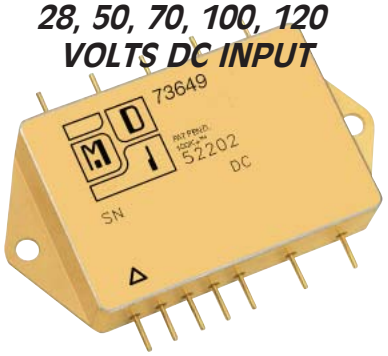
RAD HARD *BUS MASTER* HYBRID MODULE

3-IN-1 SOLUTION FOR SYSTEM DESIGN

PROTON RAD HARD 100K + ® TECHNOLOGY

28, 50, 70, 100, 120 VOLTS DC INPUT



Series (*)3649	
MODEL	INPUT VOLTAGE
53649	28 VDC (18 - 50 VDC)
73649	50 VDC (30 - 75 VDC)
83649	70 VDC (55 - 90 VDC)
93649	100 VDC (80 - 120 VDC)
33649	120 VDC (86 - 158 VDC)

Series Features

- Rad Hard: TID > 100kRad(Si)
- 2:1 margin: Operates beyond 200kRad TID
- No SEE:LET > 82MeV*cm^2/mg
- Proton Resistant: No optocouplers used
- Allows user selection and application of input from redundant power buses via logic level command.
- Manages peak inrush current when series connected ahead of downstream DC-DC converters.
- Sequences the inhibit of downstream DC-DC converters until their inputs are fully charged and the power bus has achieved steady state range.
- Programmable current limit permits customizing the output ramp to user preference and system requirements.
- Precision constant current output, stable with temperature, bus voltage and radiation
- Built in current telemetry
- Undervoltage Lockout
- Thermal mass for output FET to integrate turn on thermal pulse
- Serves single or multiple converters.

Specifications (*)3649

INPUT VOLTAGE RANGE:

*** Specify First Digit**

See Table: 1

Command threshold voltage – 2.5 VDC nominal.

Output current telemetry – ground referenced, volts per ampere output scaled per Table 1.

Inhibit output – open collector: 80 VDC, 15mA max.

CASE TEMPERATURE RANGE:

Storage: -65°C to 150°C

Operating: -55°C to 85°C (R, S)

Operating: -55°C to 125°C (RE, SE)

WEIGHT: 50 grams typical

(*)3649 Theory of Operation

The *3649 Bus Master simplifies satellite system electrical design by combining the features of a solid state relay, inrush current limiter and turn-on sequencer to provide: 1) user selection of redundant satellite power buses via logic command; 2) limiting inrush currents to the capacitive inputs of downstream dc-dc converters; and 3) sequencing the active turn-on of those converters via an inhibit signal until their input voltage has achieved steady state value and the inrush interval is complete. Significant reliability gains are thereby achieved.

Operation

The functional block diagram shows two identical constant current inrush limiting power stages. Each power stage, fed from its respective power bus, comprises two series connected FETs close coupled to a thermal mass. The thermal mass integrates the impulse of power dissipation during an inrush current and minimizes the FETs temperature rise.

• Solid State Relay - Power Bus Selection

The power section is controlled by independent under voltage lockouts, which prevent the power stage from activating unless a minimum power bus voltage level is present. When either individual power bus voltage exceeds the under voltage minimum, that individual bus may be selected on by grounding the appropriate command pin.

• Inrush Current Limiter

The FETs are followed by a current shunt, then connected to the output terminal. Using the shunt resistor signal, the FET drive is the pass stage of a constant current limiter. The un-adjusted constant current is preset to compliment the nominal bus voltage, but may be externally adjusted to a lower value by the user to tailor the output rise time. The output current magnitude, as measured across the shunt resistor, is translated to the input ground level, where it provides a current telemetry signal.

• Turn-On Sequencer

In addition to the two identical power circuits, there is a common control circuit. This common circuitry includes a combined inhibit, which can override both bus turn on commands, as well as serves as an inhibit release for downstream DC-DC converters. The inhibit output release allows downstream DC-DC converters to go active only after either of the two bus switches has completed its turn on and inrush limit phase.

TABLE 1: Bus Master Ratings and Characteristics 25°C

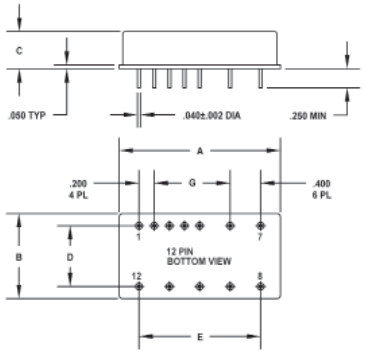
Model Number	Application Bus Voltage	Application Input Voltage Range	Maximum Recommended Input Voltage	Absolute Maximum Input Range	Current Limit	Undervoltage Lockout	Initial On Time	Leakage Current at Max Recommended Input Voltage	Volt Drop at Rated Current	Quiescent Current at Nominal Input	TLM Scaling, Nominal (min-max)	CMD Threshold, Nominal (min-max)
	Vdc	Vdc	Vdc	Vdc	A	V	uSec	uA	V	mA	V/Aout	V
33649	120	86-158	158	-0.6-200	2	80	500	20	1.2	15	2 (1.5-2.2)	2.5 (2.25-2.75)
93649	100	80-120	120	-0.6-200	2	75	500	20	1.2	15	2 (1.8-2.2)	2.5 (2.25-2.75)
83649	70	55-90	120	-0.6-200	2	52	350	20	1.1	15	2 (1.8-2.2)	2.5 (2.25-2.75)
73649	50	30-75	75	-0.6-100	4	28	250	200	2.5	14	1 (0.9-1.1)	2.5 (2.25-2.75)
53649	28	18-50	75	-0.6-100	6	17	250	200	2.5	20	0.4 (0.36-0.44)	2.5 (2.25-2.75)

