FEATURES

- **–55°C to +125° C operation**
- **16 TO 40 VDC input**
- Four fully regulated outputs
- Internal EMI filter meets MIL-STD-461C CE03
- Active transient suppressor
- Built in hold-up function with flag
- Fully isolated
- Magnetic feedback
- Fixed frequency, 550 kHz typical
- Topology – Single Ended Forward
- Inhibit function
- Indefinite short circuit protection
- Undervoltage lockout

DC/DC CONVERTERS 28 VOLT INPUT

MQO SERIES 16 WATT



MODELS
VDC OUTPUT
QUAD
±5 and ±12
±5 and ±15

Size (max.): 3.200 x 2.600 x 0.460 inches (81.28 x 66.04 x 11.68 mm)
See Section B8, case N, for dimensions.
Weight: 120 grams typical
Screening: Standard or ES. See Section C2 for screening options, see Section A5 for ordering information.

DESCRIPTION

The MQO Series™ of DC/DC converters supply up to 16.5 watts in a four output configuration of ±5 and ±12 or ±5 and ±15 VDC. An integral EMI filter and transient suppressor allow the converters to meet MIL-STD-461C standards without external components. An output hold-up feature provides a low power flag and full output power hold-up through transient dropout conditions.

The MQO Series converters are packaged in hermetically sealed cases and are rated for full power operation from –55° to +125° C case temperature. This makes these units ideal for military, aerospace, and hi-rel industrial applications.

A high gain bandwidth magnetically isolated control loop is used to precisely regulate the +5 VDC output. Constant frequency pulse width with a single ended forward topology is used. The –5 VDC output and the auxiliary outputs are independently controlled with low headroom regulators, eliminating cross regulation errors. The use of feedforward, compensation, and a high gain bandwidth control loop provides excellent rejection to the conducted audio spectrum of MIL-STD-704A-D and MIL-STD-461C.

INTEGRAL EMI FILTER

The MQO Series includes a a built-in EMI filter and transient suppressor which allow the units to meet the most common military standards without any external components. The internal EMI filter provides both differential and common mode attenuation on the input power lines to allow meeting the CE03 interference and CS02 susceptibility requirements. The active internal transient suppressor provides protection against MIL-STD-704A, 1275, and 461C line transients. Protection is provided for transients up to 400 V from a 0.5 ohm source and 600 V from a 50 ohm source.

BUILT-IN HOLD-UP FUNCTION WITH FLAG

An output hold-up feature provides a low power flag and full output power hold-up through transient drop out conditions. At full load for a Vin step from 28 to 0 volts, the minimum hold-up time will be 50 µs. The low power flag (TTL high) is asserted 10 µs before the end of the hold-up time. External capacitance can be added to extend hold-up time.

SHORT CIRCUIT PROTECTION

MQO Series converters provide predictable current limiters which directly sense output load current in the converter's secondary. During short circuit or overload conditions, the current limiters provide constant output current and an input power fold-back.

UNDERVOLTAGE LOCKOUT

Undervoltage lockout prevents the converters from operating below approximately 12 VDC input voltage which helps keep system current levels smooth, especially during initialization or re-start operations.

MQO SERIES
16 WATT

DC/DC CONVERTERS

ABSOLUTE MAXIMUM RATINGS

Input Voltage
- 16 to 40 V

Output Power
- 16.75 watts

Lead Soldering Temperature (10 sec per lead)
- 300°C

Storage Temperature Range (Case)
- –65°C to +150°C

INHIBIT

Inhibit TTL Open Collector
- Logic low (output disabled)
- Referenced to input common
- Logic high (output enabled)
  Open collector

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range
- 16 to 40 VDC continuous

Case Operating Temperature (Tc)
- –55°C to +125°C full power
- –55°C to +135°C absolute

Derating Output Power/Current
- Linearly from 100% at 125°C to 0% at 135°C

TYPICAL CHARACTERISTICS

Undervoltage Lockout
- 12 V input typical

Isolation
- 100 megohm minimum at 500 V

Audio Rejection
- Up to 50 dB

Conversion Frequency
- 550 kHz typical

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, unless otherwise specified.

