

Smart Electronic Load System

MODEL: 6300 SERIES

KEY FEATURES:

- Max Power : 60W, 100W, 250W, 300W,
- Max. Input Voltage : 60V / 250V

Configuration:

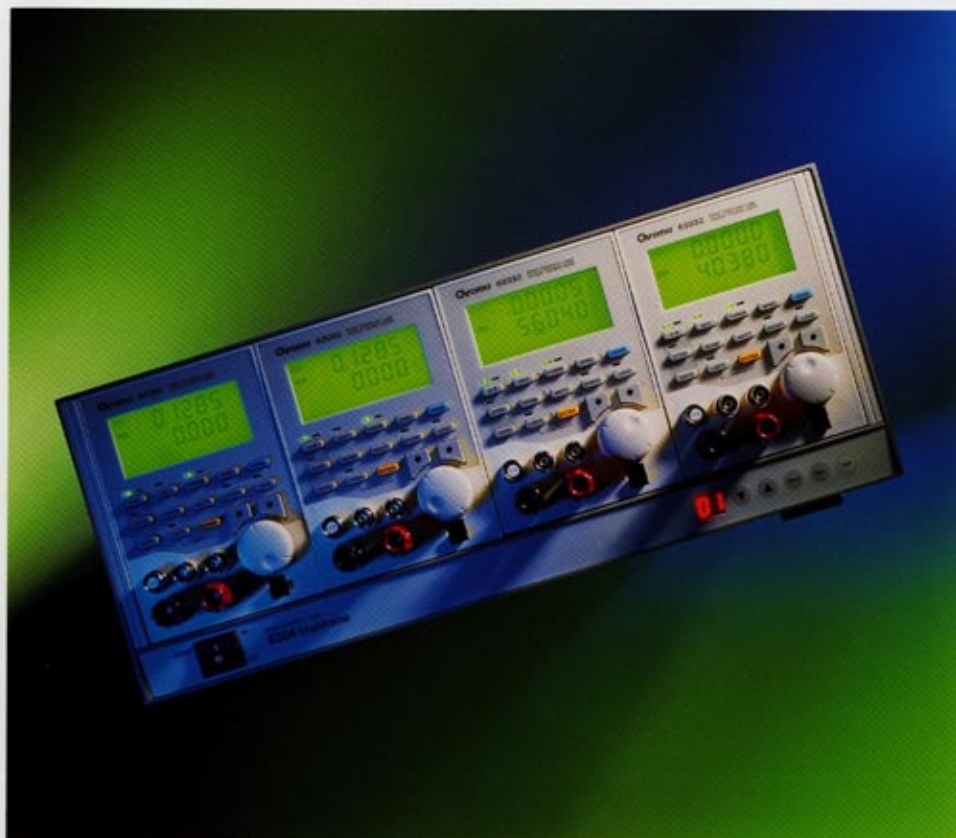
- Plug-in electronic load modules in selectable mainframes.
- Parallel load modules up to 2400W for high current and power application.
- Master/Slave interface for synchronizing multiple loads.
- GPIB Interface.

Load Control:

- CC, CR, CV, and CP operation modes.
- Precision loading delivers 150uA resolution.
- Minimize input resistance allowing load to sink high current at low voltage.
- Dynamic loading with speed up to 20KHz.
- Real time load simulation and output measurement.
- Store up to 100 sets of front panel input status for instant recall.

Measurement:

- 15 bits precision voltage and current measurement with multi-range selection.
- Remote sensing capability.
- 20MHz differential mode noise measurement.
- Short circuit test & short current measurement.
- DC Power measurement.
- Self Test at power on.



SMART ELECTRONIC LOAD SYSTEM MODEL: 6300 SERIES

← IEEE-488 →

Chroma 6300 series Smart Electronic Load System is the state-of-the-art instrument for testing DC power sources and power electronic components. The system is configured by plugging the user selectable load modules into the system mainframe, and operated using the instrument front panel keypads or the remote controlled instructions via GPIB interface. The load modules can be programmed independently for testing multi-output DC/DC power supplies, or parallelly for testing high power application.

