53508 Series SOLID STATE POWER CONTROLLERS

PRELIMINARY

MICROPAC
MICROCIRCUITS PRODUCTS DIVISION

Features:

- 270V, 10A Operation
- Power MOSFET with Low On-State Resistance
- Controlled Soft Turn-On
- I^2t Overload Protection
- Short Circuit protection
- External Trip Profile Programming (30% to 100% of Rating)
- Fault and Output State Monitor
- Isolation to 1000V
- Military environmental screening available

Applications:

- Designed for 270V bus application
- Aircraft Power Distribution
- Military/High Reliability Systems
- Satellite/Space Systems

DESCRIPTION

The 53508 Series Solid-State Power Controllers are lightweight and resistant to damage from shock and vibration. They are designed to replace electromechanical breakers and solid-state relays. They overcome the problems associated with arcing and contamination of breakers as well as providing internal protection for overload and short circuit conditions. They provide Fault and Output State monitoring as well as a controlled Soft Turn-On. The Trip Profile is externally Programmable from 30% to 100% of Rating

Optical coupling between input and output stages provide effective isolation of 1000VDC. The Power MOSFET switches used in the output stage provide low "on" resistance, low offset and minimal internal power dissipation.

Precautions:
Precautions must be taken to limit the transient voltages generated by the inductance in the system wiring and load when a short circuit causes the SSPC to turn off. When testing individual SSPC's, care should be taken to simulate actual system conditions.

ABSOLUTE MAXIMUM RATINGS

Isolation voltage	1000 VDC
Continuous operating output voltage	400 VDC
Transient output voltage	550 VDC
Bias supply voltage	-.6 to 5.5 VDC
Control Voltage	32VDC
Operating temperature	-55ºC to +125ºC Case
Storage temperature	-60ºC to +150ºC

This device is available unscreened (for engineering use) or environmentally screened to H level plus PIND in accordance with Table C-IX of MIL-PRF-38534.

