SMU Specifications

Source Measure Unit
Precision Pulsed Current
Performance Series

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Specifications are subject to change.

Operating Mode	Description	Typical Application
DC	Constant current.	Any constant current application. LM-85, light measurement, characterization, R&D, production.
Single Pulse (Mono Pulse)	Single pulse output (one transition on and off) according to configured pulse parameters.	Any single pulse application. LM-85, light measurement, characterization, R&D, production.
Continuous Pulse (Pulse Train)	Continuous current pulse train that transitions on and off according to configured pulse parameters.	Continuous pulse light measurements to reduce junction heating. Any other continuous pulse application.
Modulated Current (MODI)	A programmable sequence of DC current steps that define a waveform. Sequences may be finite or run indefinitely.	Cell phone flash emulation, rectifier ripple emulation. Requires purchase of optional Modulated Current function.
Pulsed Sweep (QCW Sweep)	A series of N current pulses that increase or decrease in amplitude. Step number reported upon error.	I-V plots for LEDs, lasers, and other semiconductors. L-I plots for optoelectronics, overcurrent protection circuit tests, pulse withstand testing.
Multiple Pulse	Similar to Single Pulse mode, but allows a programmable number of pulses to be output.	Fixed pulse count device testing. Also recommended for Single Pulse use (1 pulse).
Multiple Pulse Burst	Multiple bursts of pulses with defined pulse and burst timing, and current changes	Burst L-I-V sweeps, high duty cycle sweeps
Repetitive Burst Mode	Multiple bursts of bursts.	VCSEL testing
DC Dynamic	Constant current - current changes may occur while the source channel is enabled.	Low speed > 10s pulsing. Software controlled pulsing. Useful for TEC control.
Continuous Dynamic	Continuous pulse train - current changes may occur while the source channel is enabled.	PWM, production binning, closed-loop power control.
Bias	Constant DC bias current - generally used for S_{VF} (voltage sensitivity factor) determination.	Thermal Resistance and Tj measurements. Bias may be added to many operating modes. Requires purchase of optional BIAS.

SpikeSafe SMU Specifications	Model (Max Current)				
	0.05	0.5	4	5	10
Overall					
Min Output Voltage	0V				
Max Compliance Voltage[15]	100V	180V (400V option)		180V	
Source Channels	1				
Max DC Output Power	2.5W	200W	Selectable 300W or 600W		
Max Pulsed Output Power[4]	2.5W	200W	1600W	900W	1350W
Form Factor	1/2 Rack				
Pulsing					
Pulse Width Range[10, 14]	Model Dependent; minimum (1µs, 10µs or 50µs) to 15000s				
Pulse Width Resolution (w/Pulse Width Offset)[12]	0.1µs (11ns)				
Pulse Width Accuracy (w/Pulse Width Offset)[12, 2]	1µs (50ns)				
Pulse Rise/Fall Time[3]	200ns-3µs				
Typical Pulse Width Jitter	30ns				
Timebase Accuracy	50ppm				
Pulse Period Range[17]	11µs-30000s, depending on model				
Duty Cycle Range	Programmable 0-100%, no current limits, limited by $Toff_{Min}$ of 20 µs or 9 µs (1 µs model)				
Pulse Count	0-12000000 (Multiple Pulse and Pulsed Sweep modes)				
Sweep Steps	3-10000 (Pulsed Sweep mode)				
Low Range Current					
Max Current	4mA	40mA	200mA		400mA
Setpoint Resolution	100nA	1µA	5µA		10µA
Output Current Accuracy	0.05%+6µA	0.05%+10µA	0.04%+175µA		0.04%+1mA
Min Recommended Current	6µA	10µA	175µA		1mA
High Range Current					
Max Current	50mA	500mA	4A	5A	10A[16]
Setpoint Resolution	1µA	10µA	100 µA		200µA
Output Current Accuracy	0.05%+10µA	0.05%+75µA	0.08%+1mA		0.08%+5mA

