

FEATURES

- -40°C to $+85^{\circ}\text{C}$ operation
- 10 to 16 VDC input or 18 to 36 VDC input
- Fully Isolated
- Optocoupler feedback
- Fixed frequency, 125 kHz typical single and dual outputs 250 kHz typical triple outputs
- Transient protection 50 V for up to 50 ms 28 Vin models
- Inhibit function
- Indefinite short circuit protection
- Up to 86% efficiency
- Output trim on single output models

DC/DC CONVERTERS 12 & 28 VOLT INPUT

HR150 SERIES 20 WATT



MODELS		
VDC OUTPUT		
SINGLE	DUAL	TRIPLE
5	± 12	+5 & ± 12
12	± 15	+5 & ± 15
15		

Size (max.): HR151 and HR152 models, case H6
2.125 x 1.125 x 0.495 inches (53.98 x 28.58 x 12.57 mm)
HR153 models, case F4
1.950 x 1.350 x 0.505 inches (49.53 x 34.29 x 12.83 mm)
See section B8, cases F4 and H6 for dimensions.

Weight: HR151 and HR152: 50 grams typical. HR153: 53 grams typical.

Screening: Standard only. See Section C2 for screening description.

DESCRIPTION

The HR150 Series™ DC/DC converters have been designed to give industrial applications the same high reliability, small size, and high performance that Interpoint has provided to military and aerospace programs since 1969.

HIGH RELIABILITY

Each HR150 converter is built to perform reliably in the harshest environments. Assembled using thick-film hybrid technology, HR150 converters have more uniform thermal coefficients and 50% fewer connections than converters built by surface mount techniques. The HR150 converter parts use the same manufacturing procedures and quality controls that we apply to converters designed for commercial airliners, the space shuttle, advanced fighter aircraft, and other high reliability applications. The steel cases are hermetically sealed in a dry nitrogen environment and are guaranteed a maximum leak rate of less than 10^{-3} atm-cc/sec. All devices are 100% electrically tested.

SMALL SIZE – LOW PROFILE

The HR150 Series manufacturing techniques provide extremely small size and low profile components. Each converter uses less than 2.7 square inches of board area. The overall power density is from 11 to 17 watts per cubic inch.

HIGH PERFORMANCE

The HR150 Series converters are high efficiency, low noise, pulse width modulated, forward mode switching regulators with a constant switching frequency of 125 kHz typical for single and dual output

models and 250 kHz typical for triple output models. They achieve high isolation (500 V, 100 megohm) through use of a transformer in the forward power circuit and an opto-coupler in the feedback control loop.

HR 150 Series input ranges are 10 to 16 VDC or 18 to 36 VDC for single or triple output models and 18 to 36 VDC for dual output models. Outputs are available as 5, 12, 15, ± 12 , ± 15 , +5/ ± 12 , and +5/ ± 15 VDC. The converters typically provide greater than 80% efficiency over the entire input range and from 25% to full load. Line regulation is typically within 0.1 % and load regulation within 0.2%.

HR150 converters are designed to operate between -40°C and $+85^{\circ}\text{C}$ case and are short circuit protected up to a case temperature of 85°C . The combination of high conversion efficiency and heat dissipating metal enclosures minimizes heat sinking requirements. If additional dissipation is desired, heat conducting material (PCB, copper sheet, heat sink, etc.) may be brought into contact with the unit's baseplate.

An inhibit function is provided for HR150 converters when the inhibit input pin is connected to the input common. The open circuit voltage of the inhibit input pin is 8 to 10 VDC ($V_{in} = 12$) or 11 to 13 VDC ($V_{in} = 28$). The inhibit input pin must sink approximately 1 mA during the inhibit state. During inhibit, the converter's output voltage drops to less than 1 volt and the input current is typically 8 mA.

