

# SM 6000 with Power Sink Option

## 2 Quadrant operation: Source and Sink

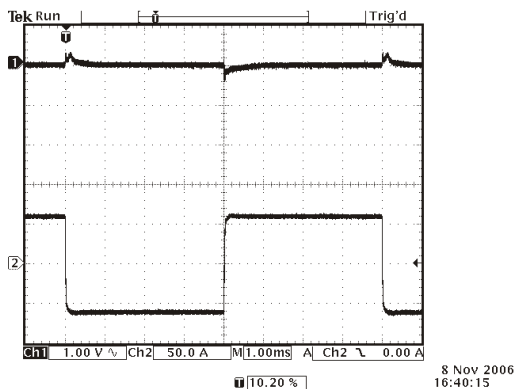
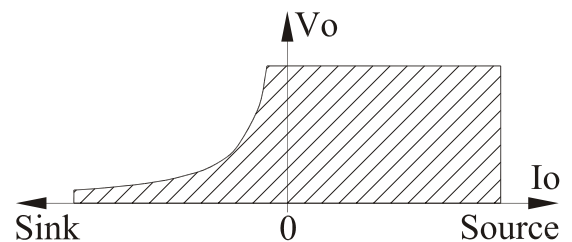


SM15-400

Models	Order Code
SM 15-400	P230
SM 30-200	P231
SM 45-140	P232
SM 60-100	P233
SM 70-90	P234

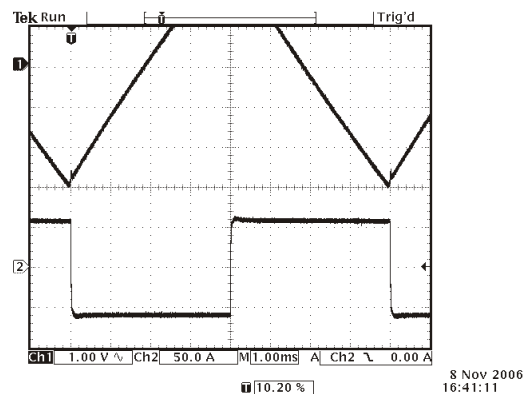
The Power Sink Option permits the power supply to absorb bursts of power fed back to the unit. An internal module senses the status of power supply and sinks current across the output terminals, thus maintaining a constant output voltage. The Power Sink Option allows a faster response when the power supply is step programmed to a lower voltage at low load conditions.

- Can absorb 700 W peak power
- Maintains output voltage setting regardless output power is positive or negative (source and sink)
- Ideal solution for supplying electric motors with PWM-speed control. These systems often return power to the power supply during a braking action
- Ideal solution for ATE systems requiring fast down programming at no load conditions
- Generation Automotive waveforms (fast)



SM15-400 with Power Sink Option  
 Current - 60 A means the load delivers 60 A to the power supply (sink operation)

Upper trace: output voltage  
 Lower trace: output current  
 (current switching from +60 A to -60 A at  $V_o=6$  V)

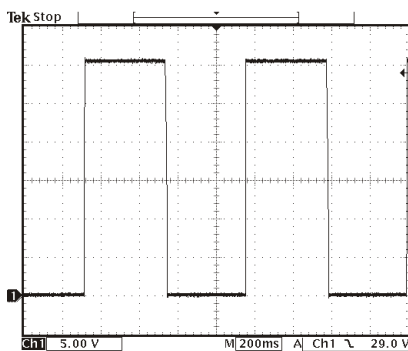


SM15-400 without Power Sink Option  
 The output voltage is out of control when the output current is **negative**

Upper trace: output voltage  
 Lower trace: output current  
 (current switching from +60 A to -60 A at  $V_o=6$  V)