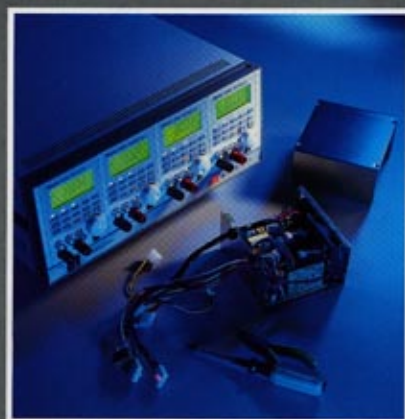
The 6300 family offers 4 types of modular loads with power ranging from 60 watts to 300 watts, current setting from 150uA to 60A, and voltage measurement from 0.5mV to 256V. Each load is isolated and floating, programmable in dual current ranges and measuring voltage ranges, and capable of synchronizing interface for master/slave control operation. The load can be operated in constant current, constant resistance, constant voltage, or constant power mode.

The 6300 can simulate a wide range of dynamic loading applications. The loading waveform is user programmable in slew rates, load levels, duration, and conducting voltage. The load can

also be controlled via external analog control voltage, or signal generator to simulate specific application requirements. Furthermore, up to 100 sets of system operating status can be stored in battery backup SRAM and recalled instantly for automated testing application.

Real time measurement of voltage, current, and power is integrated in each 6300 load module using 15-bits precision measurement circuit. The user can perform on line voltage measurement and adjustment, or simulate short circuit test using simple front panel keypad operation. Additionally, the load module offers optional noise measurement function capable of detecting 20MHz noise via differential mode input without the need of a scope.

The 6300 has self diagnosis routine to maintain instrument performance at all time. It is also protected against OPP, OCP, OVP, OTP, and reverse polarity to guarantee quality and reliability for even the most demanding engineering testing and ATE applications.



Chroma

Modular, Synchronized, Dynamic Load Simulation, Noise Measurement, Short Circuit Test, -----

----- Comprehensive, Flexible Solution for Power Electronics Test Applications. -----

1. Versatile System Configuration

Chroma 6300 Smart Load System integrates microprocessing capability in each load module and main frame, as such the system operates in parallel processing mode to optimize the speed and control among multiple load modules. All load modules are configured to work synchronously, and testing can be carried out simultaneously at multiple output to simulate real life application.

In addition to stand alone operation via the instrument front panel keypad, the user can add GPIB interface control option to the system mainframe, and integrate it into any ATE test applications. The user can configure and modify the system by simply selecting the load modules suitable for specified applications, and plug them into the system mainframe.

2. Modular Load Design

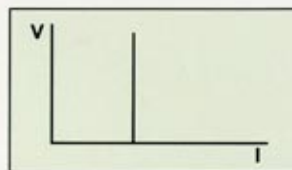
Chroma 6300 load modules can be plugged in the 6304 or 6301 mainframe easily. The 6304 takes 4 modules and fits onto an 19" instrument rack, the 6301 takes 1 module and is one fourth the width. All modules on the 6304 mainframe share common GPIB address to synchronize and speed up the control of load modules and read back of operating data.



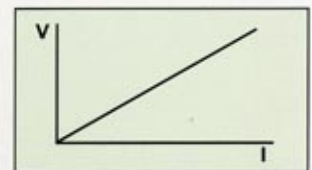
The 6300 family offers 4 types of load modules ranging from model 63006 with 60 watts power to model 63030 with 300 watts power. Each model is designed with specific applications in mind. Model 63006 is capable of precision loading control to 150 μ A and voltage measurement to 0.5mV accuracy, and is well suited for testing low power, high precision DC/DC converter. Model 63025 is designed to operate up to 250V for high voltage testing application. Model 63030 sinks a maximum 60A each module, and is most cost effective for high power test application.

3. Application Specific Load Simulation

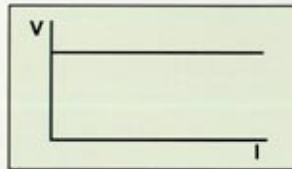
The 6300 load modules operate in constant current, constant resistance, constant voltage, or constant power mode to satisfy a broad range of test requirements. For example, the test of battery charging can be simulated easily by setting the load to operate in constant power mode.