HR150 SERIES 20 WATT

DC/DC CONVERTERS

ABSOLUTE MAXIMUM RATINGS	
Input Voltage	<ul style="list-style-type: none"> 10 to 16 VDC HR15X-12XX 18 to 36 VDC HR15X-28XX
Output Power	<ul style="list-style-type: none"> 15 watts (HR151-2812 & HR151-2815, 20 watts)
Lead Soldering Temperature (10 sec)	<ul style="list-style-type: none"> 300°C
Storage Temperature Range (Case)	<ul style="list-style-type: none"> -55°C to +125°C

INHIBIT	
Inhibit TTL Open Collector	<ul style="list-style-type: none"> Logic low (output disabled) <ul style="list-style-type: none"> Inhibit pin current 1 mA typical Inhibited input current 8 mA typical Referenced to input common Logic high (output enabled) <ul style="list-style-type: none"> Open collector

TYPICAL CHARACTERISTICS	
Output Voltage Temperature Coefficient	<ul style="list-style-type: none"> 150 ppm/°C, typical
Input to Output Capacitance	<ul style="list-style-type: none"> 60 pF, typical
Isolation	<ul style="list-style-type: none"> 100 megohm minimum at 500 V
Conversion Frequency	<ul style="list-style-type: none"> 250 kHz
Inhibit Pin Voltage (unit enabled)	<ul style="list-style-type: none"> 8 to 10 V HR15X-12XX models 11 to 13 V HR15X-28XX models
Line Regulation	<ul style="list-style-type: none"> 0.1% typical, 0.2% maximum
Load Regulation	<ul style="list-style-type: none"> 0.2% typical, 0.4% maximum

RECOMMENDED OPERATING CONDITIONS	
Input Voltage Range	<ul style="list-style-type: none"> 10 to 16 VDC continuous HR15X-12XX models 18 to 36 VDC continuous HR15X-28XX models 50 V/50 ms transient HR15XX-28XX models
Case Operating Temperature (Tc)	<ul style="list-style-type: none"> -40°C to +85°C full power -40°C to +105°C absolute
Derating Output Power/Current	<ul style="list-style-type: none"> Linearly from 100% at 85°C to 0% at 105°C for HR151 and HR152 models Linearly from 100% at 85°C to 0% at 115°C for HR153 models

Electrical Characteristics: 25°C Tc, 28 VDC Vin (12 Vin for 12V models), 100% load, unless otherwise specified.

SINGLE OUTPUT MODELS, 12 V IN		HR151-1205			HR151-1212			HR151-1215			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		4.95	5.0	5.05	11.88	12	12.12	14.85	15	15.15	VDC
OUTPUT CURRENT		—	—	3.0	—	—	1.25	—	—	1.0	A
OUTPUT POWER		—	—	15	—	—	15	—	—	15	W
OUTPUT RIPPLE	0 to 1 MHz	—	35	70	—	35	70	—	35	70	mV p-p
INPUT VOLTAGE	CONTINUOUS	10	12	16	10	12	16	10	12	16	VDC
INPUT CURRENT	NO LOAD	—	—	24	—	—	32	—	—	32	mA
INPUT RIPPLE CURRENT	0 TO 2 MHz	—	40	80	—	40	80	—	40	80	mA p-p
EFFICIENCY		75	81	—	76	82	—	77	83	—	%

SINGLE OUTPUT MODELS, 28 V IN		HR151-2805			HR151-2812			HR151-2815			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		4.95	5.0	5.05	11.88	12	12.12	14.85	15	15.15	VDC
OUTPUT CURRENT		—	—	3.0	—	—	1.667	—	—	1.333	A
OUTPUT POWER		—	—	15	—	—	20	—	—	20	W
OUTPUT RIPPLE	0 to 1 MHz	—	30	60	—	40	80	—	40	80	mV p-p
INPUT VOLTAGE	CONTINUOUS	18	28	36	18	28	36	18	28	36	VDC
	TRANSIENT 50 ms	—	—	50	—	—	50	—	—	50	V
INPUT CURRENT	NO LOAD	—	—	20	—	—	30	—	—	30	mA
INPUT RIPPLE CURRENT	0 TO 2 MHz	—	25	50	—	25	50	—	25	50	mA p-p
EFFICIENCY		75	81	—	76	82	—	77	83	—	%

DC/DC CONVERTERS

HR150 SERIES 20 WATT

Electrical Characteristics: 25°C Tc, 28 VDC Vin (12 VDC for 12V models), 100% load, unless otherwise specified.

