

# Series 3699 7.5 – 20 Watt Hybrid

## For CUBESATS and MINIATURIZED SATELLITES

### Features

- Rad Hard: TID > 100kRad(Si)
- 2:1 margin: Operates beyond 200kRad TID
- No SEE: LET > 82MeV<sup>+</sup>cm<sup>2</sup>/mg
- Proton Resistant: No optocouplers used
- Single and dual outputs for 6 - 16V powerbus of cubesats and scalable miniaturized satellites
- Completely self contained Thick Film Hybrid DC–DC Converter
- No external filter caps required
- Fully isolated design
- "Inhibit-not" function
- Power on soft start
- 200 kHz operation for low ripple and fast response time
- Built-in EMI input filter
- Short circuit and overvoltage protection
- Capability of external sync for switching frequencies

### Specifications

**INPUT:** 12 VDC nominal  
Range: 6 to 16 VDC continuous

#### ISOLATION:

Input to case: 500 VDC  
Input to output: 500 VDC  
Output to case: 100 VDC

#### ENVIRONMENT:

Storage temperature: -55°C to +150°C  
Shock: 50 G's  
Acceleration: 500 G's  
Vibration: 30 G's

Grades EU, R & S:

Full Power Output at T<sub>case</sub> = +85°C  
Linearly derates to zero at T<sub>case</sub> = +115°C

Grades RE & SE:

Full Power Output at T<sub>case</sub> = +125°C  
Linearly derates to zero at T<sub>case</sub> = +135°C

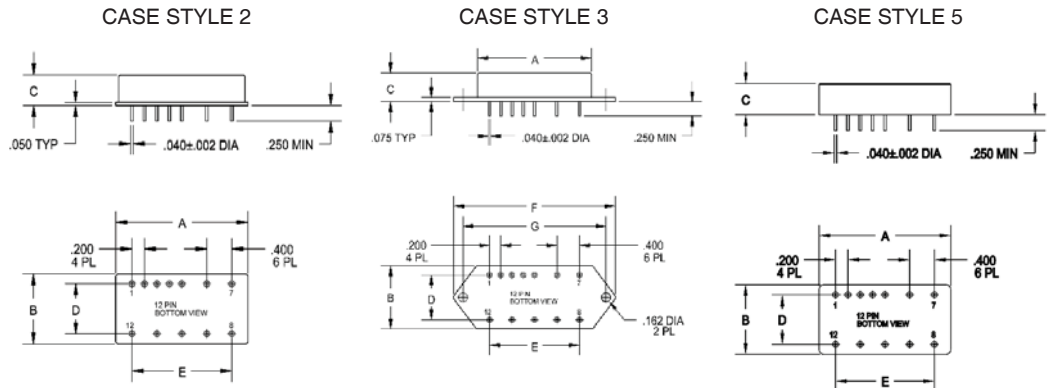
**WEIGHT:** 60 grams typical

SINGLE OUTPUT DEVICES		3699-S02 (8W)			3699-S02.5 (10W)			3699-S03.3 (13.2W)			3699-S05 (20W)		
PARAMETER	CONDITION	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
Output voltage	—	+1.9	+2.0	+2.1	+2.4	+2.5	+2.6	+3.2	+3.3	+3.4	+4.9	+5.0	+5.1
Output current	$V_{in\ min} - V_{in\ max}$	—	—	4A	—	—	4A	—	—	4A	—	—	4A
Efficiency	$P_{out} = \text{max rated load}$	55%	58%	—	60%	63%	—	65%	68%	—	70%	73%	—
Line regulation	$P_{out} = \text{max rated load}$ $V_{in\ min} - V_{in\ max}$	—	10mV	30mV	—	10mV	30mV	—	10mV	30mV	—	10mV	50mV
Load regulation	$P_{out} = 10\%$ to F.L.	—	10mV	30mV	—	10mV	30mV	—	10mV	30mV	—	10mV	50mV
Output ripple	F.L. BW 2 MHz mV <sub>pp</sub>	—	25	50	—	30	60	—	30	65	—	40	85

