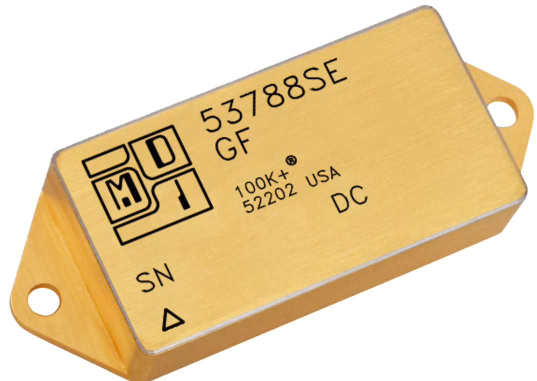
Model 53788 30A Inrush Limiter Switch

PROTON RAD HARD 100K+® TECHNOLOGY



18 – 75VDC INPUT

Parameter	Min	Nom	Max
Vin	18VDC	28VDC	75VDC
Rswitch @ 25°C	—	—	0.01Ω
Rswitch @ 85°C	—	—	0.02Ω
Rswitch @ 125°C	—	—	0.03Ω
Base Delay Time	8ms	10ms	12ms
Ext added Time Delay per µF	16ms	20ms	24ms
Inhibit Not Short Circuit Current (Gnd)	—	—	2mA
Inhibit Not Short Trip Point	—	2.5VDC	—
Inhibit Not Open Circuit Voltage	8VDC	10VDC	12VDC
Inhibit Output V Open Circuit	—	—	40VDC
Inhibit Output I Short Circuit	—	—	10mA
UVLO Unadjusted	14VDC	16VDC	18VDC

- •Maximum Recommended Input Voltage is the maximum factory recommendation considering single event radiation effects
- •Absolute Maximum Input Range - No damage 18 – 75V
- •Initial delay time
- •Leakage Current at Max Recommended Input Voltage OFF State - Typical values
- •Volt Drop - Maximum values at current
- •Quiescent Current at Nominal maximun - Typical values, input inhibited

Features:

- Rad Hard: TID > 100kRad(Si)
- 2:1 margin: Operates beyond 200kRad TID
- No SEE:LET > 82MeV*cm²/mg
- Proton Resistant: No optocouplers used
- Overall inrush limiter for downstream converters when used with external resistor
- Effectively controls the power input and manages peak inrush current when series connected ahead of downstream DC-DC converters.
- Sequences the inhibit of downstream DC-DC converters after timeout and switch closure.
- Serves single or multiple converters.

Specifications:

INPUT VOLTAGE RANGE:

18 – 75VDC

Input inhibit not pin open circuit voltage: 5 VDC

Input inhibit pin short circuit current: 100 microamperes

Output inhibit pin open circuit voltage withstand 60 VDC

Output inhibit pin short circuit current withstand: 10 mA

CASE TEMPERATURE RANGE:

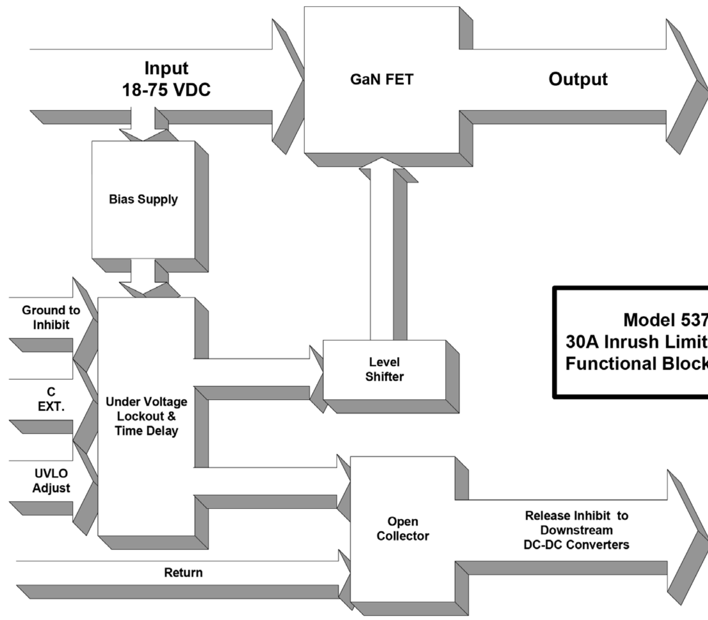
Storage: -65°C to 150°C

Operating: -55°C to 85°C (LE)

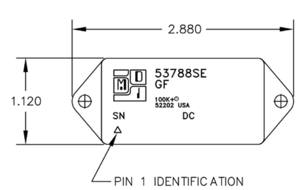
Operating: -55°C to 125°C (SE)

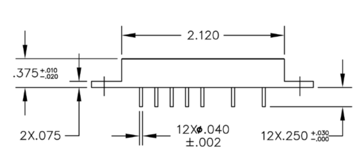
WEIGHT:

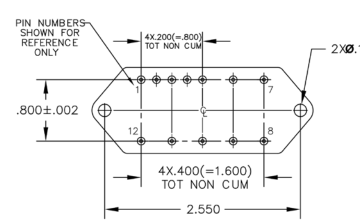
50 grams typical



Pin#	Functions
1	+18 – 75VDC Input Return
2	Delay Capacitor
3	Inhibit-Not Input
4	Inhibit-Not Output
5	+18 – 75VDC Input
6	+18 – 75VDC Input
7	+18 – 75VDC Input
8	+18 – 75VDC Output
9	+18 – 75VDC Output
10	+18 – 75VDC Output
11	Case
12	UVLO Adjust







Modular Devices, Inc.
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Model 53788 30A Inrush Limiter Switch

PROTON RAD HARD 100K + ® TECHNOLOGY

53788 Inrush Limiter Switch

“Sometimes, the best inrush limiter is a resistor”- Mark Twain

The function of an inrush limiter is to charge a capacitor at a controlled maximum current value.