DUAL OUTPUTS		HR152-2812			HR152-2815			UNITS
PARAMETER	CONDITION	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		±11.88	±12.00	±12.12	±14.85	±15.00	±15.15	VDC
OUTPUT CURRENT		0	—	±625	0	—	±500	mA
OUTPUT POWER		—	—	15	—	—	15	W
OUTPUT RIPPLE	0 TO 1 MHz	—	30	50	—	30	50	mV p-p
INPUT VOLTAGE	CONTINUOUS	18	28	36	18	28	36	VDC
	TRANSIENT 50 ms	—	—	50	—	—	50	V
INPUT CURRENT	NO LOAD	—	—	35	—	—	35	mA
INPUT REFL. RIPPLE	0 TO 2 MHz	—	25	50	—	25	50	mA p-p
EFFICIENCY		75	79	—	75	79	—	%

TRIPLE OUTPUTS			HR153-1212			HR153-1215			HR153-2812			HR153-2815			UNITS
PARAMETER	CONDITION		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	FULL LOAD	MAIN DUAL	4.95 ±11.88	5.00 ±12.00	5.05 ±12.12	4.95 ±14.85	5.00 ±15.00	5.05 ±15.15	4.95 ±11.88	5.00 ±12.00	5.05 ±12.12	4.95 ±14.85	5.00 ±15.00	5.05 ±15.15	VDC
OUTPUT CURRENT		MAIN ¹ DUAL	100 —	— —	2000 ±208	100 —	— —	2000 ±167	100 —	— —	2000 ±208	100 —	— —	2000 ±167	mA
OUTPUT POWER		MAIN ±DUAL TOTAL	— — —	— — —	10 2.5 15	— — —	— — —	10 2.5 15	— — —	— — —	10 2.5 15	— — —	— — —	10 2.5 15	W
OUTPUT RIPPLE	0 TO 1 MHz	MAIN DUAL	— —	40 20	80 40	— —	40 20	80 40	— —	40 20	80 40	— —	40 20	80 40	mV p-p
INPUT VOLTAGE	CONTINUOUS		10	12	16	10	12	16	18	28	36	18	28	36	VDC
	TRANSIENT 50 ms		—	—	25	—	—	25	—	—	50	—	—	50	V
INPUT CURRENT	NO LOAD		—	—	60	—	—	60	—	—	50	—	—	50	mA
INPUT REFL. RIPPLE	0 TO 2 MHz		—	50	100	—	50	100	—	40	80	—	40	80	mA p-p
EFFICIENCY			76	79	—	76	79	—	75	79	—	75	79	—	%

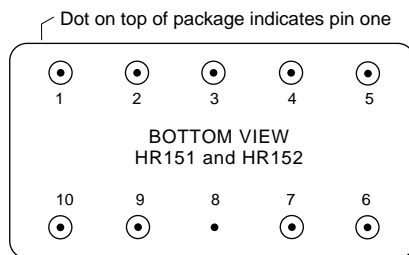
Note 1. Minimum load required for full output capability on auxiliary outputs. Minimum current can be reduced when dual outputs are used at reduced loads.

HR150 SERIES 20 WATT

DC/DC CONVERTERS

PIN OUT

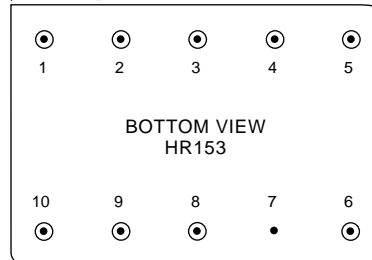
Pin	Single Output	Dual Output	Triple Output
1	Positive Input	Positive Input	Positive Input
2	Inhibit	Inhibit	Main (+5) Output
3	Trim	Positive Output	Output Common
4	Output Common	Output Common	Neg. Aux. Output
5	Positive Output	Negative Output	Pos. Aux. Output
6	No connection	No connection	No connection
7	No connection	No connection	Case Ground
8	Case Ground	Case Ground	Inhibit
9	No connection	No connection	No connection
10	Input Common	Input Common	Input Common



See Section B8, case H6, for dimensions.

FIGURE 1: HR151 AND HR152 PIN OUT

Squared corner and dot on top of package indicate pin one.



See Section B8, case F4, for dimensions.