PARAMETER	CONDITION	MQO28512Q MIN	MQO28512Q TYP	MQO28512Q MAX	MQO28515Q MIN	MQO28515Q TYP	MQO28515Q MAX	UNITS
OUTPUT VOLTAGE	+5	4.95	5.00	5.05	4.95	5.00	5.05	VDC
	–5	4.95	5.00	5.05	4.95	5.00	5.05	
	+ AUX.	11.90	12.00	12.10	14.90	15.00	15.10	
	– AUX.	11.90	12.00	12.10	14.90	15.00	15.10	
OUTPUT CURRENT	+5	390	—	2000	390	—	2000	mA
	–5	0	—	350	0	—	350	
	+ AUX.	0	—	208	0	—	167	
	– AUX.	0	—	208	0	—	167	
OUTPUT POWER	+5	1.95	—	10.00	1.95	—	10.00	W
V_{IN} = 16 TO 40 VDC	–5	0	—	1.75	0	—	1.75	
	+ AUX.	0	—	2.50	0	—	2.50	
	– AUX.	0	—	2.50	0	—	2.50	
OUTPUT RIPPLE	+5	—	50	55	—	50	55	mV p-p
10 kHz to 2 MHz	–5	—	—	30	—	—	30	
	+ AUX.	—	—	50	—	—	50	
	– AUX.	—	—	50	—	—	50	
LINE REGULATION	V_{IN} = 16 TO 36 VDC +5	—	—	20	—	—	20	mV
	–5, ±AUX.	—	—	50	—	—	50	
LOAD REGULATION	MINIMUM LOAD TO FULL ±5	—	20	120	—	20	120	mV
	± AUX.	—	50	220	—	50	220	
INPUT VOLTAGE	MINIMUM LOAD TO FULL Tc = –55° TO +125° C CONTINUOUS	16	28	40	16	28	40	VDC
	TRANSIENT 50 ms 0.5 OHM SOURCE	—	—	400	—	—	400	V
	50 OHM SOURCE	—	—	600	—	—	600	
INPUT CURRENT	MINIMUM LOAD	—	—	230	—	—	230	mA
	FULL LOAD	—	—	960	—	—	960	
	INHIBITED	—	—	10	—	—	10	
INPUT RIPPLE		—	50	—	—	50	—	mA p-p
EFFICIENCY	10 kHz TO 2 MHz	—	64	—	—	64	—	%
START-UP	DELAY	—	20	—	—	20	—	ms

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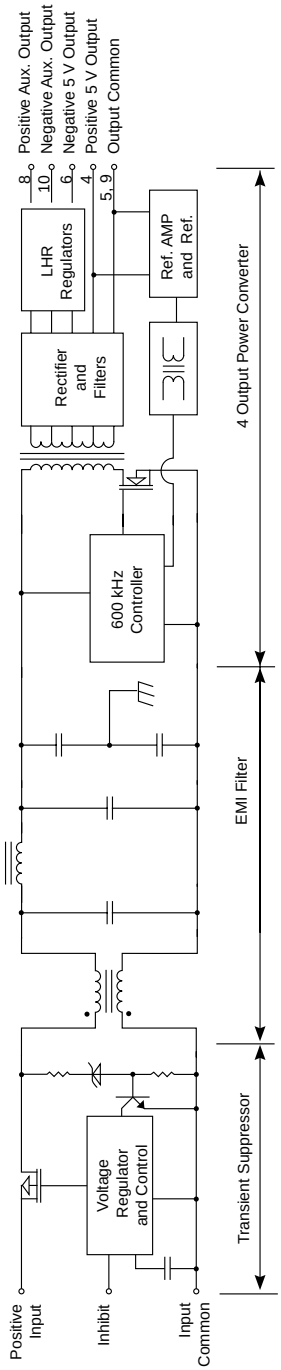
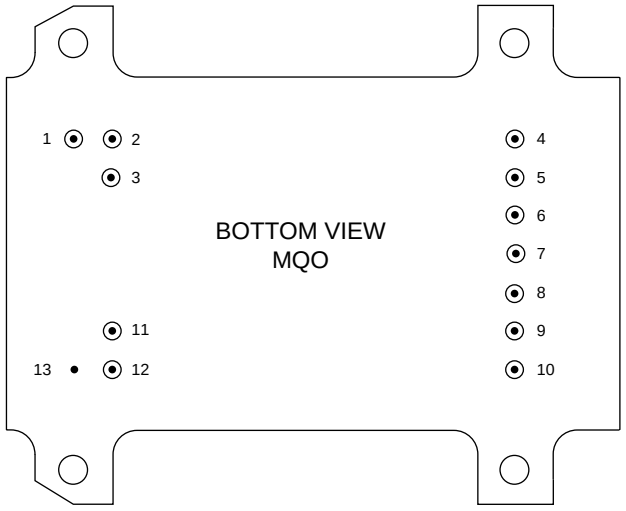


