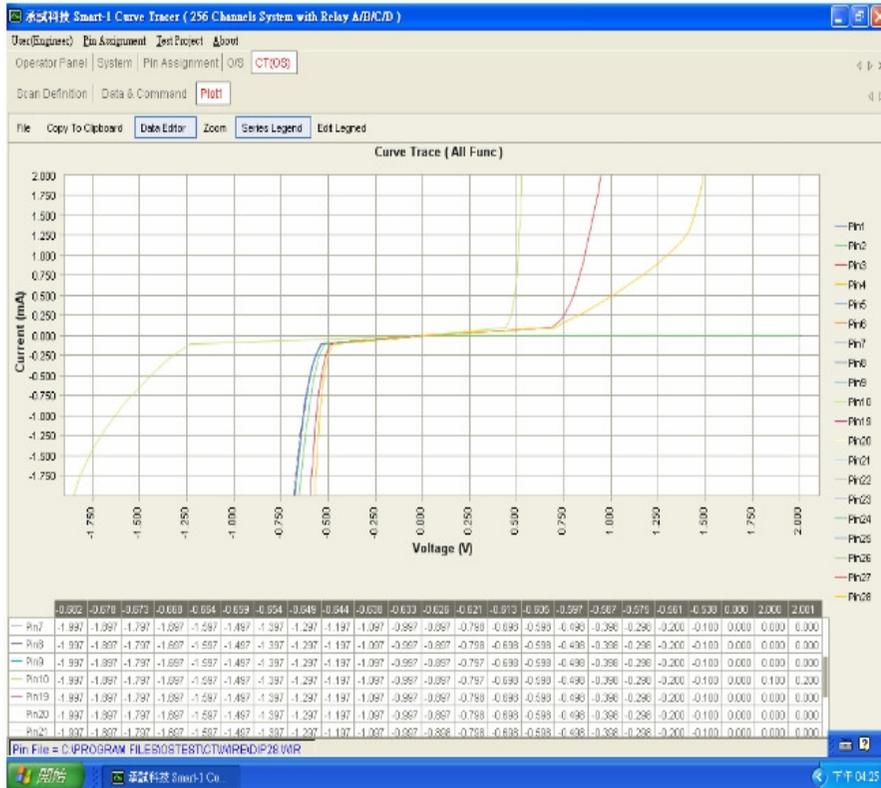
	+Pins	- Pins	Force	Delay (ms)	Open Limit	Short Limit	Reading
1	10	@0	0.4V/ 0.025mA	2	X	0.004mA	0.002mA
2	@0	20	0.4V/ 0.025mA	2	X	0.004mA	0.003mA

Below the table, there is a text box with the following text: 'Unpowered Leakage steps', 'Pin10 is Ground Pin', 'Pin20 is Power Pin', and 'Other Pins is I/O'. A context menu is open over the table, showing options: 'Reverse Pins', 'Change Specification', 'Find Pin', and 'Add to Curve Trace'. A red arrow points from the 'Add to Curve Trace' option to a list of test steps: '1. All-to-Pin', '2. Pin-to-All', '3. Pin-to-Pin', '4. Pins-to-Pins', '5. All-to-Pins', and '6. Pins-to-All'. Another red arrow points from the '4. Pins-to-Pins' step to the configuration panel on the right. The configuration panel is titled 'SMU1(+) & GND(-)' and shows a dropdown menu set to '4. Pins-to-Pins'. It includes buttons for 'New', 'Insert', 'Append', 'Delete Steps', and 'Add Steps'. The 'Append' option is selected. Below these are input fields for 'Force V (V)' (0.4), 'Clamping (mA)' (0.025), 'Open Limit (mA)' (0.001), 'Short Limit (mA)' (0.004, checked), and 'Delay (msec)' (2). At the bottom of the panel are buttons for 'Daisy Chain', 'Save', and 'Test all steps'.

Software Function--- Auto I / V curve tracer Analysis

Automatic /Manual plot is available

Can use simple curve tracer function to measure I/V curve of all pins



Function ID	Action	Bias Hold (msec)	GND	SMU1			
				Force	Delay(ms)	Clamp	
				mA	1	1.500V	
				Start	Stop	Step	
				-1.000	1.000	0.040	
				Pins	Bias (V)	Bias (mA)	Pins
1	F1	FDM	0.5	All	1.000	0.100	1
2	F2	FDM	0.5	All	1.000	0.100	2
3	F3	FDM	0.5	All	1.000	0.100	3