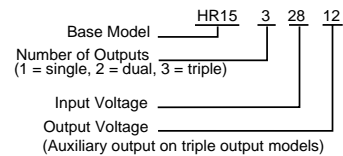
FIGURE 2: HR153 PIN OUT

OUTPUT ADJUSTMENT RESISTOR VALUES FOR HR151-2805

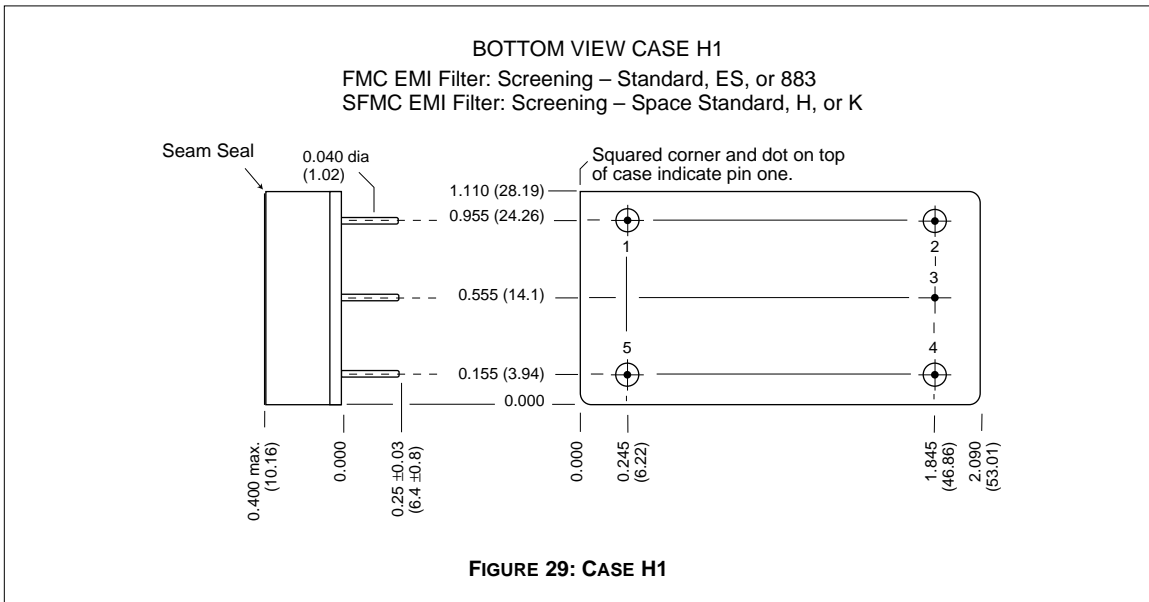
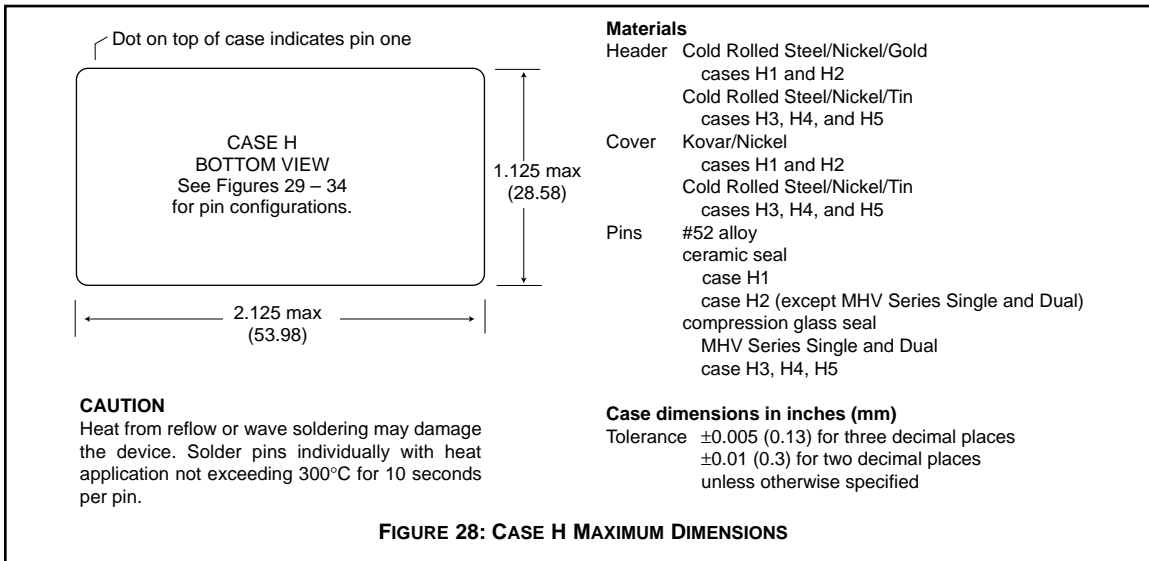
Resistance Pin 3 to 4	Output Voltage Increase (%)
∞	0
390K	+1%
145K	+2%
63K	+3%
22K	+4%
0	+5%