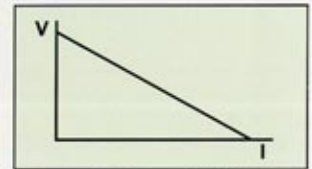
Constant Current Mode



Constant Resistance Mode

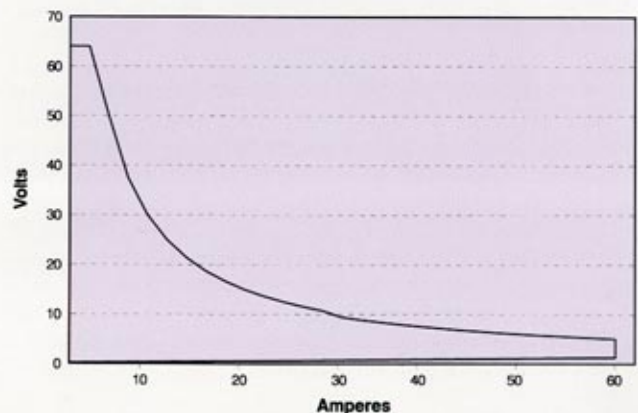


Constant Voltage Mode



Constant Power Mode

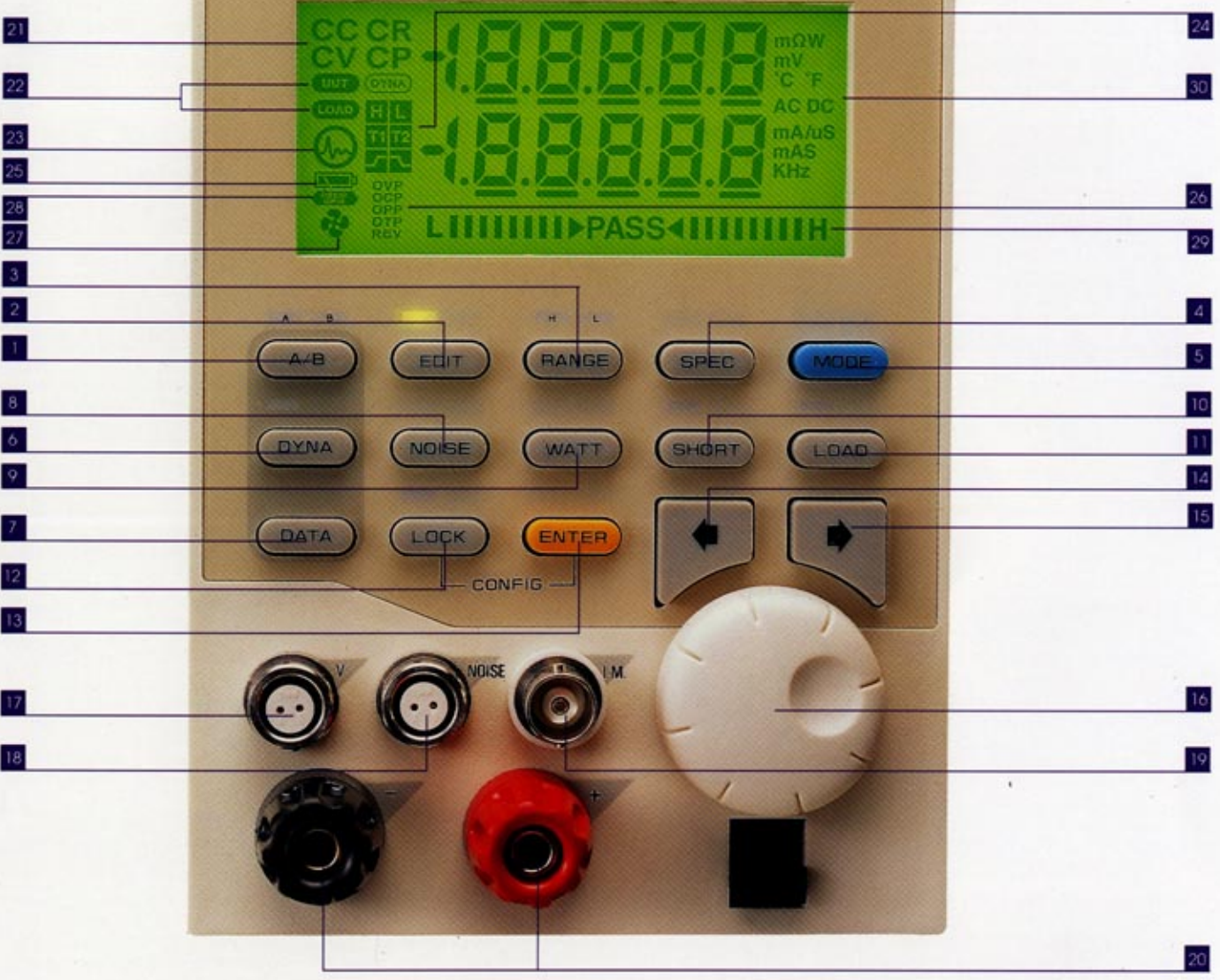
Each load module uses current close loop design and connects all power MOSFET devices parallelly to insure high accuracy load control with minimum drift of less than 0.15% of the current setting. The FET technology accomplishes minimum input resistance and enables the load to sink high current even at very low voltage. For example, model 63030 is capable of sinking 60A at minimum 1V output, and is well suited for testing the new 3.3V low voltage power supplies. Low voltage operation, down to zero volt, is possible at correspondingly reduced current level.