SINGLE OUTPUT DEVICES		3699-S05.2 (20W)			3699-S12 (20W)			3699-S15(20W)			3699-S28 (20W)		
PARAMETER	CONDITION	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
Output voltage	—	+5.1	+5.2	+5.3	+11.9	+12.0	+12.1	+14.9	+15.0	+15.1	+27.8	+28.0	+28.2
Output current	$V_{in\ min} - V_{in\ max}$	—	—	3.85A	—	—	1.67A	—	—	1.33A	—	—	714mA
Efficiency	$P_{out} = \text{max rated load}$	70%	73%	—	76%	80%	—	77%	81%	—	76%	80%	—
Line regulation	$P_{out} = \text{max rated load}$ $V_{in\ min} - V_{in\ max}$	—	10mV	50mV	—	20mV	100mV	—	25mV	125mV	—	50mV	250mV
Load regulation	$P_{out} = 10\%$ to F.L.	—	10mV	50mV	—	20mV	100mV	—	25mV	125mV	—	50mV	250mV
Output ripple	F.L. BW 2 MHz mV <sub>pp</sub>	—	40	85	—	60	150	—	75	180	—	150	350

Model No.	Case Style	Pin Count	Mounting
3699	2	12	Solder Sealed Flangeless PCB Mount
3699	F	12	Solder Sealed PCB Mount with Flange
3699	I	12	Seam Weld Flangeless PCB Mount
3699	IF	12	Seam Weld PCB Mount with Flange
3699	WF	12	Seam Weld Chassis Mount with Flange
3699	PB	10	Solder Sealed Flangeless PCB Stud Mount
3699	PE	12	Seam Weld Flangeless PCB Stud Mount



### Case Dimensions

Units: inches | millimeters

**TOLERANCES: ALL DIMENSIONS ±0.01 EXCEPT F= MAX. C = +0.01/-0.02; DRAWINGS IN INCHES.**

Case Style	A	B	C	D	E	F	G
2	2.200   55.880	1.350   34.290	0.495   12.573	1.000   25.400	1.600   40.640	—   —	—   —
3	2.200   55.880	1.350   34.290	0.495   12.573	1.000   25.400	1.600   40.640	2.960   75.184	2.610   66.294
5	2.225   56.515	1.350   34.290	0.495   12.573	1.000   25.400	1.600   40.640	—   —	—   —
6	2.225   56.515	1.350   34.290	0.495   12.573	1.000   25.400	1.600   40.640	2.960   75.184	2.610   66.294
8	2.225   56.515	1.350   34.290	0.495   12.573	—   —	1.600   40.640	2.960   75.184	2.610   66.294
10	2.225   56.515	1.350   34.290	0.495   12.573	1.000   25.400	1.600   40.640	—   —	—   —
12	2.225   56.515	1.350   34.290	0.495   12.573	1.000   25.400	1.600   40.640	—   —	—   —



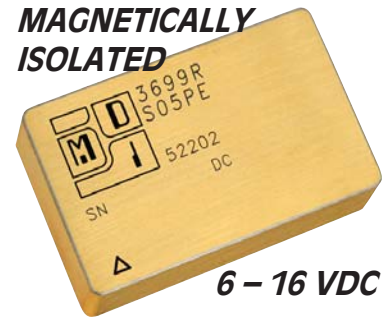
# DC – DC Converters

## PROTON RAD HARD 100K+™ SERIES 3699

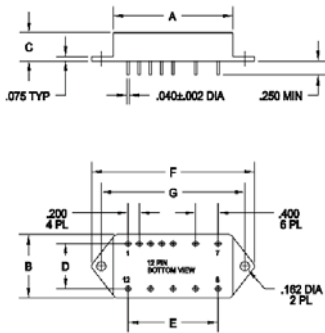
DUAL OUTPUT DEVICES		3699-D3.3/5 (11.6W)			3699-D05 (20W)			3699-D12 (20W)			3699-D15 (20W)		
PARAMETER	CONDITION	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
Output voltage	—	+3.2	+3.3	+3.4	+4.9	+5.0	+5.1	+11.9	+12.0	+12.1	+14.9	+15.0	+15.1
		+4.9	+5.0	+5.1	-4.9	-5.0	-5.1	-11.9	-12.0	-12.1	-14.9	-15.0	-15.1
Output current*	$V_{in\ min} - V_{in\ max}$	200mA	—	2A	±150mA	—	±2A	±125mA	—	±883mA	—	—	4A
		100mA	—	1A	—	—	—	—	—	—	—	—	—
Efficiency	$P_{out} = \text{max rated load}$	62%	65%	—	70%	74%	—	76%	80%	—	77%	81%	—
Line regulation	$P_{out} = \text{max rated load}$ $V_{in\ min} - V_{in\ max}$	—	10mV	30mV	—	±10mV	±50mV	—	±20mV	±100mV	—	±25mV	±125mV
		—	10mV	50mV	—	—	—	—	—	—	—	—	—
Load regulation†	$P_{out} = 10\% \text{ to F.L.}$	—	10mV	30mV	—	±10mV	±50mV	—	±20mV	±100mV	—	±25mV	±125mV
		—	10mV	50mV	—	—	—	—	—	—	—	—	—
Output ripple	F.L. BW 2 MHz mV <sub>pp</sub>	—	30	65	—	40	85	—	60	150	—	75	180
		—	25	50	—	—	—	—	—	—	—	—	—