The function of an inrush limiter switch is to charge a capacitor through an external resistor, then bypass the resistor with a low resistance semiconductor switch.

Model 53788 30 Ampere Inrush Limiter Switch contains a low resistance high side switch, which bypasses an external current limiting resistor after a programmable time delay. It also has a user adjustable under voltage lockout, input inhibit not and an output inhibit release (which can enable downstream DC-DC converters).

Model 53788 is rated at 30 amperes pass through current and operates from an 18 VDC to 75 VDC input voltage. Model 53788 is packaged in a 1.12” by 2.12” by 0.375” plus flange package.

Background: Many power electronics applications require large capacitor values but have restrictions on the magnitude of capacitor charging current. If DC-DC power conversion is involved, the inrush limiter can be at the input side or on the output side.

Inrush limiters limit the current flowing into a capacitor when voltage is applied. Charging a capacitor through a resistive element always incurs a power dissipation.

Energy stored in a capacitor has the units of watt-seconds and it takes an equivalent amount of watt seconds dissipated to charge the capacitor through a resistor, semiconductor or switch.

For relatively low stored energy, the limiting dissipative element can be a semiconductor (transistor of FET). An active constant current limiter can charge the capacitor linearly whereas the resistor current limiter charges the capacitor exponentially. So, an active current limiter can offer faster charge times.

However, for higher dissipations, the best limiter may be a resistor. Resistors may have much larger surge power ratings for their than semiconductors because they can operate at higher peak temperatures.

Once the capacitor is charged through a resistor, we want the resistor to be out of the circuit and the load connected to the voltage source with low resistance.

An inrush limiter switch is functionally an electronic time delay relay (delay on power on) with a low resistance high side switch. As compared to an inrush limiter with an active semiconductor dissipator, the inrush limiter switch uses an external resistor to dissipate the power lost when charging the capacitive load.

MDI’s inrush limiter switches also have an inhibit input and an inhibit output. The inhibit output remains low (at the input return voltage) unit the delay interval is complete and the high side switch closes. Then, the inhibit output goes open collector. The inhibit output allows sequencing of input or output DC-DC converters.

Sizing the inrush resistor:

Divide the maximum input voltage by the desired peak inrush current to get the ohmic value of the resistor.

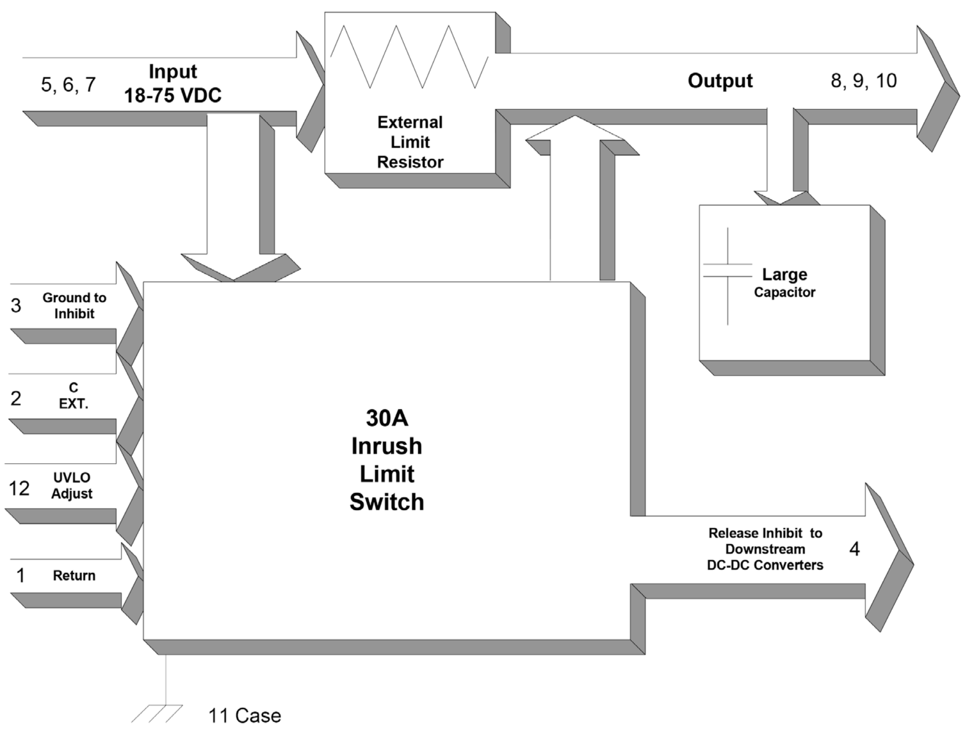
Multiply the resistor value by the capacitance to be charged to get the inrush time constant.

Using a multiple of three time constants, compute the recommended inrush limiter switch delay. Select an appropriate delay capacitor.

The energy stored in the load capacitor is $1/2CV^2$. Divide the stored energy (in watt seconds) by the inrush time constant to get an initial resistor wattage.

Using surge rating guidance from the resistor manufacturer, determine the actual resistor wattage rating to handle the inrush surge.

The resistor should be mounted so it’s thermally able to dissipate the surge power.



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