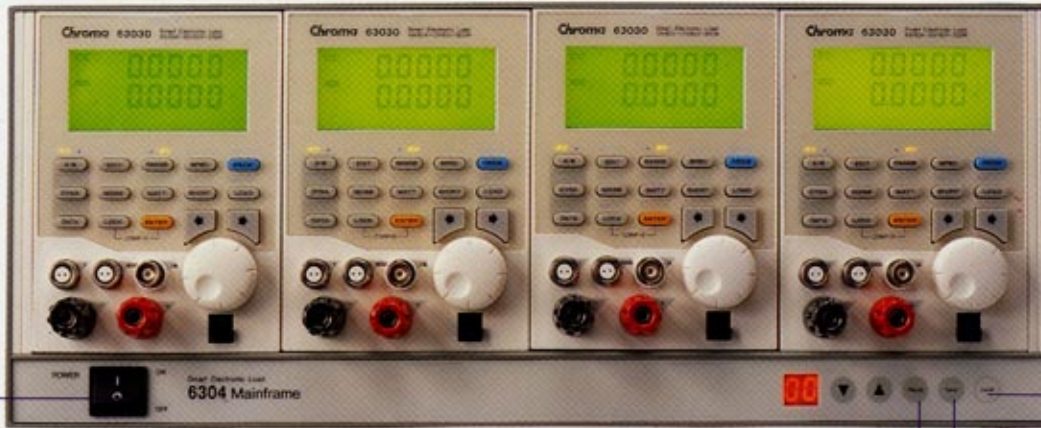
MODEL 63030 INPUT CHARACTERISTICS

The 6300 load module uses photo coupler for isolation between the output and control sections, thus each load is isolated and floating. The user can use multiple load modules independently to test multi-output power supplies, or parallelly in master/slave control for high power application.

Chroma 63030 Smart Electronic Load
6A/60A•10V/60V•300W



- | | | |
|---|---|---|
| <p>1 A B Key : To Program the two load levels in the static mode.</p> <p>2 Set Key : To select the system's operation mode between "SET" or " MEASUREMENT " mode.</p> <p>3 Range Key : To select High/Low loading range.</p> <p>4 Spec Key : To set up High/Low limits of voltage for GO/NG test or assisting voltage adjustment.</p> <p>5 Mode Key : To select C.C, C.R. C.V, C.P operation mode.</p> <p>6 Dynamic Key : To enter into dynamic test mode.</p> <p>7 Data Key : To modify the loading control parameters for dynamic test mode.</p> | <p>8 Noise Key : To display reading of the noise measurement.</p> <p>9 Watt Key : To display reading of the DC power measurement.</p> <p>10 Short Key : To apply a short circuit across the input.</p> <p>11 Load ON/OFF Key :To enable and disable the load input.</p> <p>12 Lock Key : To lock out data entry.</p> <p>13 Enter Key : To confirm editing data to the instrument.</p> <p>14 Cursor ←Key : To shift cursor one step to left.</p> <p>15 Cursor →Key : To shift cursor one step to right.</p> <p>16 Rotary Knob : To adjust load setting continuously.</p> <p>17 V Terminal :To measure the UUT output voltage using remote sense.</p> | <p>18 Noise Terminal : To measure the UUT output noise.</p> <p>19 I.M. Terminal : Isolated BNC connector to monitor load current.</p> <p>20 Load Terminal</p> <p>21 Load operation mode indicator</p> <p>22 Measure on UUT or Load indicator</p> <p>23 Noise measurement mode indicator</p> <p>24 Dynamic mode indicator</p> <p>25 Battery low indicator</p> <p>26 Protection status indicator</p> <p>27 Fan fail indicator</p> <p>28 IEEE-488/RS-232C status indicator</p> <p>29 Analog bar display to assist voltage adjustment</p> <p>30 Denomination indicator</p> |
|---|---|---|



