MODEL 63600 SERIES

Key Features :

- ■ Max. Power : 100W×2(Dual), 300W & 400W
- ■ Voltage Range : up to 80V
- ■ 5 module mainframe Max. 2000W, load modules up to 400W/ea
- ■ Up to 10 channels in one mainframe
- ■ 0.4V @ 80A (Typical) low voltage operating characteristics
- ■ Flexible CC, CR, CV and CP operation modes
- ■ CZ mode for turn on capacitive load simulation
- ■ Parallel mode for high current and power application up to 2kW
- ■ Multi Channel synchronous control
- ■ Auto frequency sweep up to 50kHz
- ■ Real time power supply load transient response simulation and Vpk+/- measurement
- ■ 100 user programmable sequence
- ■ Precision voltage and current measurement
- ■ Precision high speed digitizing measurement/ data capture
- ■ Voltage, current and P_{max} measurement for OCP/OLP testing
- ■ Timing measurement for batteries
- ■ Short circuit simulation
- ■ Self-test at power-on
- ■ Full Protection : OV, OC, OP and OT
- ■ Ethernet, USB and GPIB interfaces

PROGRAMMABLE DC ELECTRONIC LOAD MODEL 63600 SERIES

Chroma's 63600 Series DC Electronic Loads are designed for testing multi-output AC/DC power supplies, DC/DC converters, chargers, batteries, adapters, and power electronic components. They are excellent for research, development, production, and incoming inspection applications.

The 63600's state of the art design uses DSP technology to simulate non-linear loads using an unique CZ operation mode allowing realistic loading behavior.

The 63600 series can draw its rated current under very low voltage (0.5V typical). This unique feature guarantees the best loading performance for modern Point-of-Load conditions and fuel cells.

The 63600 series can simulate a wide range of dynamic loading applications, with programmable load levels, slew rates, duration, and conducting voltage. The 63600 also has a dynamic sweep function to meet the test requirements of ATX power supplies. The instrument allows up to 100 sets of system operating status which can be stored in the EEPROM and recalled instantly for automated testing application.

Real time measurement of voltage and current are integrated into each 63600 load module using a 16-bit measurement circuit with three current ranges. The user can perform online voltage measurements and adjustments or simulate short circuit test using the simple keypad on the front panel.

With the VFD display and rotary knob, the 63600 loads offer versatile front panel operation. Users are able to control the 63600 family remotely via Ethernet, USB, or GPIB interface.

Also included in the 63600 are self-diagnostic routines and full protections against OP, OC, OV, OT and reverse polarity. This ensures the quality and reliability of the 63600 and provides protection of units under test.

Ethernet GPIB USB CE

Chroma

VERSATILE SYSTEM CONFIGURATION

Chroma's 63600 Series Programmable Electronic Load integrates micro-processing capability into each load module to optimize the speed and control among multiple load modules. All load modules are configured to work independently, though testing can be carried out simultaneously at multiple outputs via remote control to simulate real life application.

MODULE LOAD DESIGN

The Chroma 63600 electronic load mainframe accepts the user-installable 63600 series load modules for easy system configuration. The model 63600-5 mainframe holds five model 63610 load modules to offer up to 10 100W load input channels with standard front-panel inputs. The maximum power for a single mainframe is 2kW when five model 63640-80-80 are paralleled. This is suitable for testing multiple output switch mode power supplies, and many other types of power products. Using the GO/NG output port, production snapshots are made available, showing the UUT's immediate pass/fail judgment capability. All modules on the mainframe share a common GPIB address to synchronize and speed up the control of the load modules and read-back operating data.

APPLICATION OF SPECIFIC LOAD SIMULATION

The 63600 series load modules operates in constant voltage, current, resistance, power, or impedance to satisfy a wide range of test requirements. For example, the CV is designed to simulate batteries for charger testing.

