

FEATURES

- -55°C to +125°C operation
- 12 to 50 VDC input
- Fully isolated
- Magnetic feedback
- Fixed frequency 370 kHz typ.
- Topology – Current Mode Flyback
- 80 V for up to 120 ms transient protection (70 V for 15 V single and dual models)
- Inhibit function
- Short circuit protection
- Undervoltage lockout

DC/DC CONVERTERS

28 VOLT INPUT



Size (max.): 0.980 x 0.805 x 0.270 inches (24.89 x 20.45 x 6.86 mm)
 Weight: 12 grams max.
 Screening: Standard, ES, or 883 (Class H)

MCH SERIES

1.5 WATT

MODELS

VDC OUTPUT

SINGLES	DUALS
5	±5
5.2	±12
12	±15
15	

DESCRIPTION

With a miniature footprint of just 0.8 square inches, the MCH Series™ of DC/DC converters delivers 1.5 watts of output power while saving significant board real estate. The wide input voltage range of 12 to 50 VDC accepts the varying voltages of military, aerospace, or space bus power and tightly regulates output voltages to protect downstream components. Transient protection of 80 volts for up to 120 milliseconds exceeds the requirements of MIL-STD-704A for the 5, 5.2, and 12 volt single models and the 12 volt dual model. The 15 volt single and dual converters will withstand transients of up to 70 volts for up to 120 milliseconds.

CONVERTER DESIGN

MCH Series DC/DC converters incorporate a continuous flyback topology with a constant switching frequency of approximately 370 kHz. Current-mode pulse width modulation (PWM) provides output voltage regulation. Output error voltage is magnetically fed back to the input side of the PWM to regulate output voltage. Regulation is also affected by the load; refer to the Electrical Characteristics tables on the following pages.

Dual models regulate the negative output with magnetic coupling to the positive output. Up to 80% of the total load may be on one output providing that the other output carries a minimum of 20% of the total load. The dual models can be used at double the output voltage by connecting the load between positive and negative outputs, leaving the common unconnected. (ex: MCH2805D can be used as a 10 VDC output.)

INHIBIT FUNCTION

When an open collector TTL logic low is applied to the inhibit terminal, pin 7, the converter shuts down and lowers the output voltage to near zero and input current to as low as 2.3 mA. Leaving the terminal open or applying an open collector TTL logic high will enable the converter.

PROTECTION FEATURES

Undervoltage lockout prevents the MCH Series converters from operating below approximately 8 VDC input voltage to keep system current levels smooth, especially during initialization or re-start operations. All models include a soft-start function to prevent large current draw and minimize overshoot. The converters also provide short circuit protection by restricting the current.

MIL-STD-461

Use Interpoint's FMSA-461 EMI filter to pass the CE03 requirements of MIL-STD-461C.

CONVENIENT PACKAGING

The MCH Series converters are packaged in hermetically sealed, projection-welded metal cases which provide EMI/RFI shielding.