- Application Bus Voltage in the commonly available satellite bus voltage ranges. These ratings harmonize with the input voltage ranges for MDI 5000, 7000, 8000 and 9000 Series converters. Model 33649 series designed for International Space Station and Orion MPCV applications.
- Maximum Recommended Input Voltage is the maximum factory recommendation considering single event radiation effects
- Absolute Maximum Input Range - No damage
- Current Limit - Maximum limit current
- Undervoltage Lockout - minimum nominal value
- Initial On Time - Typical values, via CMD_A, CMD_B release
- Leakage Current at Max Recommended Input Voltage OFF State - Typical values
- Volt Drop - Maximum values at limit current
- Quiescent Current at Nominal Input - Typical values, input inhibit not asserted
- Telemetry Signal Scaling (TLM) - Volts per Output Ampere

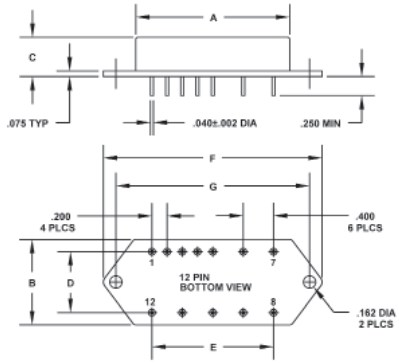
*3649

RAD HARD *BUS MASTER* HYBRID MODULE

Case Style 2



Case Style 3



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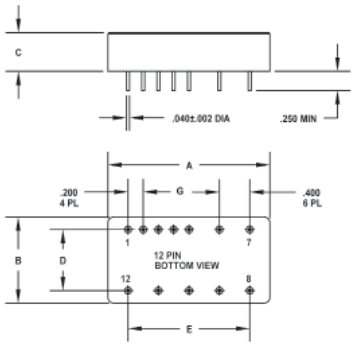

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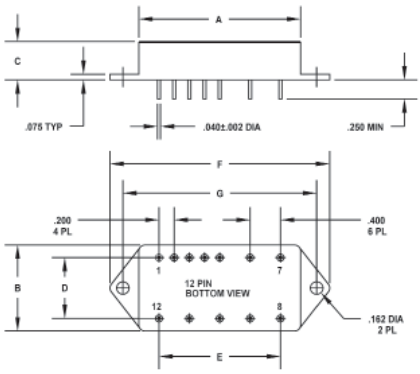

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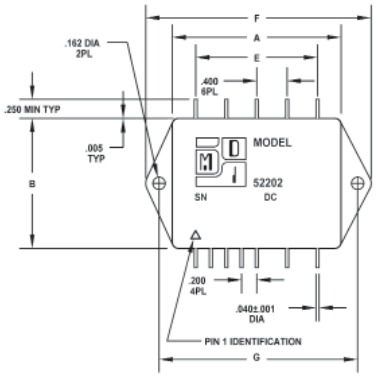

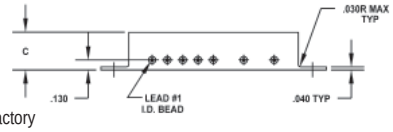

Case Dimensions
Units: inches | millimeters

TOLERANCES:
Drawings in Inches
All dimensions ±0.01 except F = max, C = +0.01/-0.020 For Custom Packages, Contact Factory

Case Style	A	B	C	D	E	F	G
2	2.130 | 54.102	1.120 | 28.448	0.375 | 9.525	0.800 | 20.320	1.600 | 40.640	— | —	— | —
3 F	2.130 | 54.102	1.120 | 28.448	0.375 | 9.525	0.800 | 20.320	1.600 | 40.640	2.890 | 73.406	2.550 | 64.770
5 G	2.130 | 54.102	1.120 | 28.448	0.375 | 9.525	0.800 | 20.320	1.600 | 40.640	— | —	— | —
6 GF	2.130 | 54.102	1.120 | 28.448	0.375 | 9.525	0.800 | 20.320	1.600 | 40.640	2.890 | 73.406	2.550 | 64.770
8 UF	2.160 | 54.864	1.510 | 38.354	0.495 | 12.573	— | —	1.600 | 40.640	2.890 | 73.406	2.550 | 64.770

Pin Outs

Pin 1	CMD_A	Ground to enable Bus A	Pin 7	GND	Input common return
Pin 2	TLM_A	Current telemetry output signal - Bus A	Pin 8	ADJ_B	Output current limit adjust for Bus B
Pin 3	CMD_B	Ground to enable Bus B	Pin 9	IN_B	Input + for Bus B
Pin 4	TLM_B	Current telemetry output signal - Bus B	Pin 10	OUT	Output
Pin 5	INH_OUT	Inhibit Output to enable downstream converters	Pin 11	ADJ_A	Output current limit adjust for Bus A
Pin 6	CASE	Case connection	Pin 12	IN_A	Input + for Bus A

GRADE LEVELS:
Please specify grade level for your application. EU grade units will be shipped if no option is specified.