Constant Current

Constant Resistance

Constant Voltage

Constant Power

CC Applications:
1. *Load/Cross regulation test for CV power supply*
2. *Battery discharge time test and life cycle test*
3. *Fuel cell testing*
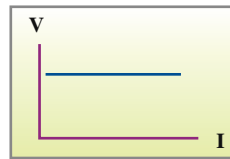4. *Loading pattern simulation for automotive wiper*

CR Applications:
1. *Test current limit point and slew rate for power supply*
2. *Soft start test for telecom power*
3. *LED's drive source test*
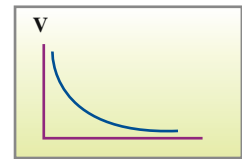4. *Loading simulation for automotive temperature controller*

CV Applications:
1. *Charger test for mobile phone*
2. *Current limit test for fold back power supply*
3. *Fuel cell test.*
4. *Current source test*

CP Applications:
1. *CP power test*
2. *Battery capacity test and capacity life cycle test*
3. *Pout vs Eff% curve test*

LOW VOLTAGE OPERATING CHARACTERISTICS

Each 63600 load module provides 3 load current range settings with a minimum full current operating voltage of 0.5V for each range. At the minimum voltage (0.4V), the 63640-80-80 series load can draw maximum current defined by the current range. Based on this design, this load is well suited for testing DC/DC converters, fuel cells, and other low voltage - high current devices. Low voltage operation is possible towards zero volts with corresponding reduced current levels (see de-rating curves).

Input Characteristics for Model 63640
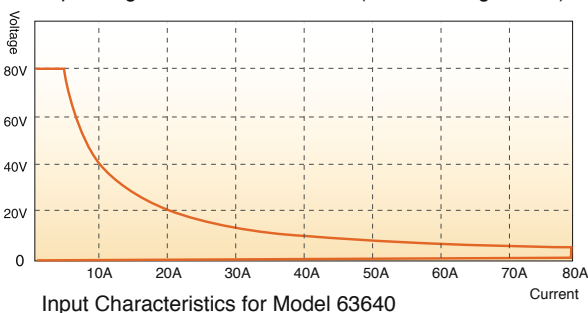
Low Voltage & V-I Curve Operating Characteristics (Typical) of 63600 Series : Model 63640/ 63630/ 63620
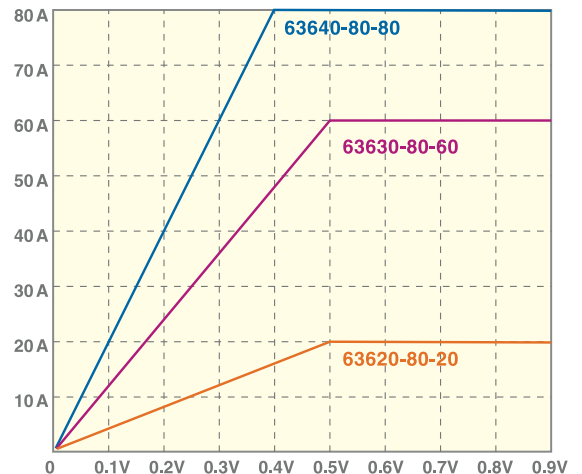
Note: All specifications are measured at load input terminals. (Ambient temperature of 25 ˚C)

CONSTANT IMPEDANCE MODE (CZ MODE)

The unique CZ mode designed in 63600 series can improve the loading behavior of the CC & CP mode and makes the simulated loading current more realistic.
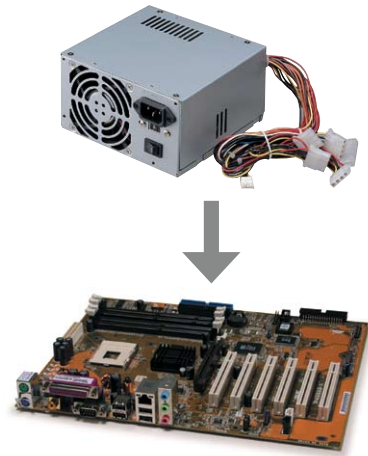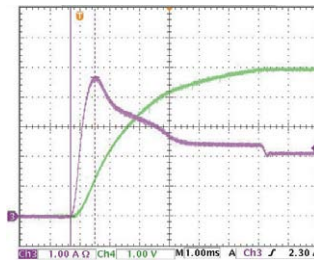
DYNAMIC LOADING AND CONTROL