Notes: \*Up to 90% full power available from either output if rated output power is not exceeded; †balanced load conditions.

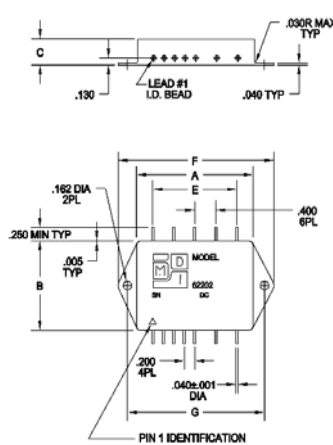
**MAGNETICALLY ISOLATED**



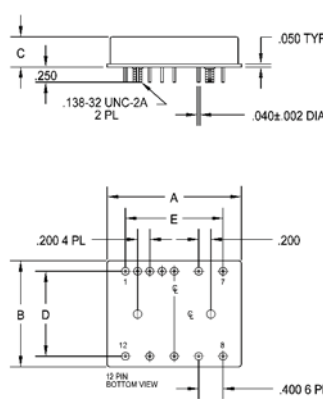
CASE STYLE 6



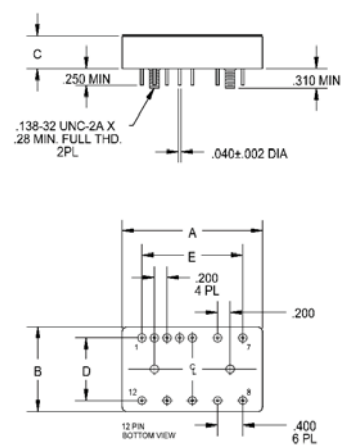
CASE STYLE 8



CASE STYLE 10



CASE STYLE 12



### 3699-SXX output < 24VDC

Pin 1	N/C	Pin 7	+Input
Pin 2	Inhibit Not	Pin 8	Main Output
Pin 3	Soft Start	Pin 9	Main Output Ret
Pin 4	Sync	Pin 10	+Remote Sense
Pin 5	N/C	Pin 11	Adjust
Pin 6	Input Ret	Pin 12	-Remote Sense

### 3699-SXX output ≥ 24 VDC

Pin 1	N/C	Pin 7	+Input
Pin 2	Inhibit Not	Pin 8	+Remote Sense
Pin 3	Soft Start	Pin 9	-Remote Sense
Pin 4	Sync	Pin 10	Main Output
Pin 5	Adjust	Pin 11	N/C
Pin 6	Input Ret	Pin 12	Main Output Ret

### 3699-DXX

Pin1	N/C	Pin 7	+Input
Pin 2	Inhibit Not	Pin 8	+Remote Sense
Pin 3	Soft Start	Pin 9	-Remote Sense
Pin 4	Sync	Pin10	+Dual Output
Pin 5	Adjust	Pin 11	Dual Output Rtn
Pin 6	Input Ret	Pin 12	-Dual Output



Please specify **GRADE LEVEL** for your application. EU grade units will be shipped if no option is specified.

**EU** Engineering Units

**R** 100 K+™, +85°C military/aerospace

**RE** 100 K+™, +125°C military/aerospace

**S** 100 K+™, +85°C space

**SE** 100 K+™, +125°C space