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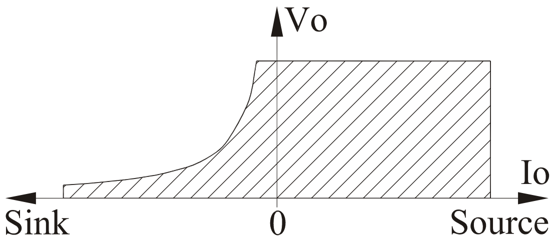
SM1540-D with Power Sink Option

2 Quadrant operation: Source and Sink
order code: SM1540-D-P140

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 small load conditions.

SM1540-D-P140

- Can absorb 70W 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



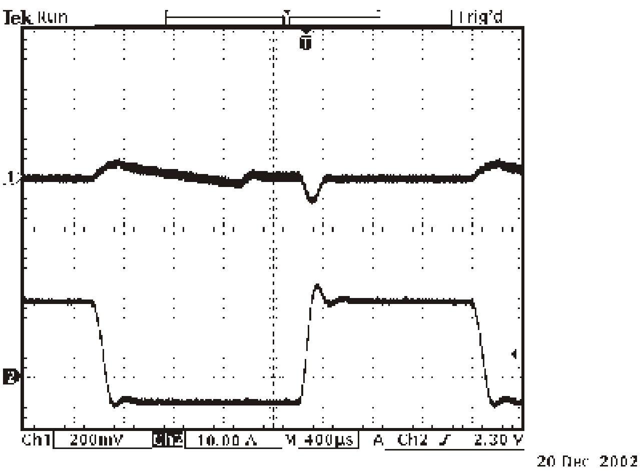


Fig. 1
***With** Power Sink Option*
Upper trace: output voltage
Lower trace: output current
(current switching from +15A to – 5A at Vo=12V)

note: current – 5A means the load delivers 5A to the power supply (sink operation)

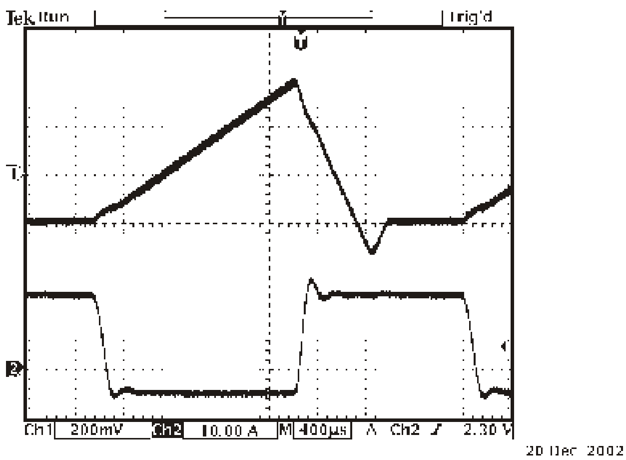


Fig. 2
***Without** Power Sink Option*
Upper trace: output voltage
Lower trace: output current
(current switching from +15A to – 5A at Vo=12V)

*the output voltage is out of control when the output current is **negative***

Power Sink Specifications

Sink Power Rating max. peak power (electronically limited) max. continous power ($T_{amb.}$ = 25 °C) max. continous power ($T_{amb.}$ = 50 °C)	70 W 50 W 30 W
Max. duration Sink Peak Power P_{sink} = 70W, $T_{amb.}$ = 25 °C **Duty Cycle for use at Peak Power** for t_{on} <= 15 s Examples to calculate t_{off}: 1) for $T_{amb.}$=25 °C, P_{peak}=70 W and t_{on}=15 s 2) for $T_{amb.}$=50 °C, P_{peak}=60 W and t_{on}=10 s *t_{on} = time, sink power dissipation is > 0 W* *t_{off} = time, sink power dissipation is 0 W*	Max. t_{on} = 270 s, following t_{off} = 720 s (for cooling down) $P_{av} = P_{peak} * (t_{on} / [t_{on} + t_{off}])$ P_{av} <= 50 W @ 25 °C: 15/[15+t_{off}] <= 50/70 --> t_{off} >= 6 s P_{av} <= 30 W @ 50 °C: 10/[10+t_{off}] <= 30/60 --> t_{off} >= 10 s
Max. Sink Current	Limited at 18 A (V_o >= 2 V and P <= 70 W)
Protection	Electronic Power Limit (70 W) limits the current Sink circuit shuts down in case of thermal overload
Recovery time / Deviation Vo = 6 V, I_o: +10 A → –10 A, di/dt = – 0.4 A/µs Vo = 15 V, I_o: + 5 A → –2.5 A, di/dt = – 0.2 A/µs *(load current switches from positive to negative)*	400 µs / 0.15 V 800 ms / 0.05 V *note: values are typical*
Programming Down Speed 15 → 0 V Fall time at **no load** (90 - 10%)	18 ms (see also Fig. 3 and 4)

Notes:

The power sink circuit can dissipate 70 W for a short time, after that it needs time for cooling down, see “Max. Duration of Sink Peak Power”.