DYNA ⟶ **DYNA Page** ⟶ **1. Dynamic + Count**
2. Frequency Sweep

Modern electronic devices operate at very high speed and demand rapid transient and dynamic response characteristics which the 63600 provides. To address these testing applications, the 63600 offers high speed, programmable dynamic loading, sweep simulation and control capability never before achieved. The figure below shows the programmable parameters : Setting Current high/low level, T1/T2, Rise/Fall, and run count.

Rise rate   Load 1   Fall rate   Load 2   T1   T2
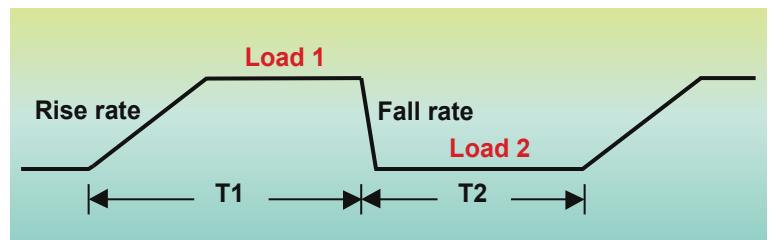
The 63600 also offers an unique dynamic frequency sweep with variable frequencies up to 50kHz ideal for use in finding the worst case UUT voltage peaks (Figure 1). Measuring the Vpeak (+/-) can be achieved by using this dynamic function and with a sampling rate of 500 kHz (Figure 2). The dynamic loading mode can simulate different loading conditions for most users' requirements. Its dedicated remote load sensors and control circuits guarantee minimum waveform distortion during dynamic loading.
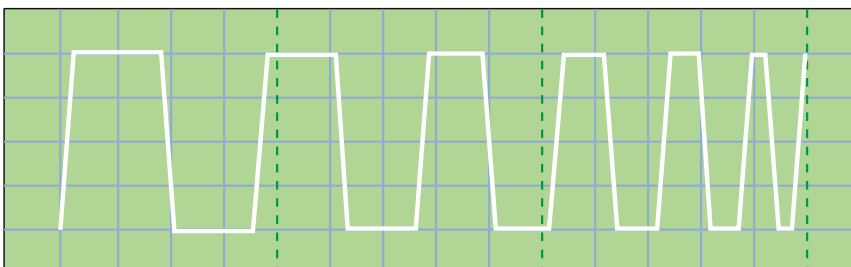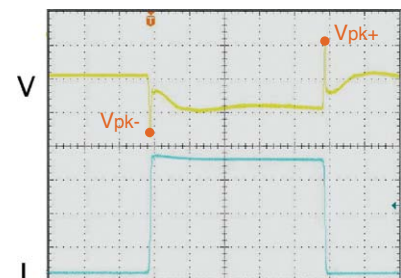
Figure 1 : Sweep Waveform