EU	Engineering Units		
R	100K+® +85°C Military/Aerospace	S	100K+® +85°C Space
RE	100K+® +125°C Military/Aerospace	SE	100K+® +125°C Space

Modular Devices, Inc • One Roned Road • Shirley, New York 11967 • E-mail sales@mdipower.com • Fax 631.345.3106 • Tel 631.345.3100

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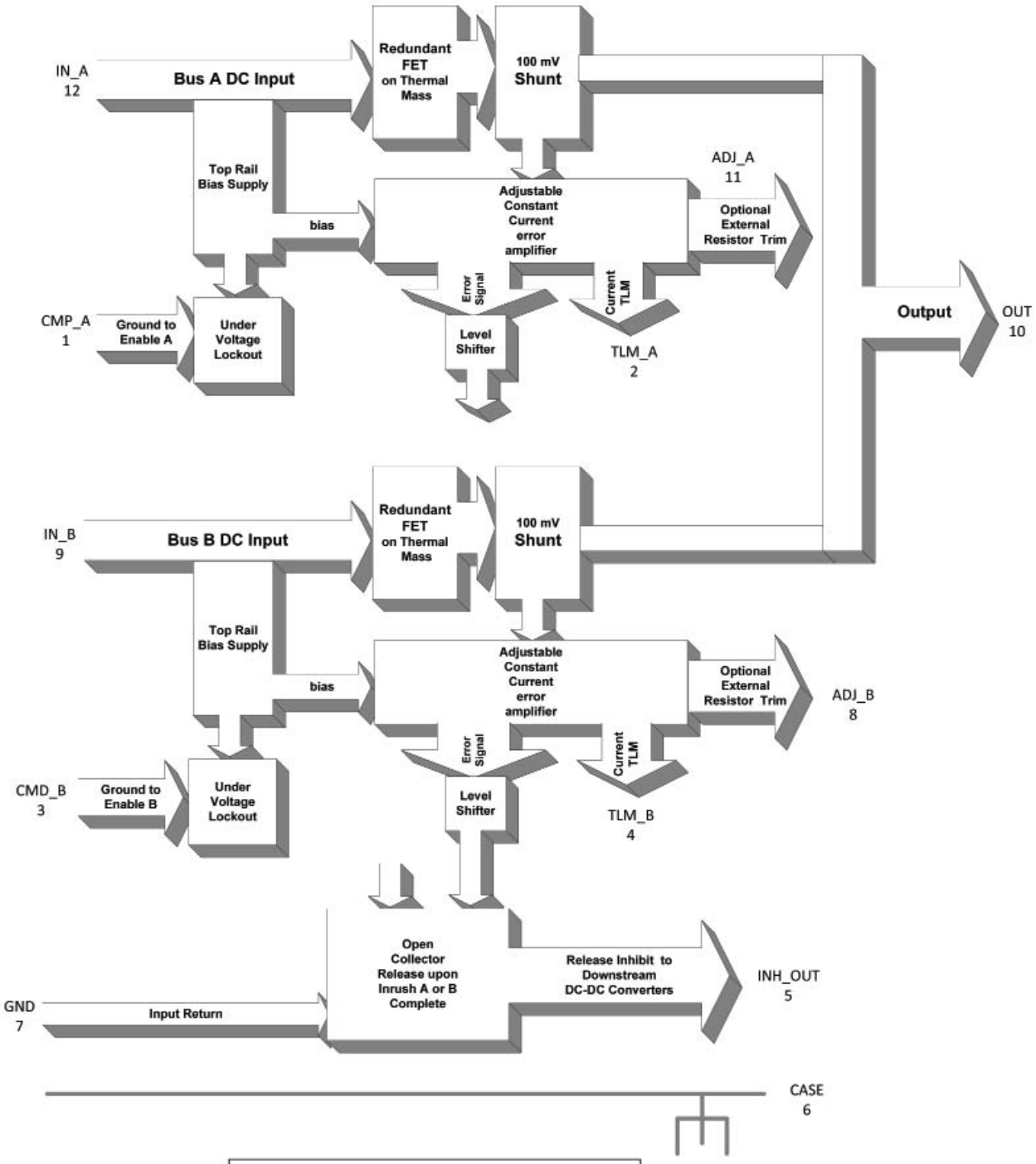

Figure 1
Bus Master Functional Block Diagram