Step.1 Sweep Source

Cable (Ohm) = 3.42

Steps can be modified

Open all relay before starting scan

Append Data for each scan

SMU1= External Keithley 2400

Start Scan

Force	mA
Delay(ms)	1
Clamp	1.500V
Start	-1.000
Stop	1.000
Step	0.040
Title	SMU1

Software function

- **Power Curve Tracer**

- Step 1 → Add power level to POWER pins, Add precondition level on some input pins,
- Step 2 → Connect SMU1 to the tested pin and force source level from Vss-1V to Vdd+1V for measuring the leakage current.
- Trace1 :(Normal) Trace2 :(Put one 3Mohm resistance between the tested pin and Vss wittingly)

Function ID	Action	Bias Hold (msec)	SMU1			SMU2			SMU3				
			Force	Delay(ms)	Clamp	Force	Delay(ms)	Clamp	Force	Delay(ms)	Clamp		
			V	5	0.100mA	V	5	0.100mA	V	5	0.100mA		
			GND	Start	Stop	Step	Start	Stop	Step	Start	Stop	Step	
				-1.000	6.000	0.001	0	0	0	0	0	0	
			Pins	Bias (V)	Bias (mA)	Pins	Bias (V)	Bias (mA)	Pins	Bias (V)	Bias (mA)	Pins	
1	B1	Bias	10.0	7	0.000	0.100	5.000	20.000	26	0.000	0.100		
2	F1	FDM	0.5	@0	0.000	0.100	6	5.000	20.000	26	4.800	0.100	@1

@0=(7,36)
@1=(5-6,35)

Step.2
Cable (Ohm) = 1.55
 Steps can be modified

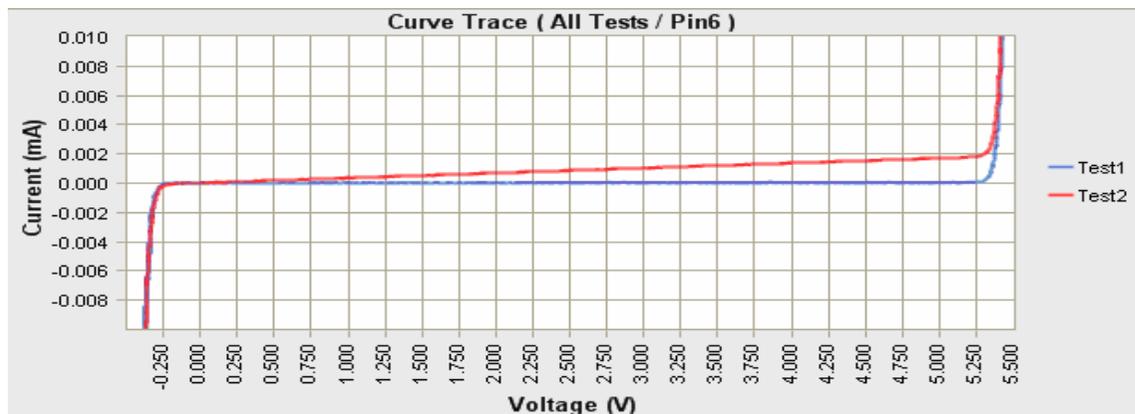
		-1.000V	-0.999V
F1	(V) SMU1-Sweep1	-0.478	-0.467
	(mA) SMU1-Sweep1	-0.0997	-0.0997

Test1 Test2

Traces Definition

	Test Name	Data Series
X-Axis	All Tests	SMU1-V
Y-Axis	All Tests	SMU1-I

Plot1



Software function

- Idd Measuring

Power	Precondition	Leakage Spec.	Idd Spec.				
Power Source	Power Name	Voltage (V)	Clamp (mA)	Limit (mA)	Delay (ms)	Pins List	
GND						@1	
SMU2	Yes	P1	5.000	1.000	0.200	30	@0
SMU3	No	P2	2.5	500	450	5	
SMU1	No	KEI2400	5.000	100	90	5	

Power	Precondition	Leakage Spec.	Idd Spec.				
GND	SMU2	SMU3	SMU1(Vih/Vil)		For Idd Measure		
Pins	Voltage	Pins	Voltage	Pins	Voltage	Pins	
1	5.000	5.000	0.000	1	Yes		
2	5.000	20.000	1	Yes			

Add Step

Delete Step

Cut Pins List

Copy Pins List

Paste Pins List

Delete Pins List

Edit Pins List

Power	Precondition	Leakage Spec.	Idd Spec.				
Power SMU?	Idd Name	Clamp (mA)	Limit (mA)	Delay (ms)	Precondition	BIN6 Low	
1	2	Idd_Reset	0.200	0.0100	5	1	
2	2	Idd_Sleep	0.200	0.0100	30	2	

Add Step

Delete Step

Cut Pins List

Copy Pins List

Paste Pins List

Delete Pins List

Edit Pins List

@0=(20,26-27)
 @1=(2-8,11-19,21-25,28)