Figure 2 : Measurement of Vpeak

MASTER / SLAVE PARALLEL CONTROL

When the need is for increased power, paralleling two or more loads together can be done to achieve the desired current. The 63600 provides the user with smart Master/Slave mode controls, this enables the user to program the loading currents on the Master and have them calculated and downloaded automatically to the Slaves. With several loads working in Master/Slave mode emulating a single load unit, will dramatically simplify users' operation. The 63600 can be configured with USB, Ethernet, and GPIB interfaces as options for remote control and automated testing applications.
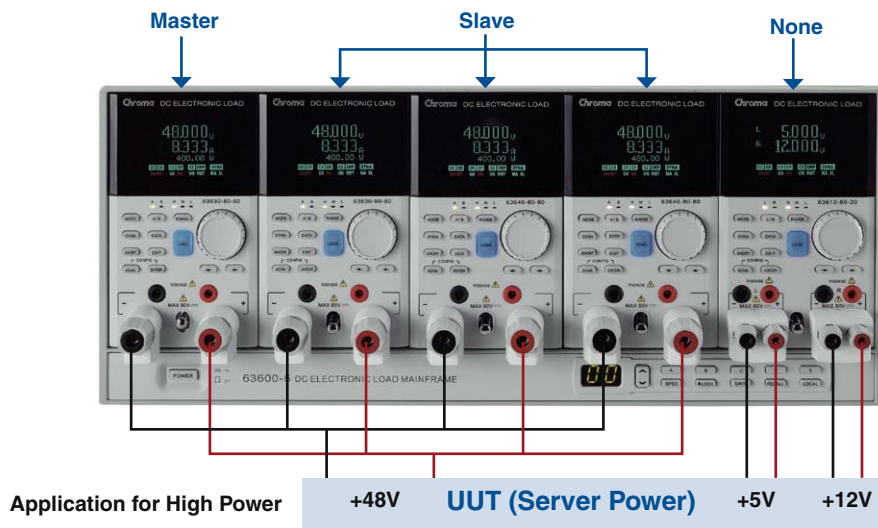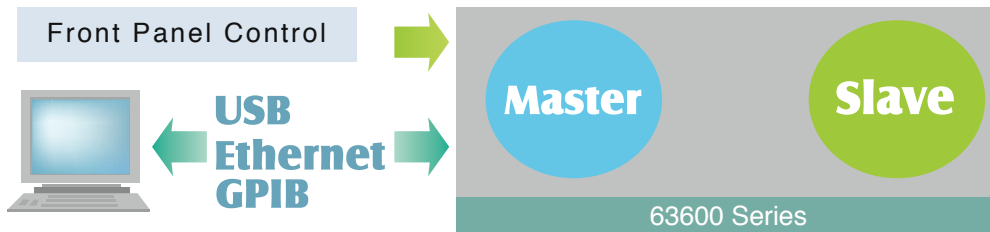
MEASUREMENTS

The 63600 series provides three operating current ranges and a built in 16-bit, precision A/D converter, achieving 0.025%+0.01%F.S., 0.05%+0.05%F.S. and 0.1%+0.1%F.S. accuracy for voltage, current and power measurement respectively. Precise measurements like these are ideal for testing power efficiency and other critical parameters of the UUT's. The 63600 can also measure OCP/OLP trip voltage and current.

TIMING FUNCTION

The 63600 series loads include an unique timing & measurement function allowing precise time measurements in the range of 2ms to 100,000s. This feature allows the users' to set the final voltage & timeout values for battery discharge testing and other similar applications.

For example, Figure 3 shows that the 63600's internal timer can be initiated automatically when the battery voltage falls below a preset value. The timer will continue counting until the second preset value is reached.

The Timing function can be used in testing battery and super capacitor discharge, fuse and breaker protection, rise time for ATX or D/D power supplies, and other similar applications.
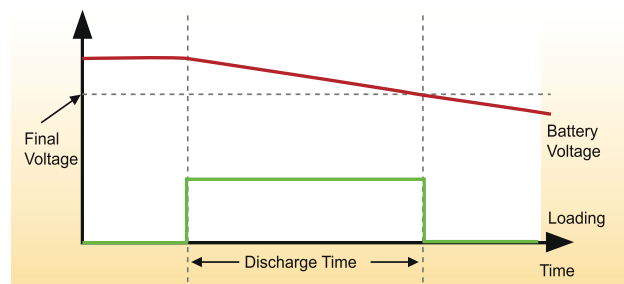


Figure 3 : Battery Discharge Testing

PROGRAM SEQUENCES

The 63600 series offers 100 programmable loading sequences that enable the user to simulate various real world conditions. In addition, each module can be operated independently or synchronized so that all modules start operating at the same time while running independent programs. Below are some examples of the most popular program sequences available.