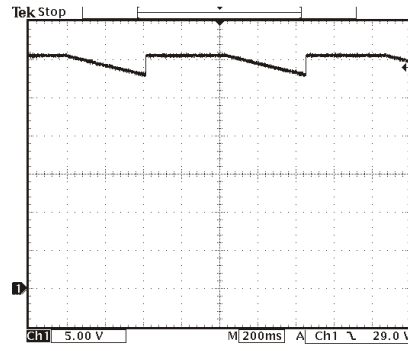
Power Sink Specifications	SM15-400 <i>Option P230</i>	SM30-200 <i>Option P231</i>	SM45-140 <i>Option P232</i>	SM60-100 <i>Option P233</i>	SM70-90 <i>Option P234</i>
<b>Sink Power Rating</b> max. peak power (electronically limited) max. continuous power (T <sub>amb.</sub> = 25 °C) max. continuous power (T <sub>amb.</sub> = 50 °C)	700 W 550 W 275 W				
<b>Max. duration Sink Peak Power</b> P <sub>sink</sub> = 700 W, T <sub>amb.</sub> = 25 °C	max. t <sub>on</sub> =80s, following t <sub>off</sub> =600s (for cooling down)				
<b>Duty Cycle for use at Peak Power</b> P <sub>sink</sub> = 700 W, T <sub>amb.</sub> = 25 °C P <sub>sink</sub> <= 700 W, t <sub>on</sub> <= 40 s  t <sub>on</sub> = time, power dissipation is > 0 W t <sub>off</sub> = time, power dissipation is 0 W P <sub>av</sub> = P <sub>peak</sub> * t <sub>on</sub> / (t <sub>off</sub> + t <sub>on</sub> )	t <sub>on</sub> <= 40s / t <sub>off</sub> >= 12s average power <= 550 W				
<b>Max. Sink Current</b> (V <sub>o</sub> >= 2 V and P <= 700 W)	Limited at 140A	Limited at 140A	Limited at 140A	Limited at 100A	Limited at 100A
<b>Protection</b>	Electronic Power Limit (700W) limits the current. The temperature of the power sink is fan controlled and the circuit shuts down in case of thermal overload.				
<b>Recovery time / Deviation</b> V <sub>o</sub> = 6 V, I <sub>o</sub> : +200 A → -80 A recovery within 100 mV / deviation:  V <sub>o</sub> = 15 V, I <sub>o</sub> : +90 A → -30 A recovery within 100 mV / deviation:  V <sub>o</sub> = 24 V, I <sub>o</sub> : +50 A → -12 A recovery within 100 mV / deviation:  V <sub>o</sub> = 42 V, I <sub>o</sub> : +20 A → -10 A recovery within 100 mV / deviation:  V <sub>o</sub> = 60 V, I <sub>o</sub> : +20 A → - 5 A recovery within 100 mV / deviation:  <i>(load current switches from positive to negative)</i>	di/dt=-5 A/μs 250μs/0.40V  di/dt=-3.5 A/μs 550μs/0.25V  -  -  -  <i>note: values are typical</i>	di/dt=-5 A/μs 350μs/0.75V  di/dt=-3.5 A/μs 550μs/0.45V  di/dt=-1.8 A/μs 650μs/0.36V  -  -  <i>note: values are typical</i>	-  di/dt=-3.5 A/μs 650μs/0.90V  di/dt=-1.8 A/μs 750μs/0.60V  di/dt=-1.2 A/μs 880μs/0.75V  -  <i>note: values are typical</i>	-  di/dt=-3.5 A/μs 650μs/1.10V  di/dt=-1.8 A/μs 750μs/0.70V  di/dt=-1.2 A/μs 880μs/0.80V  di/dt=-0.9 A/μs 1.2ms/0.70V  <i>note: values are typical</i>	-  di/dt=-3.5 A/μs 650μs/1.10V  di/dt=-1.8 A/μs 800μs/0.75V  di/dt=-1.2 A/μs 900μs/0.80V  di/dt=-0.9 A/μs 1.2ms/0.70V  <i>note: values are typical</i>
<b>Programming Down Speed</b> Fall time at <b>no load</b> (90 - 10%) Fall time at no load <i>without Power Sink</i>  Unit with Fast Programming Option Fall time at <b>no load</b> (90 - 10%) Fall time at no load <i>without Power Sink</i>	(15→0V) 6ms 3.5s  <b>P230+P166</b> 420μs 180ms	(30→0V) 10ms 5.5s  <b>P231+P167</b> 670μs 410ms	(45→0V) 4.5ms 3s  <b>P232+P168</b> 670μs 490ms	(60→0V) 9.5ms 5.5s  <b>P233+P169</b> 770μs 700ms	(70→0V) 10.5ms 6s  <b>P234+P170</b> 980μs 1.2s
<b>Parallel and Series operation</b> Refer to power sink manual for details and restrictions.	Using multiple units in parallel operation, only one unit can have a power sink. Using multiple units in series operation, all units must have a power sink.				

- Notes:
- The maximum sink current at higher voltages will not be the maximum specified current due to the power limit. For example at 30 V the maximum sink current will only be 24 A (30 V x 24 A = 700 W = maximum power).
  - A higher sink current than the maximum current will cause the output voltage to rise.



SM30-200 **with** Power Sink Option  
fast discharge of output capacitors  
by Power Sink circuit

Trace: output voltage  
Voltage Programming Speed at NO LOAD



SM30-200 **without** Power Sink Option  
slow response time during voltage step down,  
time needed to discharge the output capacitors

Trace: output voltage  
Voltage Programming Speed at NO LOAD