FIGURE 1: MQO BLOCK DIAGRAM

DC/DC CONVERTERS

PIN OUT

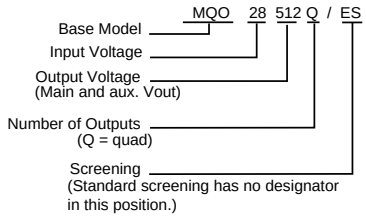
Pin	Designation
1	Inhibit
2	Positive Input
3	Input Common
4	Positive 5 V Output
5	Output Common
6	Negative 5 V Output
7	Low Power Flag
8	Positive Aux.Output
9	Output Common
10	Negative Aux. Output
11	Hold-up Common
12	Positive Hold-up Input
13	Case Ground



See Section B8, case N, for dimensions

FIGURE 2: PIN OUT

MODEL NUMBERING KEY



23624-001-DTS Rev A DQ# 3003
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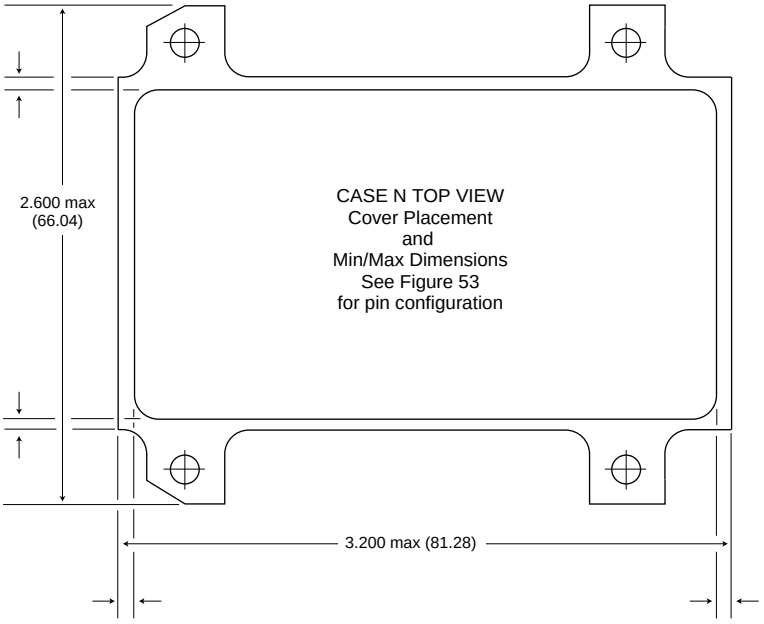

Materials

Header	Cold Rolled Steel/Nickel/Tin
Cover	Cold Rolled Steel/Nickel/Tin
Pins	#52 alloy (all cases) compression glass seal

Case dimensions in inches (mm)

Tolerance ±0.005 (0.13) for three decimal places
±0.01 (0.2) for two decimal places
unless otherwise specified

CAUTION

Heat from reflow or wave soldering may damage the device. Solder pins individually with heat application not exceeding 300°C for 10 seconds per pin.