Idd & LK (Powered)

Power SMU?	Idd Name	Clamp (mA)	Limit (mA)	Delay (ms)	Precondition
1	2	Idd_Reset	0.200	0.0100	5
2	2	Idd_Sleep	0.200	0.0100	30

of Average:

Fail

Per Pin Measure

Save

Leakage Test

Show Fail Only

Step by Step

Repeat Test #:

Save

Run

Power Name	Voltage (V)	Limit (mA)	Reading (mA)	
1	Idd_Reset	5.000	0.0100	1.4111
2	Idd_Sleep	5.000	0.0100	1.0668

Leakage Measurement Gross Idd Check Precondition

Software function

- Power Leakage Test
- Create Pin Assignment File for Leakage Test as below.

	Tester Channel	DUT					Tester Channel	DUT			
		Ball No	Finger No	Function Name	Attribution Name			Ball No	Finger No	Function Name	Attribution Name
1	1			PA3	IO	21	40			PB3	IO
2	3			PA2	IO	22	38			PB4	IO
3	5			PA1	IO	23	36			PB5	IO
4	7			PA0	IO	24	34			PB6	IO
5	9			RD*	IN	25	32			PB7	IO
6	11			CS*	IN	26	30			VCC	VCC
7	13			GND	GND	27	28			D7	IOZ
8	15			A1	IN	28	26			D6	IOZ
9	17			A0	IN	29	24			D5	IOZ
10	19			PC7	IO	30	22			D4	IOZ
11	21			PC6	IO	31	20			D3	IOZ
12	23			PC5	IO	32	18			D2	IOZ
13	25			PC4	IO	33	16			D1	IOZ
14	27			PC0	IO	34	14			D0	IOZ
15	29			PC1	IO	35	12			RESET	IN
16	31			PC2	IO	36	10			WR*	IN
17	33			PC3	IO	37	8			PA7	IO
18	35			PB0	IO	38	6			PA6	IO
19	37			PB1	IO	39	4			PA5	IO
20	39			PB2	IO	40	2			PA4	IO

Software function

- Power Leakage Test

	Power Source	Power Name	Voltage (V)	Clamp (mA)	Limit (mA)	Delay (ms)	Pins List
GND							7
SMU2	Yes	VCC	5.000	20.0	10.0	5	26
SMU3	No	P2	2.5	500	450	5	

Power / Precondition / Leakage Specification

	GND	SMU2		SMU3		For Idd Measure
	Pins	Voltage	Pins	Voltage	Pins	
1	36	5.000		4.800	@0	No

Power / Precondition / Leakage Specification

	Tested Group Name	Force (V)	Leakage (uA)	Delay (ms)	Precondition	Method	Pins List
1	LK_IN	4.800	1.0	1.0	1	Serial	@1
2	LK_IN	0.100	1.0	1.0		Serial	@2
3	LK_IO	4.800	1.0	1.0		Serial	@3
4	LK_IO	0.100	1.0	1.0		Serial	@4
5	LK_IOZ	4.800	1.0	1.0		Serial	@5
6	LK_IOZ	0.100	1.0	1.0		Serial	@6

Power / Precondition / Leakage Specification

```

@0=(5,35)
@1=(5-6,8-9,35-36)
@2=(5-6,8-9,35-36)
@3=(1-4,10-25,37-40)
@4=(1-4,10-25,37-40)
@5=(27-34)
@6=(27-34)
    
```

	Tested Group Name	Pins	Function Name	Force (V)	Limit (uA)	Reading (uA)	Bypass
2	LK_IN	5	RD*	4.8	1	0	
3	LK_IN	6	CS*	4.8	1	0	
4	LK_IN	8	A1	4.8	1	0	
5	LK_IN	9	A0	4.8	1	0	
6	LK_IN	35	RESET	4.8	1	0	
7	LK_IN	36	WR*	4.8	1	0	
9	LK_IN	5	RD*	0.1	1	0	
10	LK_IN	6	CS*	0.1	1	0	
11	LK_IN	8	A1	0.1	1	0	
12	LK_IN	9	A0	0.1	1	0	
13	LK_IN	35	RESET	0.1	1	-0.1	
14	LK_IN	36	WR*	0.1	1	0	
16	LK_IO	1	PA3	4.8	1	0	
17	LK_IO	2	PA2	4.8	1	0	
18	LK_IO	3	PA1	4.8	1	0	
19	LK_IO	4	PA0	4.8	1	0	
20	LK_IO	10	PC7	4.8	1	0	
21	LK_IO	11	PC6	4.8	1	0	
22	LK_IO	12	PC5	4.8	1	0	
23	LK_IO	13	PC4	4.8	1	0	
24	LK_IO	14	PC0	4.8	1	0	
25	LK_IO	15	PC1	4.8	1	0	

Leakage Measurement / Gross Idd / Check Precondition

Software function

- mass production Test to link with hander or by manual test

User(Operator) Pin Assignment Test Project About

Operator Panel | Pin Assignment |||

	Counter	1st fail pin of each retest
Pass	0	
Open	0	
Short	0	
Idd	0	
Leakage	0	
W-D-B	0	
Totalizer	0	
UPH		

Dut No = 1 Please hit (New Lot) button to start test.