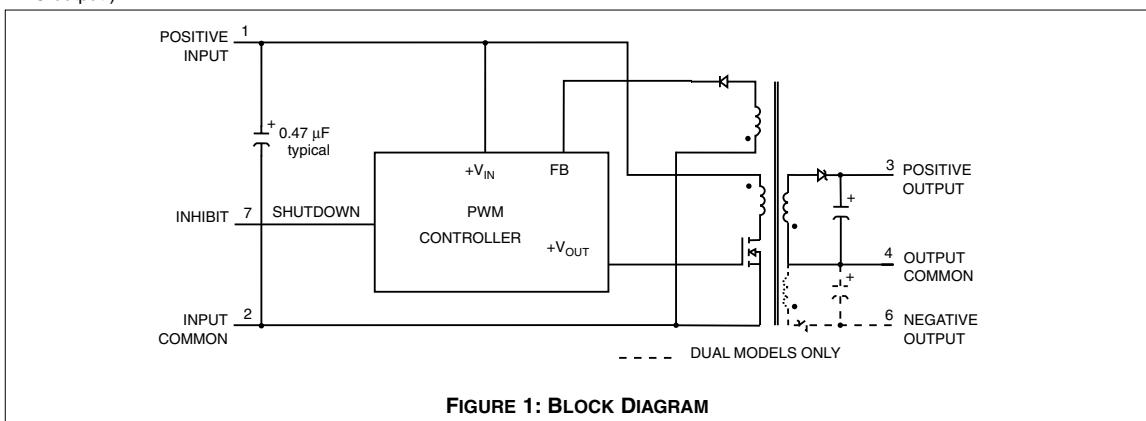


FIGURE 1: BLOCK DIAGRAM

MCH SERIES

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DC/DC CONVERTERS

ABSOLUTE MAXIMUM RATINGS

- Input Voltage**
- 12 to 50 VDC
- Output Power**
- 1.5 W
- Capacitive Load**
- Single output models 200 μ F
 - Dual output models 100 μ F
- 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) 0.8 V max
 - Inhibit pin current 1 mA max
 - Referenced to input common
 - Logic high (output enabled) open collector

RECOMMENDED OPERATING CONDITIONS

- Input Voltage Range**
- 12 to 50 VDC continuous
 - 80 V for 120 msec transient
 - (70 V for 15 V single and dual models)
- Case Operating Temperature (Tc)**
- 55°C to +125°C full power
 - 55°C to +135°C absolute
- Derating Output Power/Current (Tc)**
- Linearly from 100% at 125°C to 0% at 135°C

TYPICAL CHARACTERISTICS

- Output Voltage Temperature Coefficient**
- 100 ppm/°C typical
- Input to Output Capacitance**
- 100 to 170 pF typical
- Undervoltage Lockout**
- 8 V input typical
- Current Limit**
- 125% of full load typical
- Isolation**
- 100 megohm minimum at 500 V
- Audio Rejection 40 dB, typical**
- Conversion Frequency (kHz)**
- 25°C, 300 min, 370 typ, 450 max
 - 55°C to +125°C
 - 270 min, 370 typ, 470 max
- Inhibit Pin Voltage (unit enabled)**
- 7 to 12 V