SpikeSafe SMU Specifications

Current Out	
Output Current Drive Type	Floating, both + and - terminal driven, max 100V common mode to chassis ground
Output Cabling	Single or multi-conductor twisted pair
Recommended Max Output Cable Length	6m
Trigger In	
Signal Type	5V logic, $V_{IH} > 3.5V$, $V_{IL} < 1.5V$
Polarity	Programmable
Modes Supported	Multiple Pulse, Pulsed Sweep, Modulated Current
Programmable Delay	Programmable delay, 10μs to 30s
Delay Programming Resolution	1μs
Delay Jitter	Multiple Pulse Mode: 3.4μs, Pulsed Sweep Mode: 107μs
Trigger Out	
Signal Type	5V logic, 50Ω pull-up and open drain outputs
Polarity	Programmable
Modes Supported	All pulsed modes, Software trigger in DC mode
Trigger Jitter	<10ns typical
Programmable Delay	Programmable delay, 10μs to 30s
Other External Interfaces	
General Purpose Input (EXT_GPI)	Optoisolated input, generates External Pause SYST:ERR? Event, V_{Low} Max: 0.75V, V_{High} Min: 2.72V, V_{High} Max: 27.2V
Remote Disable (Interlock)	Optoisolated input, halts output, selectable polarity, V_{Low} Max: 0.75V, V_{High} Min: 2.72V, V_{High} Max: 27.2V
General	
Physical	Rack mount / bench top chassis 1/2 Rack 89mmH x 213mmW x 452mmD Weight: 8lbs, 3.6kg
Input Power	AC 100-240VAC, 700W, Single Phase
Remote Control	100-base T Ethernet, TCP/IP with SCPI syntax
Monitoring System	Built-in acquisition system monitors & reports voltage, current, and fault conditions
Device Protection	3rd generation SpikeSafe™ protection including high-speed over current shutdown, slow start up, leakage detection and other protection algorithms
Calibration Interval	1 year: on-site or return to Vektrex
Operating Conditions	For indoor use only, 10 to 35C, <2000m altitude
Cooling	Air cooled
Particulate Level	Clean lab conditions
Other	CE, ROHS

Digitizer Specifications

Measure Method	4 wire
Ranges	3 Ranges, 10V, 100V and 400V
Input Impedance	1MΩ -1.4MΩ
Disconnect Relay	Disconnect Sense +/- terminals when Digitizer is placed in 0V range.
Coupling	DC Coupled, All Ranges
Maximum Common Mode	Sense+ or Sense- must be <420VDC from Chassis Ground or Force+ or Force-
ADC Sample Rate	500,000 samples/second, continuous sampling
Digitizer Type	True Differential
Resolution	18 Bits
Programmable Measurement Aperture	2μs to 400ms, 500kHz samples boxcar averaged to form measurement points
Measurement Trigger	Software or hardware
Hardware Trigger Edge Polarity	Programmable
Trigger Delay	Programmable 0 to 400ms, 2μs resolution
Measurement Points Per Acquisition	1 to 525
Autozero Function	Reduces measurement offset

Digitizer Range Specifications

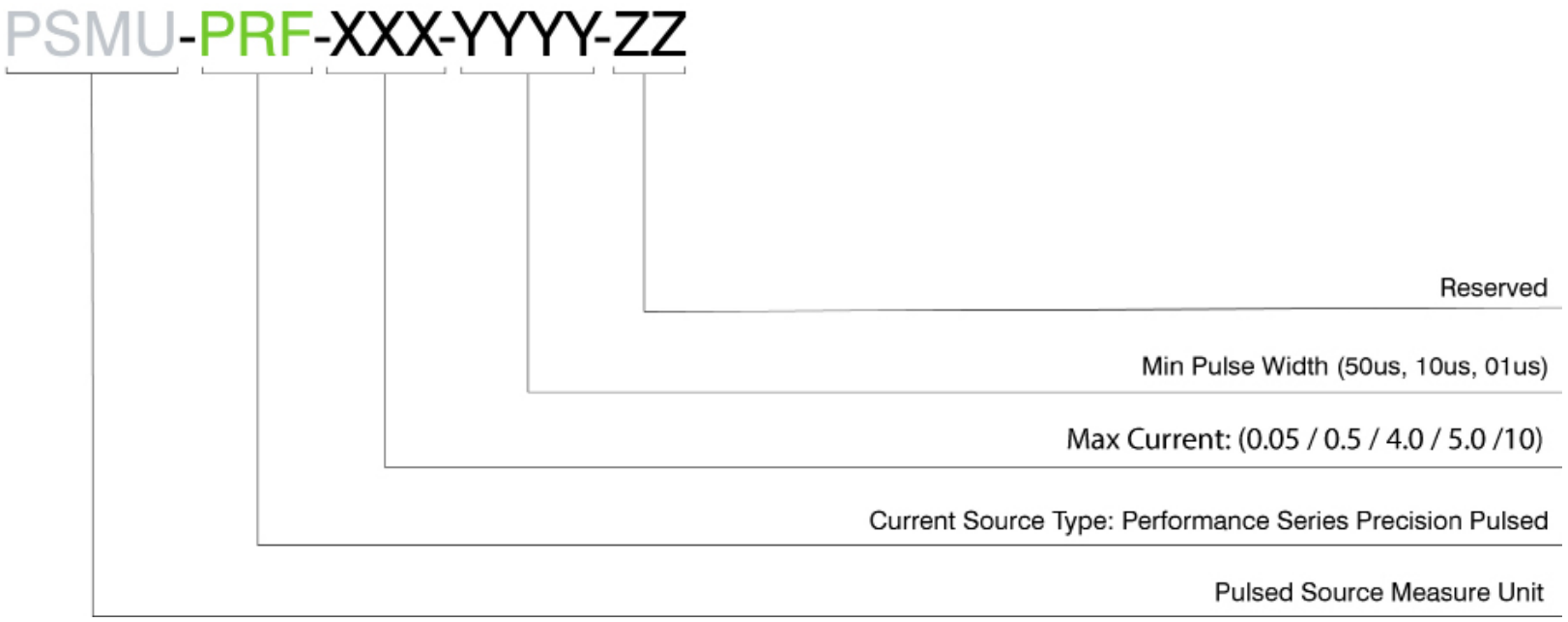
Ranges	**10V**	**100V**	**400V**
Maximum Voltage	10.4V	112.2V	420.6V
Typical Noise, RMS, 10ms Measurement Aperture	100μV	200μV	500μV
Analog Bandwidth (-3dB)	570kHz	290kHz	570kHz
Accuracy +/- (% of Settings + Volts)	0.09% + 500μV	0.09% + 2mV	0.09% + 10mV