- 1. Store Key : To store the front panel input status into memory.
- 2. Recall Key : To recall the front panel input status from memory.
- 3. Local Key : To enable or disable system remote control mode.
- 4. Power Switch
- 5. IEEE-488 Interface
- 6. Cooling Fan
- 7. AC Power Input
- 8. External Wave Control Input

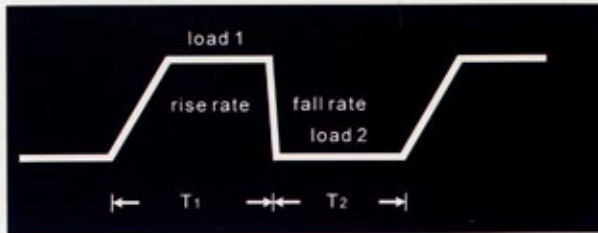
SMART ELECTRONIC LOAD SYSTEM

SPECIFICATION

MODEL	63006		63010		63025		63030	
POWER	20W	60W	20W	100W	25W	250W	30W	300W
CURRENT	0-0.6A	0-6A	0-2A	0-20A	0-1A	0-10A	0-6A	0-60A
VOLTAGE	2-64V(2-60V for CR MODE)		2-64V(2-60V for CR MODE)		2-256V (2-250V for CR MODE)		2-64V (2-60V for CR MODE)	
MIN. OPER. VOLTAGE (DC)	0.9V at 600mA	1.0V at 6A	0.9V at 2A	1.0V at 20A	1.3V at 1A	1.5V at 10A	0.8V at 6A	1.0V at 60A
CONSTANT CURRENT MODE Range	0-0.6A	0-6A	0-2A	0-20A	0-1A	0-10A	0-6A	0-60A
Resolution	0.15mA	1.5mA	0.5mA	5mA	0.25mA	2.5mA	1.5mA	15mA
Accuracy	0.1%+0.1%FS	0.1%+0.2%FS	0.1%+0.1%FS	0.1%+0.2%FS	0.1%+0.1%FS	0.1%+0.2%FS	0.1%+0.1%FS	0.1%+0.2%FS
CONSTANT RESISTANCE MODE Range	10Ω-40kΩ (60W)	0.25Ω-1kΩ (60W)	3Ω-12kΩ (100W)	0.075Ω-300Ω (100W)	25Ω-100kΩ (250W)	0.25Ω-1kΩ (250W)	1Ω-4kΩ (300W)	0.025Ω-100Ω (300W)
Resolution	12 bits		12 bits		12 bits		12 bits	
Accuracy	0.1% (0.25-100Ω), 0.01% (50-500Ω)		0.1% (0.075-50Ω), 0.01% (100Ω-1kΩ)		0.1% (0.25Ω-100Ω), 0.01% (100Ω-1000Ω)		0.1% (0.1Ω-100Ω), 0.01% (100-1kΩ)	
CONSTANT VOLTAGE MODE Range	1-64V		1-64V		1.5-256V		1-64V	
Resolution	16mV		16mV		64mV		16mV	
Accuracy	0.05%±0.1%FS		0.05%±0.1%FS		0.05%±0.1%FS		0.05%±0.1%FS	
CONSTANT POWER MODE Range	0.003-20W	0.03-60W	0.01-20W	0.1-100W	0.06-25W	0.6-250W	0.03-30W	0.3-300W
Resolution	0.3mW	3mW	1mW	10mW	2mW	20mW	3mW	30mW
Accuracy	2%FS	3%FS	2%FS	3%FS	2%FS	3%FS	2%FS	3%FS

4. Dynamic Loading and Control

Modern electronic devices operate at very high speed, and demand critical performance in the transient and dynamic response of power devices. To address these testing applications, the 6300 loads offer high speed, programmable dynamic load simulation and control capability never achieved before. The figure below shows the programmable parameters of the 6300 load modules:



The programmable slew rate makes possible the simulation of transient load changes demanded by the real life application requirement. The 6300 internal waveform generator is capable of maximum slew rate at 2.5A/uS, and dynamic cycling up to 20KHz. Its dedicated remote load sense and control circuit guarantees minimum waveform distortion during continuous load changes.