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

SINGLE OUTPUT MODELS		MCH2805S			MCH285R2S			MCH2812S			MCH2815S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE ¹	Tc = 25°C	4.95	5	5.05	5.15	5.2	5.25	11.88	12	12.12	14.85	15	15.15	VDC
	Tc = -55°C TO +125°C	4.80	5	5.20	5.00	5.2	5.40	11.52	12	12.48	14.40	15	15.60	
OUTPUT CURRENT	V _{IN} = 12 to 50 VDC	—	300	0	—	288	0	—	125	0	—	100	mA	
OUTPUT POWER	V _{IN} = 12 TO 50 VDC	0	—	1.5	0	—	1.5	0	—	1.5	0	—	1.5	W
OUTPUT RIPPLE VOLTAGE	10 kHz - 2 MHz	—	45	150	—	45	150	—	50	200	—	35	150	mV p-p
	Tc = -55°C TO +125°C	—	65	300	—	65	300	—	70	300	—	50	250	
LINE REGULATION	V _{IN} = 12 TO 50 VDC	—	35	100	—	35	100	—	60	200	—	70	300	mV
	Tc = -55°C TO +125°C	—	40	120	—	40	120	—	70	250	—	80	350	
LOAD REGULATION	10% TO FULL LOAD	—	350	700	—	350	700	—	600	1300	—	700	1500	mV
	Tc = -55°C TO +125°C	—	380	800	—	380	800	—	640	1400	—	760	1600	
	50% TO FULL	—	100	200	—	100	200	—	145	300	—	165	350	
	Tc = -55°C TO +125°C	—	115	300	—	115	300	—	160	400	—	185	450	
INPUT VOLTAGE	CONTINUOUS	12	28	50	12	28	50	12	28	50	12	28	50	VDC
NO LOAD TO FULL	TRANSIENT 120 ms	0	—	80	0	—	80	0	—	80	0	—	70	V
INPUT CURRENT	NO LOAD	—	5.5	10	—	5.5	10	—	6.0	10	—	6.0	11	mA
	Tc = -55°C TO +125°C	—	6.0	11	—	6.0	11	—	6.5	12	—	6.5	12	
	FULL LOAD	—	70	74	—	70	74	—	68	72	—	68	72	
	Tc = -55°C TO +125°C	—	73	78	—	73	78	—	70	74	—	70	74	
	INHIBITED	—	2.3	3.2	—	2.3	3.2	—	2.3	3.2	—	2.3	3.2	
INPUT RIPPLE CURRENT ²	10k Hz - 10 MHz	—	100	200	—	100	200	—	100	200	—	100	200	mA p-p
	Tc = -55°C TO +125°C	—	130	250	—	130	250	—	150	250	—	150	250	
EFFICIENCY	Tc = 25°C	72	77	—	72	77	—	74	79	—	74	79	—	%
	Tc = -55°C TO +125°C	69	75	—	69	75	—	72	77	—	72	77	—	
LOAD FAULT ^{3, 4}	POWER DISSIPATION	—	1.3	2.0	—	1.3	2.0	—	2.0	3.2	—	2.3	3.7	W
	Tc = -55°C TO +125°C	—	1.4	2.3	—	1.4	2.3	—	2.2	3.5	—	2.5	4.0	
	RECOVERY	—	3.0	12	—	3.0	12	—	3.5	15	—	4.0	18	ms
	Tc = -55°C TO +125°C	—	3.5	15	—	3.5	15	—	3.5	20	—	4.0	20	
STEP LOAD RESPONSE ⁵	50 %-100%— 50% LOAD TRANSIENT	-400	185	400	-400	185	400	-700	350	700	-700	350	700	mV pk
	Tc = -55°C TO +125°C	-500	185	500	-500	185	500	-800	380	800	-800	380	800	
	RECOVERY	—	125	500	—	125	500	—	130	500	—	140	600	μ s
	Tc = -55°C TO +125°C	—	125	600	—	125	600	—	130	600	—	180	750	
STEP LINE RESPONSE ⁵	12 TO 50 TO 12 V _{IN} TRANSIENT	-400	170	400	-400	170	400	-900	400	900	-750	400	750	mV pk
	Tc = -55°C TO +125°C	-500	180	500	-500	180	500	-1000	400	1000	-850	450	850	
	RECOVERY	—	0.75	3.0	—	0.75	3.0	—	0.6	2.5	—	0.47	2.0	ms
	Tc = -55°C TO +125°C	—	0.75	4.0	—	0.75	4.0	—	0.6	3.0	—	0.5	2.5	
START-UP 0 TO 28 VDC	DELAY	—	7	20	—	7	20	—	7	20	—	7	20	ms
	Tc = -55°C TO +125°C	—	10	40	—	10	40	—	10	40	—	10	40	
	OVERSHOOT	—	0	100	—	0	100	—	0	250	—	0	300	mV pk
	Tc = -55°C TO +125°C	—	0	150	—	0	150	—	0	350	—	0	450	

See notes 1, 2, 3, 4, 5, and 6 on the following page.

DC/DC CONVERTERS

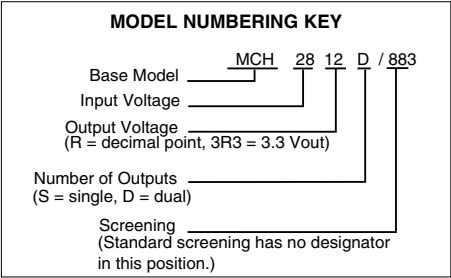
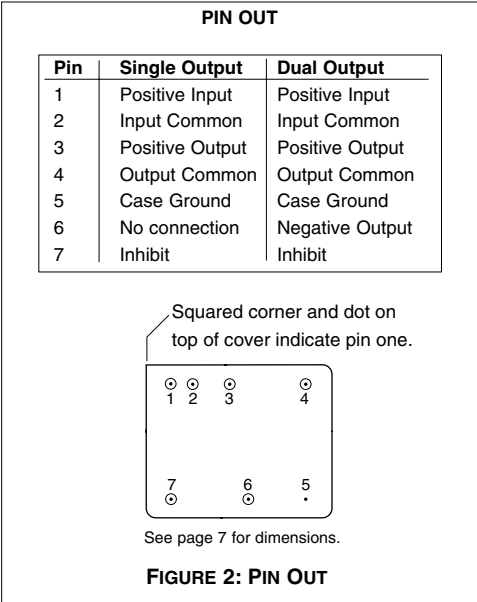
MCH SERIES 1.5 WATT