1. Simulations of all kinds of real current waveforms for battery discharge testing and other applications are possible. (Notebook, Electric car and Electric bike) (Single output channel for UUT)

2. Load cross regulation for ATX12V power. (Multi-output channel for UUT)

3. Peak power cycle test of printer power (Three output channel for UUT)
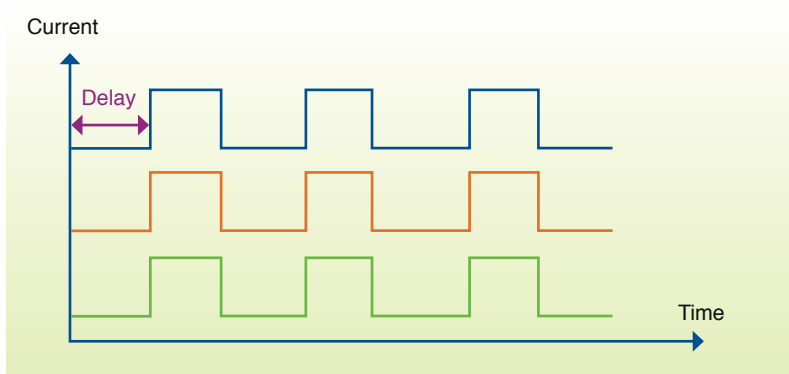
DIGITIZING FUNCTION

The 63600 offers a digitizing function that makes the load very convenient for recording transients in both voltage and current waveforms. The following are the specifications of setting parameters :

SAMPLING TIME : 2us to 40ms / R : 2us (Setting the interval of sampling time)
SAMPLING POINT : 1 to 4096 (Setting the total sampling points)

AC IMPEDANCE FUNCTION (OPTIONAL)

The optional AC impedance measuring function is helpful for those in need of measuring ohmic resistance, kinetic resistance, and transport limitations of the reactant in fuel cell systems. AC measurements can be made in ranges from 10 mHz to 10 kHz. The ability to detect the output impedance is just one of the unique features that can be achieved using the 63600 series system.
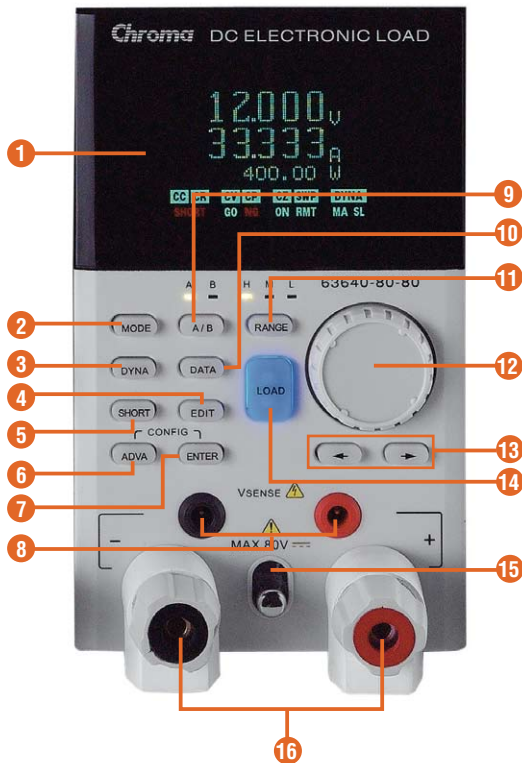
1. **LCD Display:**
   Used for setting and measurements
2. **MODE key:**
   Used to select the operating mode :
   CC, CR, CV, CP or CZ
3. **DYNA key:**
   To select dynamic test mode
4. **EDIT key:**
   Used for setting and editing
5. **SHORT key:**
   Used to apply a short circuit across the input
6. **ADVA key:**
   Used to select the other testing functions
7. **Enter key:**
   Used for confirming data entry
8. **Voltage sense terminal**
9. **A/B key:**
   Used to select static A or B load (63630, 63640)
   L/R key:
   Used to select left or right channel of input load (63610)
10. **DATA key:**
    Used to select the other parameters
11. **RANGE key:**
    Used to select HIGH, MIDDLE or LOW loading range
12. **Rotary knob:**
    Used to adjust loading and parameter setting
13. **Cursor key:**
    Used for setting and editing
14. **LOAD key:**
    Used to enable or disable the load input
15. **Module lock:**
    Used to remove the module

