M2 dynamic switch 1000A test generator

The M2 DS5 1000A dynamic switch generator is one of the Mostrak-2 (M2) family of test generators from ipTEST. It performs single and double pulse inductive load switching, diode recovery and short-circuit tests on MOS, IGBT and fast GaN and SiC power discrete semiconductor devices up to 1200V and 1000A.

The DS5 generator provides the architecture for a complete dynamic switch test cell, such as programmable power supplies, gate drives, auxiliary drives and over-current protection.

The generator is used in conjunction with a range of different application adaptors, such as the H-bridge 1200V/1000A adaptor, which provides high speed voltage and current waveform capture, inductive load, gate drive and programmable gate resistance along with a replaceable auxiliary device.

FEATURES

1.2kV/1000A dynamic switch tests

Single- and double-pulse clamped inductive load testing up to 1000A

Diode recovery test up to 1000A

Short circuit testing up to 1200A

Application-specific Adaptors for

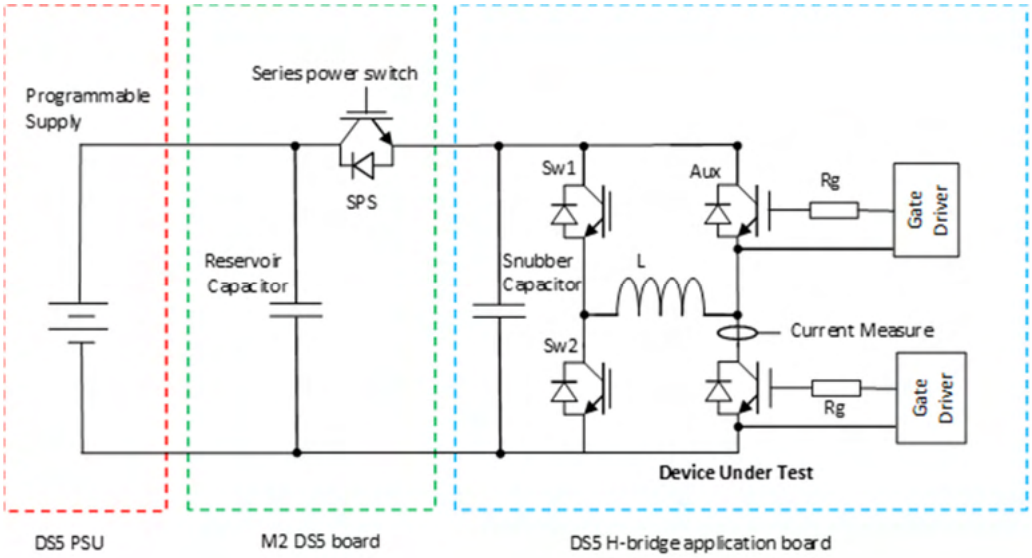
Low parasitic inductance and capacitance connections to device under test

Low board count for high reliability and low spares inventory

Uses common M2 components (Control board, enclosure)

Compact dimensions allow the generator to be mounted on a handler or prober table

Simplified schematic



Tests performed

Mode	Description
DSGate	Gate/Base Drive set-up command.
DSIND	Inductive load test.
DSSC	Short circuit test.
DSDRC	Diode recovery test
DSPSU	Voltage Source set-up command.
KELVIN	Kelvin check.
SCOPEH	Setup mode to override the default horizontal scope settings.
SCOPEV	Setup mode to override the default vertical scope settings.

DSIND Dynamic switching inductive load single pulse clamped inductive load test, or a double pulsed test for both turn-on and turn-off measurements.

DSSC Dynamic switching short circuit test ('ISC' test). The Auxiliary device is switched on for the test so this part must have a substantially higher pulsed current capability than the Device Under Test (DUT).

DSDRC Diode recovery test. The Auxiliary device is switched on with an inductive load for the DSDRC and it will typically be similar to the DUT.

1. Application adaptor specifications

Current measure

Accuracy (%)	Max current (Peak, A)	Max current (rms, A)	Square pulse rise time (ns)	Square pulse droop (%/µsec)	Square pulse IT max (amp.sec)
±0.5	5000	50	20	0.001	0.2

Current measurement uses a current transformer connected to the oscilloscope.