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

DUAL OUTPUT MODELS		MCH2805D			MCH2812D			MCH2815D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE ¹	Tc = 25°C Tc = -55°C TO +125°C	±4.95 ±4.80	±5 ±5	±5.05 ±5.20	±11.88 ±11.52	±12 ±12	±12.12 ±12.48	±14.85 ±14.40	±15 ±15	±15.15 ±15.60	VDC
OUTPUT CURRENT ⁶	VIN = 12 TO 50 VDC	0	±150	240	0	±62.5	100	0	±50	80	mA
OUTPUT POWER	VIN = 12 TO 50 VDC	0	—	1.5	0	—	1.5	0	—	1.5	W
OUTPUT RIPPLE VOLTAGE +VOUT -VOUT	10 kHz - 2 MHz Tc = -55°C TO +125°C 10 kHz - 2 MHz Tc = -55°C TO +125°C	— — — —	35 50 35 50	150 250 150 250	— — — —	35 40 35 40	150 250 150 250	— — — —	30 35 30 35	150 250 150 250	mV p-p
LINE REGULATION ⁷	VIN = 12 TO 50 VDC Tc = -55°C TO +125°C	— —	10 20	50 100	— —	100 110	300 400	— —	165 180	500 650	mV
LOAD REGULATION ⁸ ±VOUT	10% TO FULL -55°C TO +125°C 50% TO FULL -55°C TO +125°C	— — — —	300 350 80 100	600 700 200 300	— — — —	550 570 115 130	1100 1200 250 350	— — — —	600 630 125 135	1300 1400 300 400	mV
INPUT VOLTAGE NO LOAD TO FULL INPUT CURRENT	CONTINUOUS TRANSIENT 120 ms NO LOAD Tc = -55°C TO +125°C FULL LOAD Tc = -55°C TO +125°C INHIBITED Tc = -55°C TO +125°C	12 0 — — — — —	28 — 5.0 6.0 69 72 2.3 2.4	50 80 10 12 73 77 3.2 3.5	12 0 — — — — —	28 — 7.5 8.0 70 71 2.3 2.4	50 80 13 14 73 77 3.2 3.5	12 0 — — — — —	28 — 7.5 8.0 71 72 2.3 2.4	50 70 13 14 74 78 3.2 3.5	VDC V mA
INPUT RIPPLE ² CURRENT	10 kHz - 10 MHz Tc = -55°C TO +125°C	— —	100 130	200 250	— —	115 150	200 250	— —	90 120	200 250	mA p-p
EFFICIENCY	Tc = 25°C Tc = -55°C TO +125°C	73 70	77 75	— —	73 70	77 75	— —	72 69	76 74	— —	%
LOAD FAULT ^{3,4}	POWER DISSIPATION Tc = -55°C TO +125°C RECOVERY Tc = -55°C TO +125°C	— — — —	1.4 1.6 3.7 3.8	2.2 2.5 15 20	— — — —	2.5 2.7 3.2 3.2	3.8 4.2 15 20	— — — —	2.7 3.0 4.0 4.0	4.1 4.5 15 20	W ms
STEP LOAD RESPONSE ⁵ ± VOUT	50 %—100%— 50% LOAD TRANSIENT Tc = -55°C TO +125°C RECOVERY -55°C TO +125°C	—300 -400 — —	130 140 100 100	300 400 400 500	-600 -700 — —	250 260 165 165	600 700 700 800	-600 -700 — —	250 270 50 50	600 700 200 300	mV pk µs
STEP LINE RESPONSE ⁵ ± VOUT	12 TO 50 TO 12 VIN TRANSIENT Tc = -55°C TO +125°C RECOVERY Tc = -55°C TO +125°C	-250 -300 — —	125 130 0.6 0.6	250 300 2.5 3.0	-500 -600 — —	240 250 0.9 0.9	500 600 3.0 4.0	-500 -600 — —	220 230 0.6 0.7	500 600 3.0 4.0	mV pk ms
START-UP 0 TO 28 VDC, ± VOUT	DELAY Tc = -55°C TO +125°C OVERSHOOT Tc = -55°C TO +125°C	— — — —	8 10 0 0	25 45 100 150	— — — —	8 10 0 0	25 45 250 350	— — — —	8 10 0 0	25 45 750 900	ms mV pk