53508

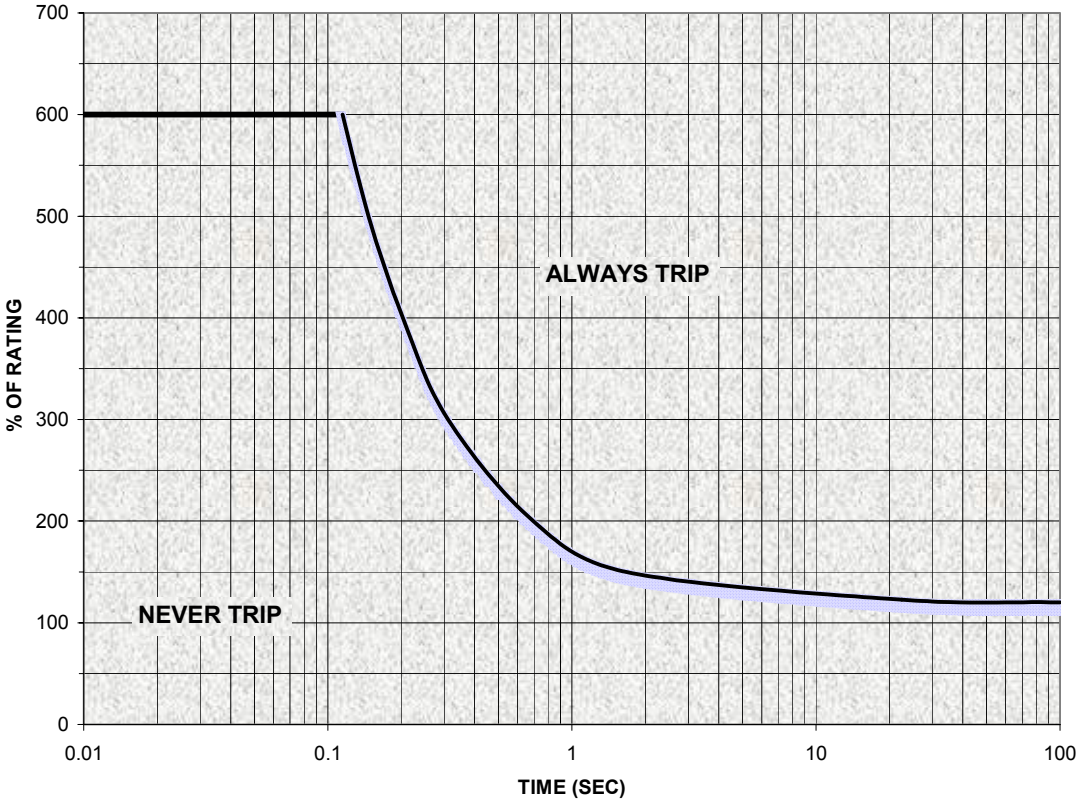
ELECTRICAL CHARACTERISTICS

T_A = -55 to 125° C

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input characteristics					
Bias supply range		4.75	5.0	5.25	VDC
Bias current			25	35	mA
Input Current (Control)	32 VDC Input			6	mA
Input Current (Control)	5 VDC Input			2	µA
Control voltage range		-0.5	5	32.0	VDC
Turn-on voltage	See Notes 1 & 2	2.4	2.8		VDC
Turn-off voltage	See Notes 1 & 2		1.9	2.2	VDC
Dielectric strength	Input /Output / Power Bus/ Case	1000			VDC
Output characteristics					
Output current, Continuous	Steady State Load Current	110		120	% of Rating
Output Current, Trip Point	500% of Rating	100			mS
Output Current, Trip Point	600% of Rating		50	100	µS
Steady State Current Adjustment Range:		30		100	% of Rating
Transient Voltage	Output Device Rating			550	VDC
Forward Voltage Drop	10A Load Current @ 25°C			0.85	VDC
Forward Voltage Drop	10A Load Current @ 125°C			1.7	VDC
Turn-on time @ 25ºC case	270VDC, 10A	400	500	600	µS
Turn-off time @ 25ºC case	270VDC, 10A		50	100	µS
Off-State Leakage	Vds = 550V, Tc = 25°C			250	µA
Off-State Leakage	Vds = 440V, Tc = 125°C			1000	µA
Total Device Power Dissipation (Tpd)	Iload = 10A. Ta = 25°C			11.5	W
Junction temperature				150	ºC
Thermal resistance, θ_{JC}				2.0	ºC/W

NOTES:
1. Maximum input switching frequency not to exceed 1 Hz under normal conditions, or into a shorted output.
2. Input transitions must be “bounceless contact” with transitions of <1 ms.
3. Devices are electrically tested at -55°C, +25°C and +125°C with no environmental screening or qualification.
4. Fully compliant Class H or Class K devices will require Element Evaluation and QCI.

TRIP PROFILE



TRIP PROFILE

The Trip Profile is a combination of 2 separate functions; the I²t Circuit protection and the Short Circuit protection. The I²t Circuit protection continuously monitors the Load Current and when the Load Current exceeds a preset limit (110 to 120% of rating) the Time-Integral of the difference determines the Trip time as indicated by the curved line on the chart (Typical Turn-off time is <1uS).

The Short Circuit protection continuously monitors the Load Current and when the Load Current exceeds a preset limit (600% of Rating) it immediately shuts down the SSPC (Typical response time is < 50uS, Typical Turn-off time is <1uS).