Additionally, the 6300 has programmable control to start sinking current at any specified output voltage level of a power device. This allows the user to test the transient response of the startup characteristics of a DC power supply exactly as required in the real circuit application.

The 6300 load module can also be controlled using external analog control voltage or signal generator to simulate load waveform in synchronization with any external device.



5. Powerful Measurements

Each 6300 load module has integrated 15-Bit precision A/D converter for voltage measurement with an accuracy of 0.05% full scale. The built-in resistive load current sensing circuit is capable of current measurement with an accuracy of 0.1%. Power measurement is done by realtime integration of the measured voltage and current. Also, short circuit can be simulated and short circuit current measured.

All measurements are done using remote sensing and feedback technology to eliminate any error due to voltage drop along the measurement path. The user can also select the full range setting of the voltage and current measurement according to the application requirements.

Each 6300 load module allows for plug-in expansion of a precision 20M Hz noise measurement capability. The user can select lowpass filtering at 1KHz, 10KHz, 100KHz, 1MHz, or 20MHz, and measure the peak-to-peak noise through a differential mode input circuit. This facilitates realtime display of noise readings without the need of a scope.

6. Easy Operation

The function and load control parameters can be easily programmed using the front panel keys and the rotary knob, or downloaded from a remote controller using GPIB interface. All control parameters needed for executing a function (e.g. dynamic loading, noise measurement, etc.) are automatically linked to a single key on the front panel, and the user simply hits the function key to carry out the testing. While in test, the user can modify the setting of any control parameter and analyze its real time effect on the spot.

In most test application the user often switches from minimum load to maximum load to check the effect of regulation, noise etc. Each load module allows for these presetting load conditions and the user can switch back and forth using one key control to optimize test efficiency. Also, the system has built-in on the mainframe non-volatile memory which is capable of storing 100 system/loads control data sets. The user can recall individual set according to the application requirement, or link them into an ATE program.



7. Ergonomical Friendly

The system is designed with user friendliness in mind. Each load module uses thermo-control DC fan and the fan speed increases only when internal temperature rise calls for more heat ventilation. This minimizes the acoustic noise from the fan during operation. The custom designed LCD displays test set up and operating status with the most comfortable visual effect possible. The software improves user interface by displaying both numerical data and graphical indication during test execution to guide the user in making Pass or Fail distinction. The rotary knob input lets the user adjust the test setting on the finger tip with maximum speed and control.



8. Self Diagnosis and Protection

Each load module has built-in self diagnosis routine to calibrate its performance and assist trouble shooting of field failure. Each load is protected against over voltage, overload, overpower, over temperature, reverse polarity to guarantee quality and performance of the instrument for all kinds of applications in R&D, QA, Production, and Field Services.