16. **Load terminal**
17. **Power switch**
18. **LED display:**
    Used to display the memory address
19. **Up / Down key:**
    Used to select the next or previous memory address
20. **SPEC key:**
    Used to setup High/Low limits for GO/NG test
21. **LOCK key:**
    Used to lock the setting data
22. **SAVE key:**
    Used to save the front panel input status into memory
23. **RECALL key:**
    Used to recall the front panel input status from memory
24. **LOCAL key:**
    Used to recover local control
25. **Shortcut key:**
    Used to save loading profile for all channels
26. **Voltage & Current monitor output:**
    Analog output to proportional to the voltage
    and current waveform
27. **V EXT:**
    Input for external wave in control
28. **System I/O:**
    Used for system input/output control signals
29. **Ethernet connector**
30. **System Bus:**
    Used for master/slave control system data communication
31. **USB connector**
32. **GPIB connector**
33. **AC input fuse**
34. **AC Input connector**

SPECIFICATIONS

Model	63610-80-20			63630-80-60			63640-80-80		
Configuration	100Wx2			300Wx1			400Wx1		
Voltage *1	0~80V			0~80V			0~80V		
Current	0~0.2A	0~2A	0~20A	0~0.6A	0~6A	0~60A	0~0.8A	0~8A	0~80A
Power *2	2W	10W	100W	6W	30W	300W	8W	40W	400W
Static Mode									
Typical min. operating voltage (DC)	0.5V@0.2A	0.5V@2A	0.5V@20A	0.5V@0.6A	0.5V@6A	0.5V@60A	0.4V@0.8A	0.4V@8A	0.4V@80A
Constant Current Mode									
Range	0~0.2A	0~2A	0~20A	0~0.6A	0~6A	0~60A	0~0.8A	0~8A	0~80A
Resolution	14 bits			14 bits			14 bits		
Accuracy	0.1%+0.1%F.S.			0.1%+0.1%F.S.			0.1%+0.1%F.S.		
Constant Resistance Mode									
Range	CRL : 0.04~80 ohm (6V) CRM: 1.44~2.9k ohm (16V) CRH : 5.76~12k ohm (80V)			CRL : 0.015~30 ohm (6V) CRM: 0.3~600 ohm (16V) CRH : 1.5~3k ohm (80V)			CRL : 0.01~20 ohm (6V) CRM: 0.36~720 ohm (16V) CRH : 1.45~2.9k ohm (80V)		
Resolution	14 bits			14 bits			14 bits		
Accuracy *3	0.1%+0.075 mho (6V) 0.1%+0.01 mho (16V) 0.1%+0.00375 mho (80V)			0.1%+0.2 mho (6V) 0.1%+0.03 mho (16V) 0.1%+0.01 mho (80V)			0.1%+0.275 mho (6V) 0.1%+0.036 mho (16V) 0.1%+0.01375 mho (80V)		
Constant Voltage Mode									
Range	6V/16V/80V			6V/16V/80V			6V/16V/80V		
Resolution	14 bits			14 bits			14 bits		
Accuracy	0.05%+0.1%F.S.			0.05%+0.1%F.S.			0.05%+0.1%F.S.		
Constant Power Mode									
Range	2W	10W	100W	6W	30W	300W	8W	40W	400W