Trip Profile External Trim

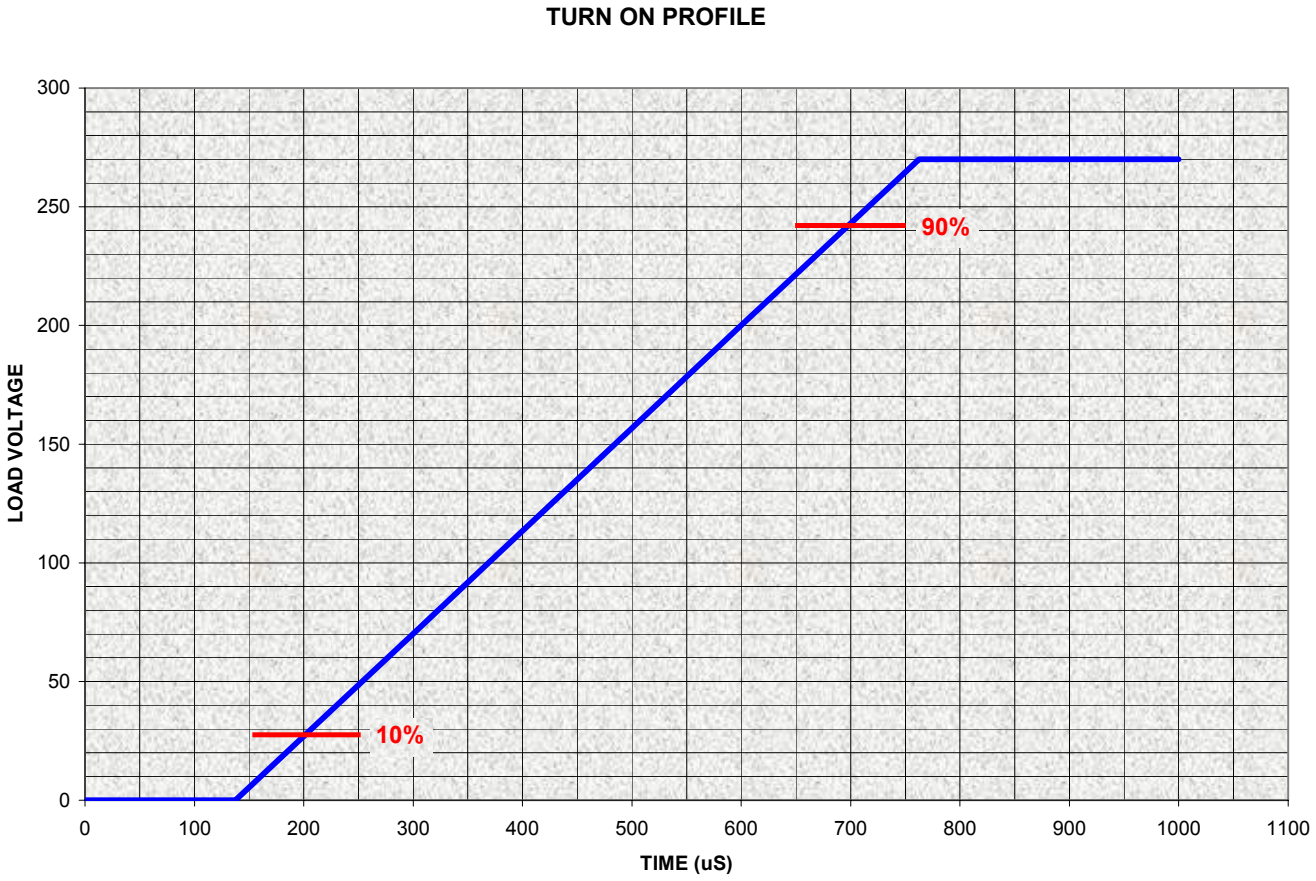
The Trip Profile is externally Programmable by connecting the proper resistance between Pins 12 and 13 (Trip Set - and Trip Set +). The following formula dictates the Profile setting:

$$Rext = (7 * Xprog / (1 – Xprog)) – 3$$

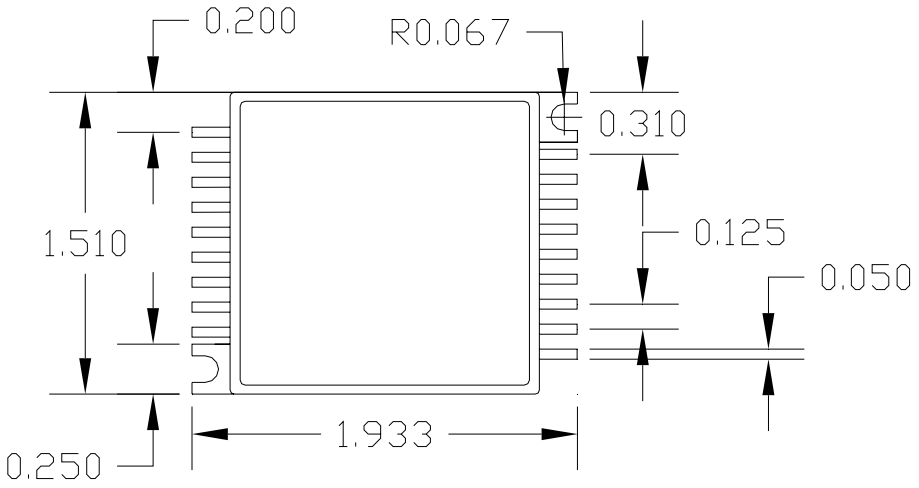
Where Xprog is the ratio of the desired trip point to the device rating. (0.3 < Xprog < 1)
Rext is in KOhms. Table 1 provides typical solutions for Rext.

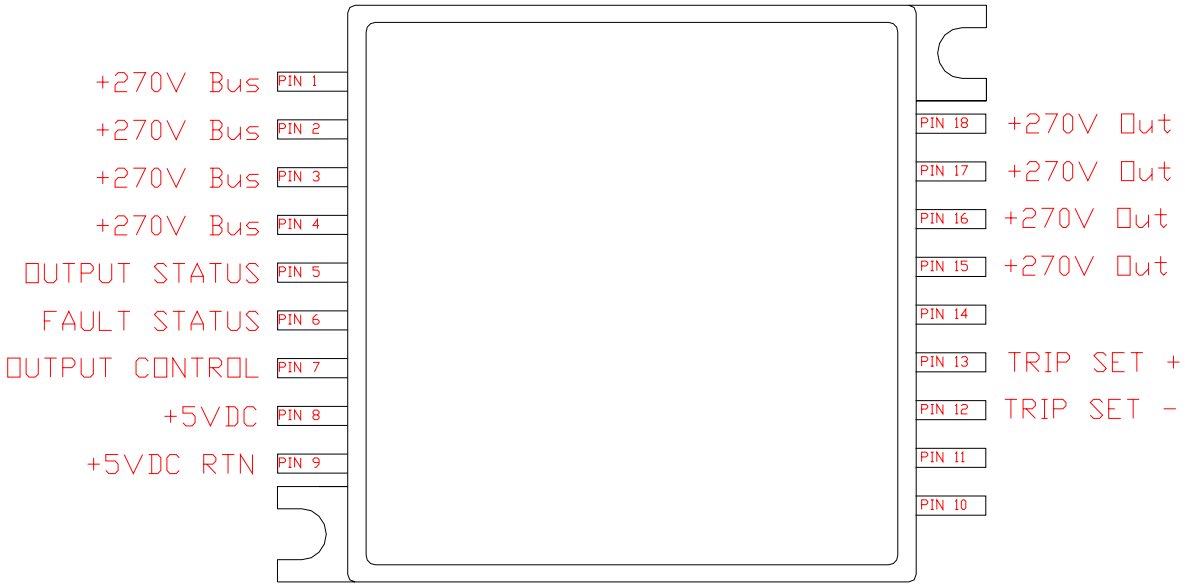
Table 1

Current Rating	Nominal Value (R_{ext})	Tolerance (R_{ext})
3A	0	-
5A	4K	± 10%
6.7A	11.2K	± 10%
8.3A	32K	± 10%
10A	OPEN	-



The SSPC applies Voltage to the Load at a fixed rate of approximately 43V/100uS during Turn-On independent of the Load Current. This corresponds to a Turn-On time of 500uS when measured from 10% to 90% with an applied voltage of +270VDC.





Orderable Part Number	Description
53508-102	Unscreened (for engineering evaluation)
53508-108	Screened to Class H plus PIND of MIL-PRF-38534, Table C-IX