FIGURE 52: CASE N MAXIMUM DIMENSIONS

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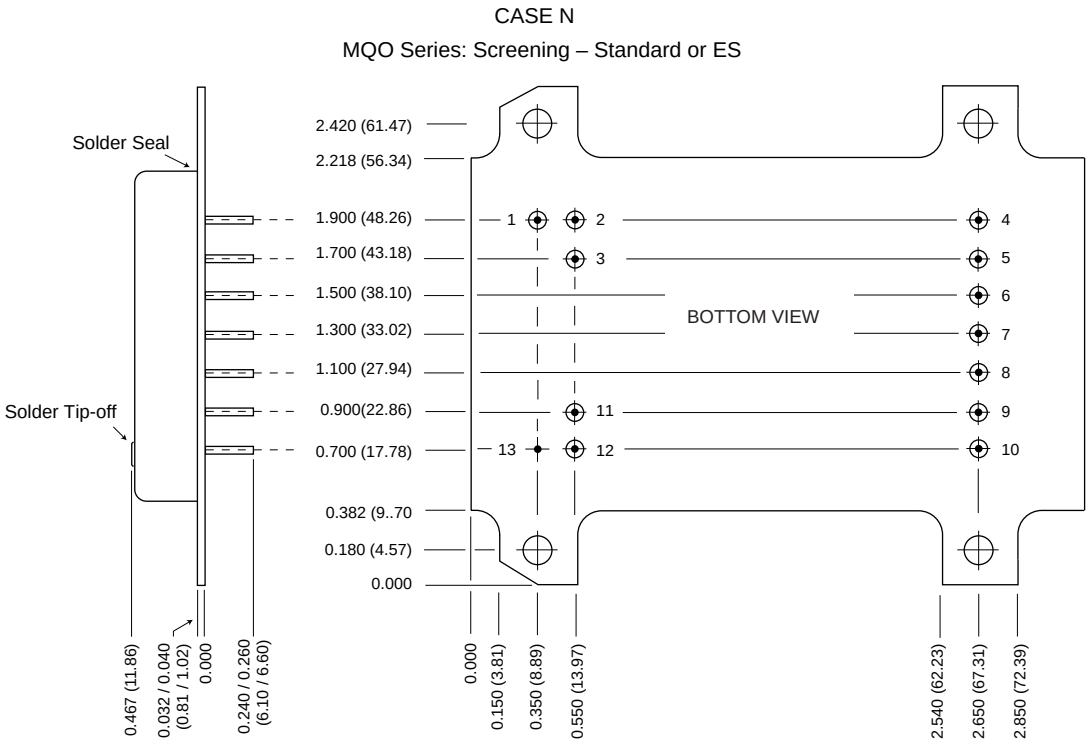

FIGURE 53: CASE N DIMENSIONS

125°C PRODUCTS

TEST (125°C Products)	STANDARD	/ES	/883 (Class H)*
PRE-CAP INSPECTION			
Method 2017, 2032	yes	yes	yes
TEMPERATURE CYCLE (10 times)			
Method 1010, Cond. C, -65°C to 150°C	no	no	yes
Method 1010, Cond. B, -55°C to 125°C	no	yes	no
CONSTANT ACCELERATION			
Method 2001, 3000 g	no	no	yes
Method 2001, 500 g	no	yes	no
BURN-IN			
Method 1015, 160 hours at 125°C	no	no	yes
96 hours at 125°C case (typical)	no	yes	no
FINAL ELECTRICAL TEST MIL-PRF-38534, Group A			
Subgroups 1 through 6: -55°C, +25°C, +125°C	no	no	yes
Subgroups 1 and 4: +25°C case	yes	yes	no
HERMETICITY TESTING			
Fine Leak, Method 1014, Cond. A	no	yes	yes
Gross Leak, Method 1014, Cond. C	no	yes	yes
Gross Leak, Dip (1×10^{-3})	yes	no	no
FINAL VISUAL INSPECTION			
Method 2009	yes	yes	yes

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

*883 products are built with element evaluated components and are 100% tested and guaranteed over the full military temperature range of –55°C to +125°C.

Applies to the following products

MOR Series	MHD Series	MGH Series	FMGA EMI Filter
MFLHP Series	MHV Series	MCH Series	FMSA EMI Filter
MFL Series	MHF+ Series	FM-704A EMI Filter	HUM Modules**
MHP Series	MHF Series**	FMD**/FME EMI Filter	LCM Modules**
MTR Series	MGA Series	FMC EMI Filter	LIM Modules
MQO Series**	MSA Series	FMH EMI Filter	

**MFLHP Series, MQO Series, MHF Series, FMD EMI Filters, Hum Modules, and LCM Modules do not offer ‘883” screening.

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