Force Sense Selector Switch Specifications[13]

A/B Function	Used to route external auxiliary device to the Force and Sense output terminals. Allows SpikeSafe SMU and auxilary device to share load wiring.
Connect/Disconnect Function	Rapid connect/disconnect of load to speed production.
Control	SCPI command, programmable power-on default, switching time < 1 ms

Other Specifications	Model (Max Current)				
	0.05	0.5	4	5	10
Misc.					
Nominal Current Ripple[1]	<1mA: 4µA 1mA to 10mA: 40µA 10mA to 50mA: 170µA	0.01%+160µA	<1A: 0.03%+300µA >1A: 0.03%+500µA	<1A: 0.03%+300µA >1A: 0.03%+1mA	<1A: 0.03%+300µA >1A: 0.012%+1mA
DC Ramp Rate: Low Speed Setting	10V/s, 50mA/s				
DC Ramp Rate: Default Setting	10V/s, 500mA/s				
DC Ramp Rate: High Speed Setting	1000V/s, 50A/s				
Current Stability[9]	70ppm				
SpikeSafe Monitoring (2 wire)					
Voltage Monitor Accuracy[11]	3%+1V (See Digitizer section for voltage measure specifications)				
Current Monitor Accuracy, Low Range[11]	0.1%+50µA	0.7%+200µA	0.1%+1mA		0.5%+5mA
Current Monitor Accuracy, High Range[11]	0.1%+100µA	0.2%+1mA	0.4%+5mA		0.4%+12mA
Bias Current[5]					
Max Current	33mA				
Setpoint Resolution	1µA				
Bias Current Accuracy	0.35%+60µA				
Fall Time to Bias Current	200ns-3µs				
5% Settling Time After Falling Edge[7]	10-70µs				
0.1% Settling Time After Falling Edge[8]	70-130µs				
Modulated Current[6]					
Sequence Step Amplitude Range	0-100%				
Min Step Width	1ms				
Max Step Width	10s				
Step Width Accuracy	10µs				
Max Number of Steps	20				
Max Number of Step Sequences (Loops)	3				
Loop Count	1 to 32767 or Infinite				
Current Rise/Fall Time Each Step[3]	5-8µs				

Model Number Guide



Total output power selectable 300W or 600W
Ordering Options
Total Output Power - 300W or 600W
+400V
+BIAS
+MODI
+Rtheta

When ordering, consider accessories, including rackmount kit, output cables, and trigger cables.

Notes

All source specifications at 23C+/-5C, pulsing specifications: outside cable <3m.

All digitizer specifications at 23C+/-5C, 5% to 80% relative humidity, noncondensing after autozero and a 90 minute warmup period.

[1] RMS, 20MHz BW, primary frequency 100kHz or 200kHz

[2] Typical performance with automatic adjustments enabled, compensation settings tuned for best shape, I > 10% Imax, Pulse Width <10s

[3] Typical performance with compensation settings tuned for fastest rise and best pulse shape, I > 10% Imax

[4] Typical energy per pulse available: 1.5J

[5] Requires BIAS option

[6] Requires MODI option

[7] Typical time to recover to 95% of bias value, typical cable compensation, Ibias>50% Max bias

[8] Typical time to recover to 99.9% of bias value, typical cable compensation, Ibias>50% Max bias

[9] Typical p-p current variation over 1 hour, after warm up at 23C

[10] Max Pulse Width is 10sec for: Pulsed Sweep, Bias Pulsed Sweep, and Multiple Pulse modes

[11] 2-wire measurement designed for load monitoring. I > Imin. Ton > 10μs.

[12] Pulse Width Offset is a correction factor that is automatically added to the pulse width setting. By setting this factor, nominal pulse width errors can be reduced. The setting range for Pulse Width Offset is +/- 50μs

[13] Requires Force Sense Selector Switch option

[14] Max compliance voltage, load inductance and forward voltage can impact pulse widths below 50μs

[15] MCV 400 requires 400V MCV option

[17] Min period is 10 μs, 300 μs in Pulsed Sweep mode. Max period is 40 s for Pulsed Sweep, and Multiple Pulse modes

Email **sales@vektrex.com** or visit **www.vektrex.com** to get more information and request a quote.