Resolution	1mW/10mW/100mW			3.2mW/32mW/320mW			4mW/40mW/400mW		
Accuracy *4	0.3%+0.3%F.S.			0.3%+0.3%F.S.			0.3%+0.3%F.S.		
Dynamic Mode - CC									
Min. operating voltage	1.5V			1.5V			1.5V		
Frequency	100Hz~50kHz/0.01Hz~1kHz			100Hz~50kHz/0.01Hz~1kHz			100Hz~50kHz/0.01Hz~1kHz		
Duty	1~99% (Min. Rise Time Dominated)			1~99% (Min. Rise Time Dominated)			1~99% (Min. Rise Time Dominated)		
Accuracy	1µs/1ms+100ppm			1µs/1ms+100ppm			1µs/1ms+100ppm		
Slew rate	0.04A/ms~0.02A/µs	0.4A/ms~0.2A/µs	4A/ms~2A/µs	0.12A/ms~0.06A/µs	1.2A/ms~0.6A/µs	12A/ms~6A/µs	0.16A/ms~0.08A/µs	1.6A/ms~0.8A/µs	16A/ms~8A/µs
Resolution	9 bits			9 bits			9 bits		
Min.rise time	10 µs			10 µs			10 µs		
Current									
Range	0~0.2A	0~2A	0~20A	0~0.6A	0~6A	0~60A	0~0.8A	0~8A	0~80A
Resolution	14 bits			14 bits			14 bits		
Ext Wave Mode(20KHz) : CC									
Range	0~0.2A	0~2A	0~20A	0~0.6A	0~6A	0~60A	0~0.8A	0~8A	0~80A
Level	0~10V			0~10V			0~10V		
Accuracy	0.5%F.S.			0.5%F.S.			0.5%F.S.		
Program mode									
Sequence No.	100/Program			100/Program			100/Program		
Dwell / SEQ	0.1ms ~ 30s (Resolution : 0.1ms)			0.1ms ~ 30s (Resolution : 0.1ms)			0.1ms ~ 30s (Resolution : 0.1ms)		
Load Setting	Refer to Static mode specifications			Refer to Static mode specifications			Refer to Static mode specifications		
Spec Check	Voltage/Current/Power			Voltage/Current/Power			Voltage/Current/Power		
Measurement									
Voltage read back									
Range	6V/16V/80V			6V/16V/80V			6V/16V/80V		
Resolution	16 bits			16 bits			16 bits		
Accuracy *5	0.025%+0.01%F.S.		0.01% + 0.025%F.S	0.025%+0.01%F.S.		0.01% + 0.025%F.S	0.025%+0.01%F.S.		0.01% + 0.025%F.S
Current read back									
Range	0~0.2A	0~2A	0~20A	0~0.6A	0~6A	0~60A	0~0.8A	0~8A	0~80A
Resolution	16 bits			16 bits			16 bits		
Accuracy *5	0.05%+0.05%F.S.			0.05%+0.05%F.S.			0.05%+0.05%F.S.		
Power read back									
Range	2W	10W	100W	6W	30W	300W	8W	40W	400W
Resolution	16 bits			16 bits			16 bits		
Accuracy *4 *5	0.1%+0.1%F.S.			0.1%+0.1%F.S.			0.1%+0.1%F.S.		
Voltage Monitor									
Bandwidth	20 kHz			20 kHz			20 kHz		
Range	6V/16V/80V			6V/16V/80V			6V/16V/80V		
Output	0~10V			0~10V			0~10V		
Accuracy	0.5%F.S.			0.5%F.S.			0.5%F.S.		
Current Monitor									
Bandwidth	20 kHz			20 kHz			20 kHz		
Range	0~0.2A	0~2A	0~20A	0~0.1A	0~1A	0~10A	0~0.8A	0~8A	0~80A
Output	0~10V			0~10V			0~10V		
Accuracy	0.5%F.S.			0.5%F.S.			0.5%F.S.		