NG	Pin List	High	Low	Reading

Lot Information | Test Specion | Project Note |

Pin File = C:\CTCT\BIN\WIRE\8255.WIR | Project = C:\CTCT\BIN\DEVICE\INTEL\8255

Production Test
Simple O/S Inspection

New Lot
Reset Totalizer

Software function

- Production Test

The screenshot shows a software interface for a production test. At the top, there's a menu bar with 'User(Operator)', 'Pin Assignment', 'Test Project', and 'About'. Below it is an 'Operator Panel' with 'Pin Assignment' selected. A table shows test results for various categories: Pass (0), Open (2), Short (0), Idd (0), Leakage (0), W-D-B (0), Totalizer (5), and UPH (1800.0). A 'Counter' column is also present. To the right, a 'Production Test' panel shows '#1, All->1, (O) 3.489V' and '#2, All->1, (O) 3.490V'. Below this is a 'Simple O/S Inspection' panel with a table of test results for 8 pins. The table has columns for NG, Pin List, High, Low, and Reading. The 'High' column is highlighted in red. To the right of the table are buttons for 'Stop Test', 'Reset Fail', and 'Print Result'. At the bottom, there are fields for 'Pin File = C:\CT\CT\BIN\WIRE\8255.WIR' and 'Project = C:\CT\CT\BIN\DEVICE\INTEL\8255'.

Counter	1st fail pin on each retest (Max. 1 times)
Pass	0
Open	2
Short	0
Idd	0
Leakage	0
W-D-B	0
Totalizer	5 From 04-19-2004,02:39:54
UPH	1800.0 From 03:01:18, (4 sec / 2 DUTs)

NG	Pin List	High	Low	Reading
1	0 All->1	3.000V	0.2000V	3.490V
2	0 All->2	3.000V	0.2000V	3.490V
3	0 All->3	3.000V	0.2000V	3.491V
4	0 All->4	3.000V	0.2000V	3.490V
5	0 All->5	3.000V	0.2000V	3.490V
6	0 All->6	3.000V	0.2000V	3.489V
7	0 7->All	3.000V	0.2000V	3.497V
8	0 All->8	3.000V	0.2000V	3.490V

Production Test Result (Smart-1 Curve Tracer: Station=1.1.1)

Lot No. = 1 , Operator = 1 , Time = 01/19/2004,03:01:02

Project = C:\CT\CT\BIN\DEVICE\INTEL\8255
Pin File = C:\CT\CT\BIN\WIRE\8255.WIR

O/S Specification (AutoSet)

(1) I/O Pins: Force = 0.100 (mA), Clamp Voltage = 3.50 (V)
Open = 3.000 (V), Short = 0.200 (V)

(2) Power Pins: Force = 0.100 (mA), Clamp Voltage = 3.50V
Short = 100 (ohm)

Idd Specification
VCC = 5.000 (V), Clamp = 20.0 (mA), Limit= 10.0 (mA)

Leakage Specification

(1) LK_IN: Force = 4.800 (V), Limit = 1.0 (uA)
(2) LK_IN: Force = 0.100 (V), Limit = 1.0 (uA)
(3) LK_IO: Force = 4.800 (V), Limit = 1.0 (uA)
(4) LK_IO: Force = 0.100 (V), Limit = 1.0 (uA)
(5) LK_IOZ: Force = 4.800 (V), Limit = 1.0 (uA)
(6) LK_IOZ: Force = 0.100 (V), Limit = 1.0 (uA)

#1: Open Pins = 1,2,3,4,5,6,7,8,More

All->1	=3.491V	All->2	=3.490V	All->3	=3.490V
All->4	=3.490V	All->5	=3.489V	All->6	=3.489V
7->All	=3.497V	All->8	=3.490V		

#2: Open Pins = 1,2,3,4,5,6,7,8,More

All->1	=3.491V	All->2	=3.490V	All->3	=3.490V
All->4	=3.490V	All->5	=3.491V	All->6	=3.489V
7->All	=3.497V	All->8	=3.489V		

Option :

Universal DUT Board
(256Pins)

(512Pins)

(1024Pins)