SMART ELECTRONIC LOAD SYSTEM

SPECIFICATION

DYNAMIC MODE									
DYNAMIC MODE	C.C. & C.R.		C.C. & C.R.		C.C. & C.R.		C.C. & C.R.		
T1&T2	0.025ms-10ms		0.025ms-10ms		0.025ms-10ms		0.025ms-10ms		1ms-10s
Resolution	1µs		1µs		1µs		1µs		1ms
Accuracy	2%FS		2%FS		2%FS		2%FS		
Slew Rate	0.1-25mA/µs		0.32-80mA/µs		0.16-40mA/µs		1.6-400mA/µs		0.001-0.25A/µs
Resolution	0.1mA/µs		0.32mA/µs		0.16mA/µs		1.6mA/µs		0.001A/µs
Accuracy	10%±20µs		10%±20µs		10%±20µs		10%±20µs		
Current	0-0.6A		0-2A		0-1A		0-10A		0-6A
Resolution	0.15mA		0.5mA		0.25mA		2.5mA		15mA
Accuracy	0.2%FS		0.2%FS		0.2%FS		0.2%FS		
EXT WAVE MODE									
Range	0-0.6A		0-2A		0-1A		0-10A		0-6A
Level	0-10V		0-10V		0-10V		0-10V		0-60A
Accuracy	0.2%FS		0.2%FS		0.2%FS		0.25%FS		0.2%FS
SHORT CIRCUIT									
Resistance	0.08Ω(MAX)		0.04Ω(MAX)		0.025Ω(MAX)		0.016Ω(MAX)		
Current	6A		20A		10A		60A		
IMP RESISTANCE(LOAD OFF)	100kΩ(MIN) at 60V		100kΩ(MIN) at 60V		300kΩ(MIN) at 250V		100kΩ(MIN) at 60V		
TEMP. COEFFICIENT	100PPM/°C (typical) C.C		100PPM/°C (typical) C.C		100PPM/°C (typical) C.C		100PPM/°C (typical) C.C		
MEASUREMENT SECTION									
VOLTAGE READ BACK									
Range	0-16V		0-16V		0-25.6V		25.6-256V		0-16V
Resolution	0.5mV		0.5mV		0.8mV		8mV		0.5mV
Accuracy	0.02%±0.1%FS		0.02%±0.1%FS		0.02%±0.1%FS		0.02%±0.1%FS		
CURRENT READ BACK									
Range	0-0.6A		0-2A		0-1A		0-10A		0-6A
Resolution	0.0187mA		0.0625mA		0.0312mA		0.312mA		0.1875mA
Accuracy	0.1%±0.1%FS		0.1%±0.1%FS		0.1%±0.1%FS		0.1%±0.1%FS		
POWER READ BACK									
Range	0-20W		0-20W		0-25W		25-250W		0-30W
Resolution	0.0375mW		0.125mW		0.25mW		2.5mW		0.375mW
Accuracy	0.5%FS		0.5%FS		0.5%FS		0.5%FS		
CURRENT MONITOR									
Range	0-0.6A		0-2A		0-1A		0-10A		0-6A
Output	0-10V		0-10V		0-10V		0-10V		0-10V
Accuracy	0.5%FS		0.5%FS		0.5%FS		0.5%FS		0.5%FS
PROTECTIVE SECTION									
OVER POWER PROTECTION	20.8W		20.8W		26W		260W		31.2W
OVER CURRENT PROTECTION	0.612A		2.04A		1.02A		10.2A		6.12A
OVER VOLTAGE PROTECTION	±65V		±65V		±260V				±65V
OVER TEMPERATURE PROTECTION	±85°C		±85°C		±85°C				±85°C
REVERSE CONNECTION PROTECTION	±6A (during 1 min)		±20A (during 1 min)		±10A (during 1 min)				±60A (during 1 min)
GENERAL									
POWER	Supply from 6304 Mainframe		Supply from 6304 Mainframe		Supply from 6304 Mainframe		Supply from 6304 Mainframe		
SIZE (mm)	104(W) x 143(H) x 470(D)		104(W) x 143(H) x 470(D)		104(W) x 143(H) x 470(D)		104(W) x 143(H) x 470(D)		
WEIGHT	5kg		5kg		5kg		5kg		
OPERATING RANGE	0-40°C		0-40°C		0-40°C		0-40°C		

Mainframe:	Model 6304	Model 6301
Dimension(mm)	439(W)X177(H)X500(D)	110(W)X177(H)X500(D)
Weight	12kg	5.0kg

Ordering Information

6301: Mainframe for single Load Module
 6304: Mainframe for 4 Load Modules
 63006: Load Module 6A/64V/60W
 63010: Load Module 20A/64V/100W
 63025: Load Module 10A/256V/250W
 63030: Load Module 60A/64V/300W

6309: Test Fixture
 630001: Noise Measurement(20MHz) Kit for each Load Module
 630002: GPIB Interface for Model 6304
 630003: RC-63 Remote Controller
 630006: 19" Rack Mounting Kit for Model 6304 mainframe

Developed and Manufactured by:
CHROMA ATE INC.
 致茂電子股份有限公司

Head Office:
 43, Wu-Chuan Road, Wu-Ku Ind. Park,
 Wu-Ku, Taipei Hsien, Taiwan, R.O.C.
 Tel : 886-2-2298-3855
 Fax : 886-2-2298-3596
 WWW : http://www.chromaate.com

U. S. A.
 15279 Alton Parkway, Ste. 400
 Irvine, CA 92618
 Tel : (949)788-0822
 Fax : (949)788-0608
 Toll Free : 1-800-478-2026

Netherlands:
 Chroma ATE Europe B.V.
 Max Planckstraat 4
 6716 BE Ede
 Tel : (0)318-648282
 Fax : (0)318-648288

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