Notes:

- Specified at 50% load.
- Lin = 2 µH.
- Maximum duration of short circuit: 25°C— 90 seconds, 125°C — 30 seconds.
- Load fault is a short circuit (<50 mohms). Recovery is into resistive full load.
- Transition ≥ 10 µs. Recovery = time to settle to within 1% of Vout final value.
- Max. spec indicates 80% of the converter's total power, available from either output.
- Specification applies to both + and - Vout.
- Although no minimum load is required, at no load the output voltage may increase up to 15%.



SMD NUMBERS	
STANDARD MICROCIRCUIT DRAWING (SMD)	MCH SERIES SIMILAR PART
5962-9569601HXC	MCH2805S/883
IN PROCESS	MCH285R2S/883
5962-9569701HXC	MCH2812S/883
5962-9569801HXC	MCH2815S/883
5962-9570201HXC	MCH2805D/883
5962-9570301HXC	MCH2812D/883
5962-9570401HXC	MCH2815D/883

For exact specifications for an SMD product, refer to the SMD drawing. Call your Interpoint representative for status on the MCH Series SMD releases which are "in process". SMDs can be downloaded from <http://www.dscccols.com/programs/smc>

DC/DC CONVERTERS

MCH SERIES 1.5 WATT

TYPICAL PERFORMANCE CURVES: $T_c = 25^\circ\text{C}$, full load, $V_{in} = 28\text{ VDC}$, unless otherwise specified.