Voltage measure

Input impedance		Accuracy (%)	Rise time (ns)	Bandwidth (-3dB, MHz)	Maximum voltage (V)
MΩ	pF				
50	<7.5	±2	1.2	300	2000

The voltage probes are connected to the oscilloscope.

Gate driver for DUT and auxiliary devices

The gate driver is an opto-isolated driver chip with 3A maximum current with plug in programmable gate resistor board with 8 selectable binary weighted steps. The generator auxiliary board provides programmable DC supplies to allow a range of gate on/off voltages.

DUT Gate drive specification				
Item	**Range**	**Unit**	**Resolution**	**Accuracy**
Gate resistor	1~255	Ω	1.0Ω	5%
Gate on voltage	0 to +20	V	16 bit (305µV)	1%
Gate off voltage	-20 to 0	V	16 bit (305µV)	1%
Gate on - Gate off voltage	30 max	V	-	-

Load inductor

The load inductor is a single value plug in inductor with electronic ID. Other values are available on request.

Value*	Maximum pulsed current	Accuracy
100µH	1000A	5%

2. DS5 generator specifications

The DS5 power board provides a voltage source up to a 1.2kV DC supply and occupies 2 slots (24 HP horizontal positions) in the M2 test head assembly. The board is controlled by the M2 control card 773-332-00 which provides timing pulses with 62.5ns resolution.

Item	Value		Units
	min	max	
Input voltage	100	1200	V (DC)
Current	-	1000	A
Bus capacity	1800	-	µF
I_{SC} time	0	20	µs
DSIND times	0	100	µs
DSDRC times	0	100	µs

The gate driver control signal and the programmable gate on/off voltage are available to the local driver on the application board.

DS5 Auxiliary board

The DS5 auxiliary board provides drives and control for the applications adaptor and provides timing pulses, programmable gate voltages and current trip for the Auxiliary device and the DUT. The board is controlled by the M2 control card 773-332-00 which provides the timing pulses with a 62.5ns resolution.

Item	Value		Units
	min	max	
I_{SC} time	0	20	µs
DSIND times	0	100	µs
DSDRC times	0	100	µs
Vgon	0	20	V
Vgoff	-20	0	V

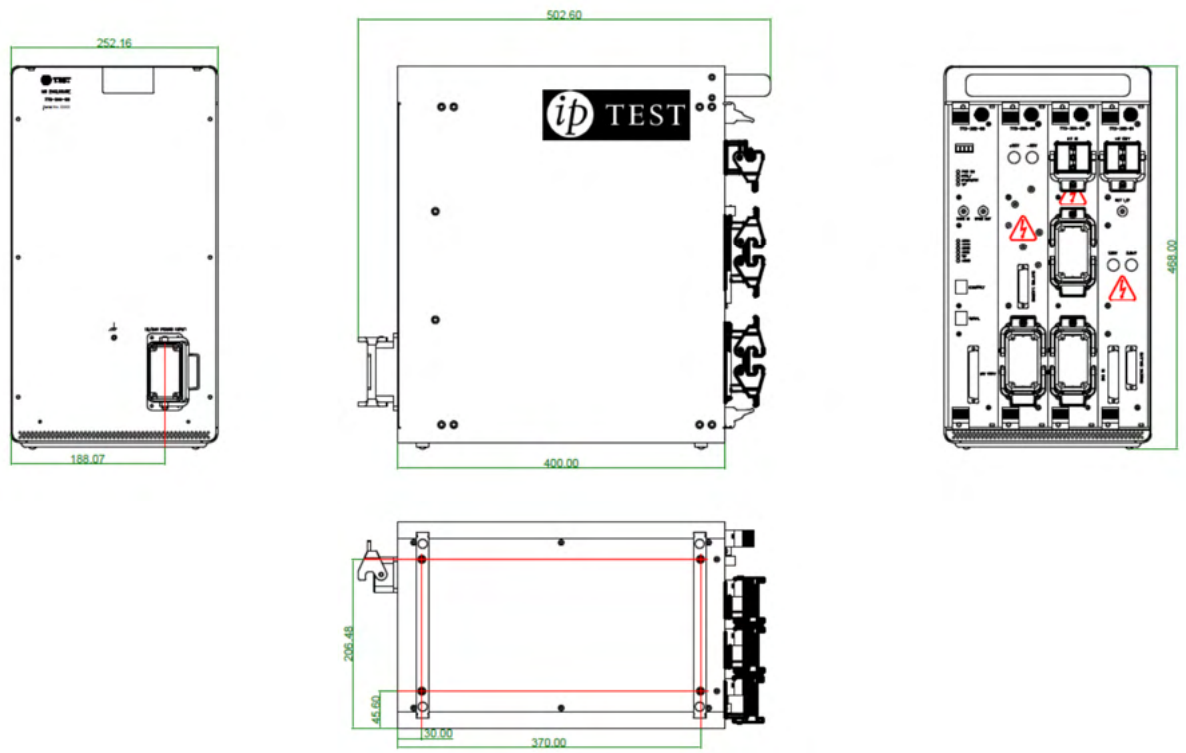
The gate driver control signals and the programmable gate on/off voltages will be exported to the local drivers on the application board.