The max. sink current will be limited due to the power limit, so at 12 V the max. sink current will only be 6 A.
A higher external current than allowed will cause the output voltage to rise.

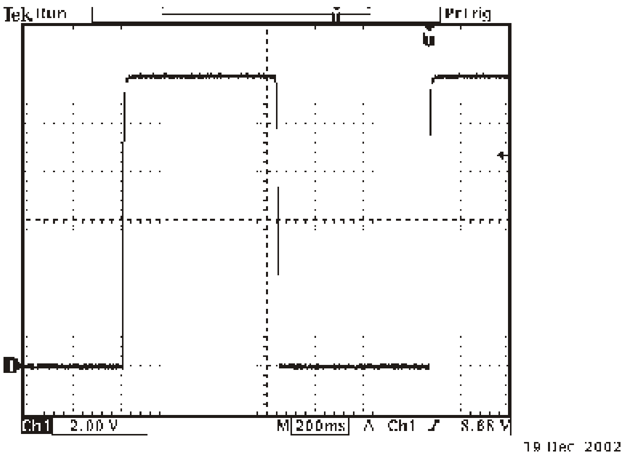


Fig. 3
***With** Power Sink Option*
trace: output voltage
Voltage Programming Speed at NO LOAD

fast discharge of output capacitors
by the power sink circuit

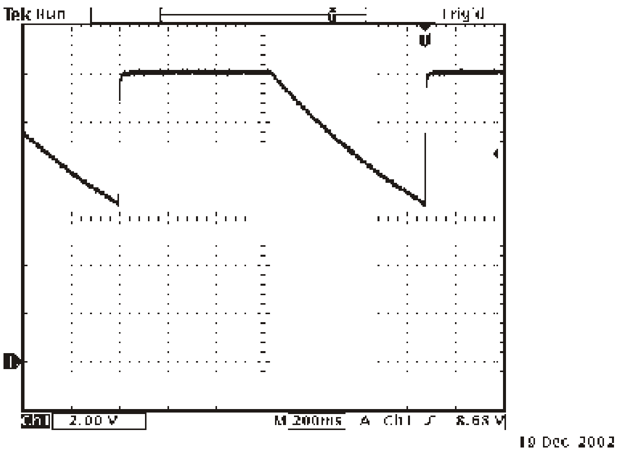


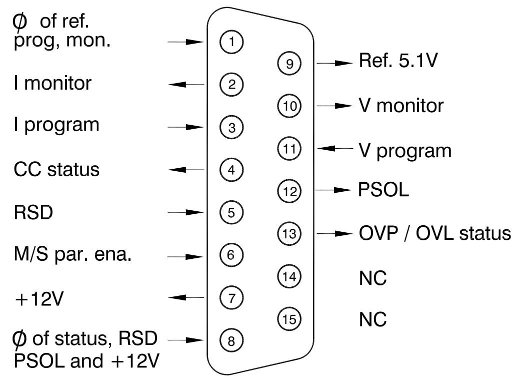
Fig. 4
***Without** Power Sink Option*
trace: output voltage
Voltage Programming Speed at NO LOAD

slow response time during voltage step down,
time needed to discharge the output capacitors

Power Sink Overload

When the Power Sink OverLoad (PSOL) signal is high, the maximum power is reached and the Sink will go in overload. In this situation the Sink cannot absorb more power and the output voltage of the supply will rise. When the situation of thermal overload is reached, the PSOL signal will be high and the Sink shuts down until the internal heat sink has cooled down again.

On the 15P programming connector, the PSOL signal is placed on pin 12, see figure 5.
The PSOL signal can be 0 V (low) or 5 V (high).



pin	description
1	Ø, return of reference, prog. inputs and monitor outputs.
2	current monitor output (0 - 5V)
3	current programming input (0 - 5V)
4	CC status output, logic 1 = CC mode (5 V / 10 mA)
5	Remote shutdown
6	M/S parallel, slave enable (only for autoranging)
7	+12 V output (Ri = 500 Ohm)
8	Ø, return of status outputs, +12 V, PSOL and remote shutdown
9	reference voltage 5.1 V
10	voltage monitor output (0 - 5V)
11	voltage programming input (0 - 5V)
12	PSOL signal 0 - 5 V
13	OVP status output, logic 1 = OVP mode (5 V / 10 mA)
14	NC
15	NC

Fig. 5
connections ANALOG PROGRAMMING CONN.