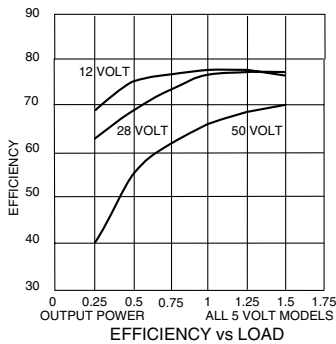


FIGURE 3

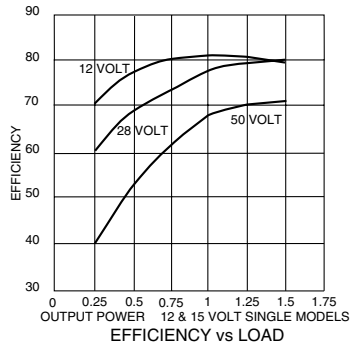


FIGURE 4

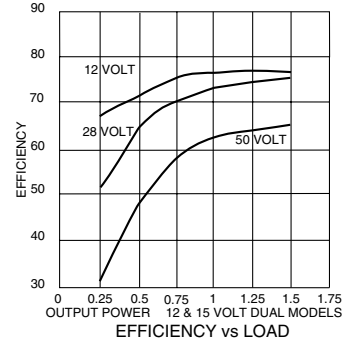


FIGURE 5

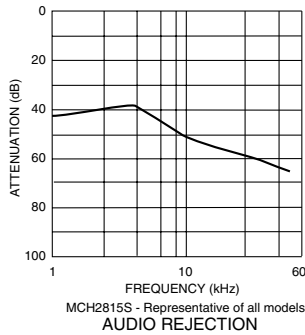


FIGURE 6

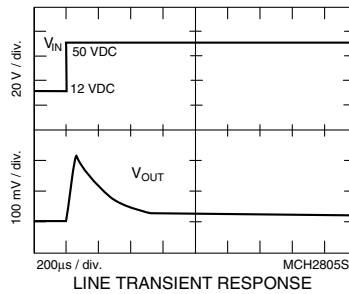


FIGURE 7

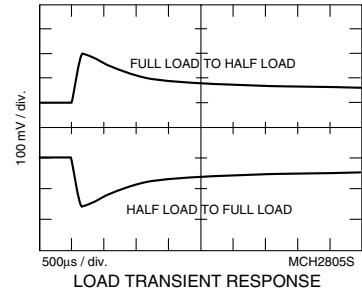


FIGURE 8

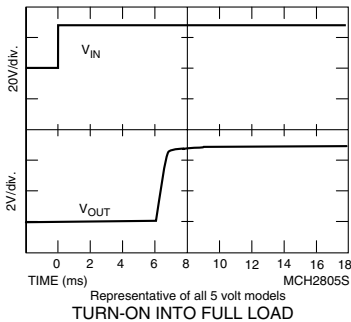


FIGURE 9

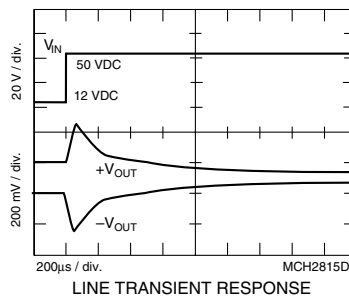


FIGURE 10

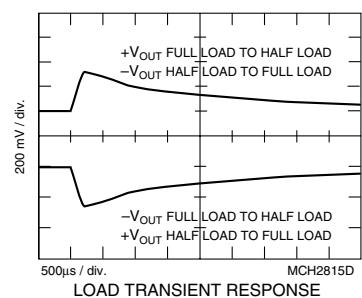


FIGURE 11

MCH SERIES

1.5 WATT

DC/DC CONVERTERS

TYPICAL PERFORMANCE CURVES: $T_c = 25^\circ\text{C}$, full load, $V_{in} = 28\text{ VDC}$, unless otherwise specified.