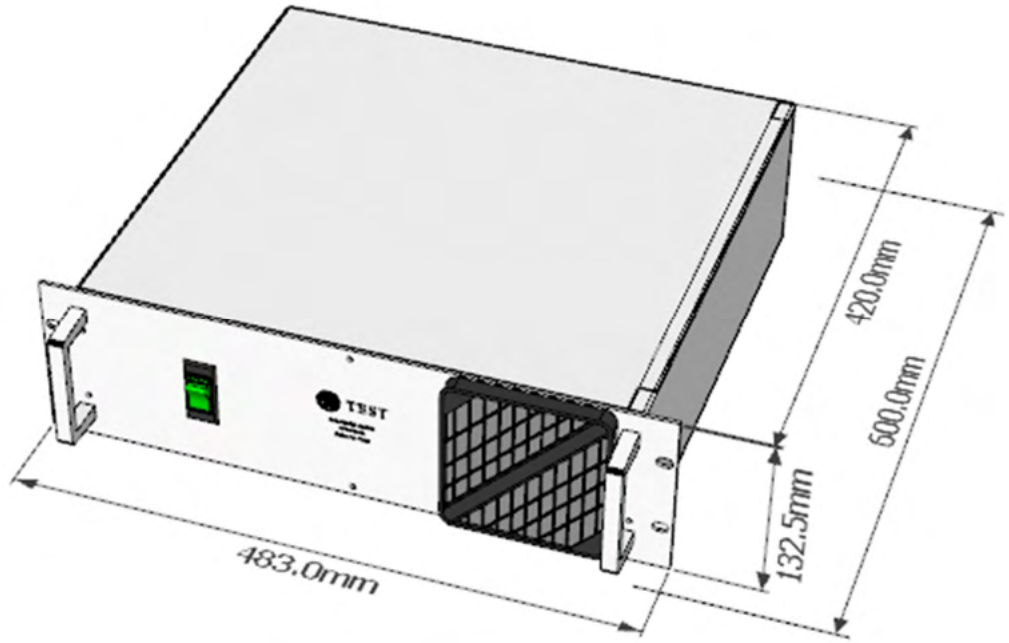
Kelvin tests

The DS5 Kelvin test forces 20mA and measures the series voltage to determine the Kelvin resistance in the path to the power and the sense contacts. Any internal tester resistance may be nulled using an external calibration process. The Kelvin test includes a built-in self-check for system reliability. It tests 3 pins in parallel with provision for switching to an additional Gate return pin.

Kelvin resistance measure				
Current Force	**Unit**	**Resolution**	**Unit**	***Accuracy**
20 (fixed value)	mA	-	-	1%
Kelvin resistance measure	**Unit**	**Resolution**	**Unit**	**Accuracy**
30	Ohms	7.32	mΩ	1%

Enclosure and PSU dimensions





The power supply cable from the Mostrak system cabinet to the M2 test head is 5m.

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