Protection			
Over Power	105~110% of Rated Power	105~110% of Rated Power	105~110% of Rated Power
Over Current	105~110% of Rated Current	105~110% of Rated Current	105~110% of Rated Current
Over Voltage	105~110% of Rated Voltage	105~110% of Rated Voltage	105~110% of Rated Voltage
OTP	Yes	Yes	Yes
Reverse	Yes	Yes	Yes
Interface			
USB	Standard	Standard	Standard
Remote controller	Optional	Optional	Optional
Ethernet	Optional	Optional	Optional
GPIB	Optional	Optional	Optional
System Bus	Master/Slave & Multi-channel Control & Remote Controller	Master/Slave & Multi-channel Control & Remote Controller	Master/Slave & Multi-channel Control & Remote Controller
Others			
Dout			
No. of bits	2 bits per mainframe	2 bits per mainframe	2 bits per mainframe
Level - H	1.8V/3.3V/5V switchable	1.8V/3.3V/5V switchable	1.8V/3.3V/5V switchable
Level - L	<0.6V	<0.6V	<0.6V
Drive	Pull_up resistor = 4.7k ohm	Pull_up resistor = 4.7k ohm	Pull_up resistor = 4.7k ohm
Din (TTL Compatible)			
No. of bits	2 bits per mainframe	2 bits per mainframe	2 bits per mainframe
External Trig. for Digitizing			
No. of bits	1 bit per mainframe	1 bit per mainframe	1 bit per mainframe
External Trig. for Auto Sequences			
No. of bits	1 bit per mainframe	1 bit per mainframe	1 bit per mainframe
Load ON - O/P			
Level	TTL Level, Active High	TTL Level, Active High	TTL Level, Active High
Short ON - O/P			
No. of channels	10 channels per mainframe	10 channels per mainframe	10 channels per mainframe
Level	TTL Level, Active High	TTL Level, Active High	TTL Level, Active High

General									
Short circuit									
Current *6	≅0.2A	≅2A	≅20A	≅0.6A	≅6A	≅60A	≅0.8A	≅8A	≅80A
Dimensions (WxHxD)	86x142x514 mm			86x142x514 mm			86x142x514 mm		
Weight	5kg			4kg			4.5kg		
Operating Temperature	0~40˚C			0~40˚C			0~40˚C		
StorageTemperature	-20~80˚C			-20~80˚C			-20~80˚C		
Power	Supply from mainframe			Supply from mainframe			Supply from mainframe		
EMC & Safety	CE			CE			CE		

*Note 1 : The maximum current loading below the minimum operating voltage (0.5V) will follow a derating curve.

*Note 2 : The 400W power rating of the 63640-80-80 specified at an ambient temperature of 35˚C, please refer to the power rating curve on the right.

*Note 3 : Does not apply to setting current < 0.3% full scale current.

*Note 4 : The full scale is $V_{max} \times I_{max}$.

*Note 5 : The DC level measurements are made over a period of 20ms, and does not measure any transient signals in the DC measurements.

*Note 6 : Its limits are the maximum power and maximum current of the current range.

*Note 7 : The 63600 is guaranteed to meet specified performance at temperature range of 25 ± 5˚C.
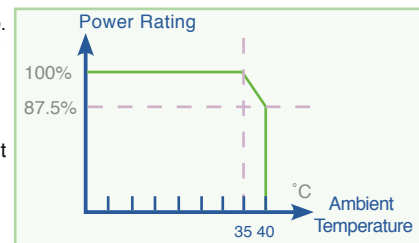
MAINFRAME SPECIFICATION

Model	63600-5
Number of slots	5 slots
Operating temperature	0~40˚C
Input Rating	90~130 / 175~253VAC Auto Range / 47~63Hz
Mainframe dimension (W×H×D)	447×177×554 mm (Full Rack)
Weight (kg)	14kg

All specifications are subject to change without notice.

ORDERING INFORMATION

63600-5 : 63600 Mainframe for 5 Modules

63610-80-20 : DC Load Module, 100W×2/ 20A/ 80V

63630-80-60 : DC Load Module, 300W/ 60A/ 80V

63640-80-80 : DC Load Module, 400W/ 80A/ 80V

A600009 : GPIB Cable (200cm)

A600010 : GPIB Cable (60cm)

A636000 : GPIB Interface

A636001 : Ethernet Interface