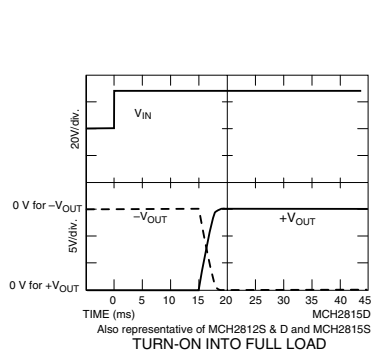


FIGURE 12

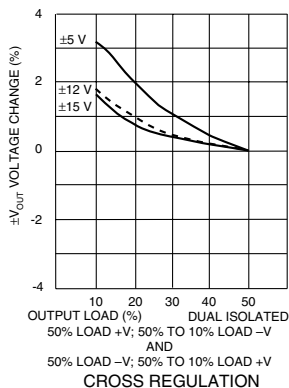


FIGURE 13

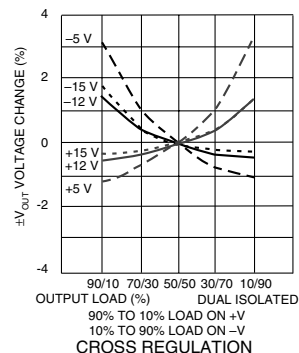


FIGURE 14

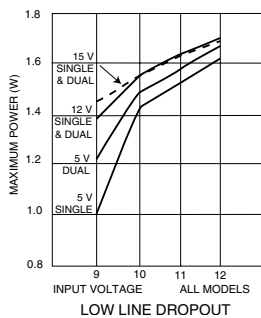


FIGURE 15

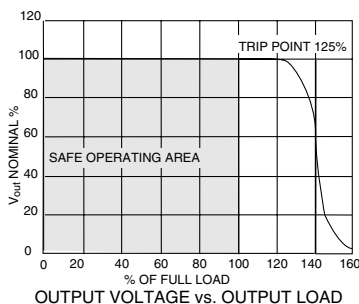


FIGURE 16

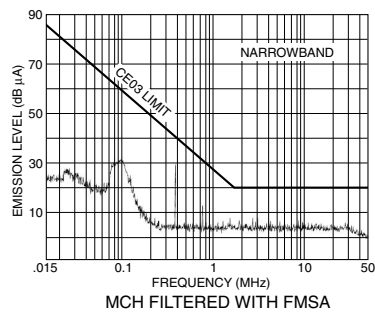
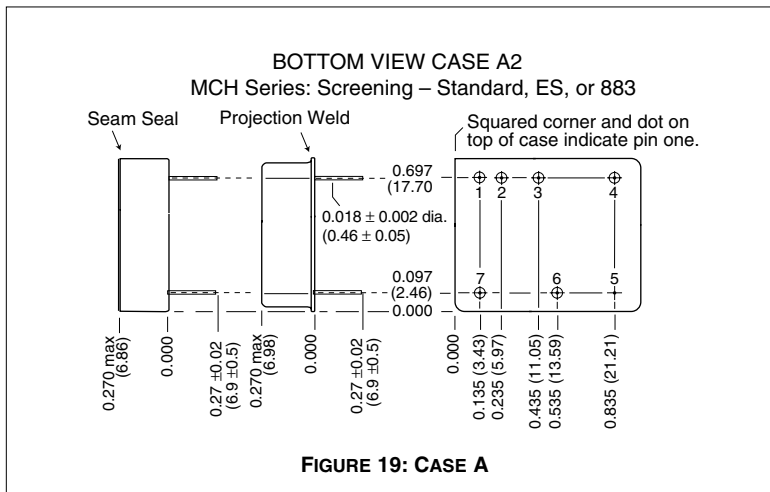
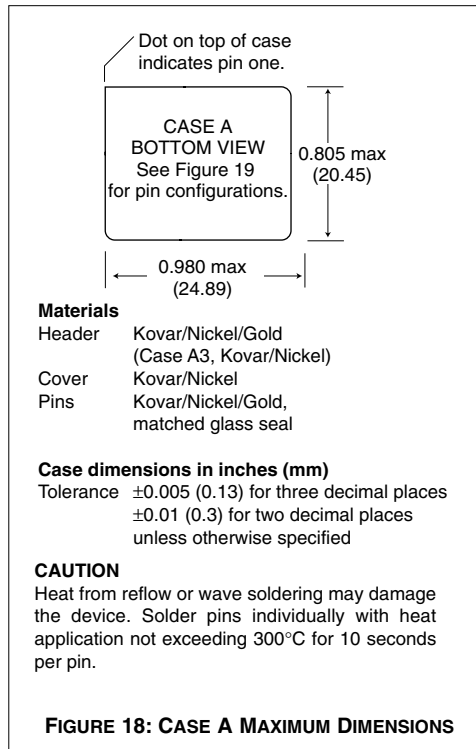


FIGURE 17



Note: Although every effort has been made to render the case drawings at actual size, variations in the printing process may cause some distortion. Please refer to the numerical dimensions for accuracy.

ENVIRONMENTAL SCREENING

TEST	125°C STANDARD	125°C /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 Method 1010, Cond. B, -55°C to 125°C	no no	no yes	yes no
CONSTANT ACCELERATION Method 2001, 3000 g Method 2001, 500 g	no no	no yes	yes no
BURN-IN Method 1015, 160 hours at 125°C 96 hours at 125°C case (typical)	no no	no yes	yes no
FINAL ELECTRICAL TEST MIL-PRF-38534, Group A Subgroups 1 through 6: -55°C, +25°C, +125°C Subgroups 1 and 4: +25°C case	no yes	no yes	yes no
HERMETICITY TESTING Fine Leak, Method 1014, Cond. A Gross Leak, Method 1014, Cond. C Gross Leak, Dip (1 x 10 ⁻³)	no no yes	yes yes no	yes yes 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

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