Output Adjustment all HR151 models (single output):
The output can be adjusted upward by using the output adjust (pin3). The resistance between output adjust (pin 3) and output common (pin 4) will determine the magnitude of the increase in the output. **The table above is only applicable to HR151-2805.**

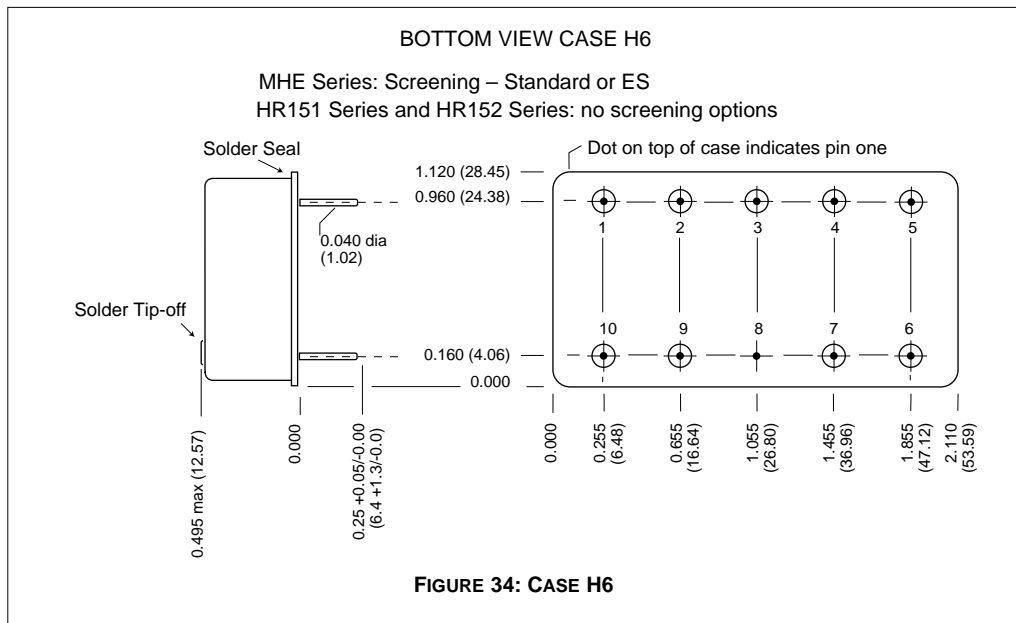
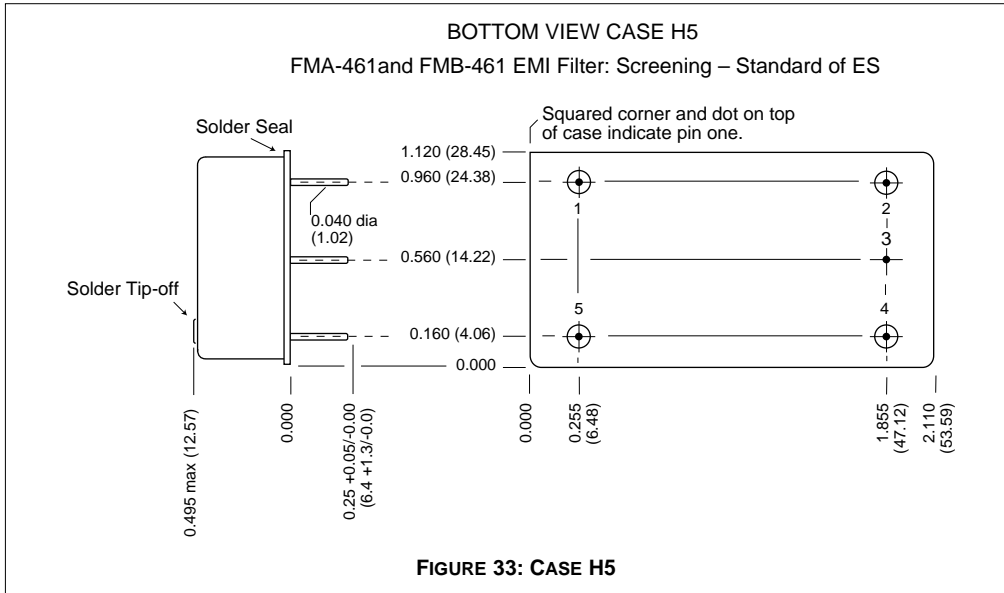
MODEL NUMBERING KEY



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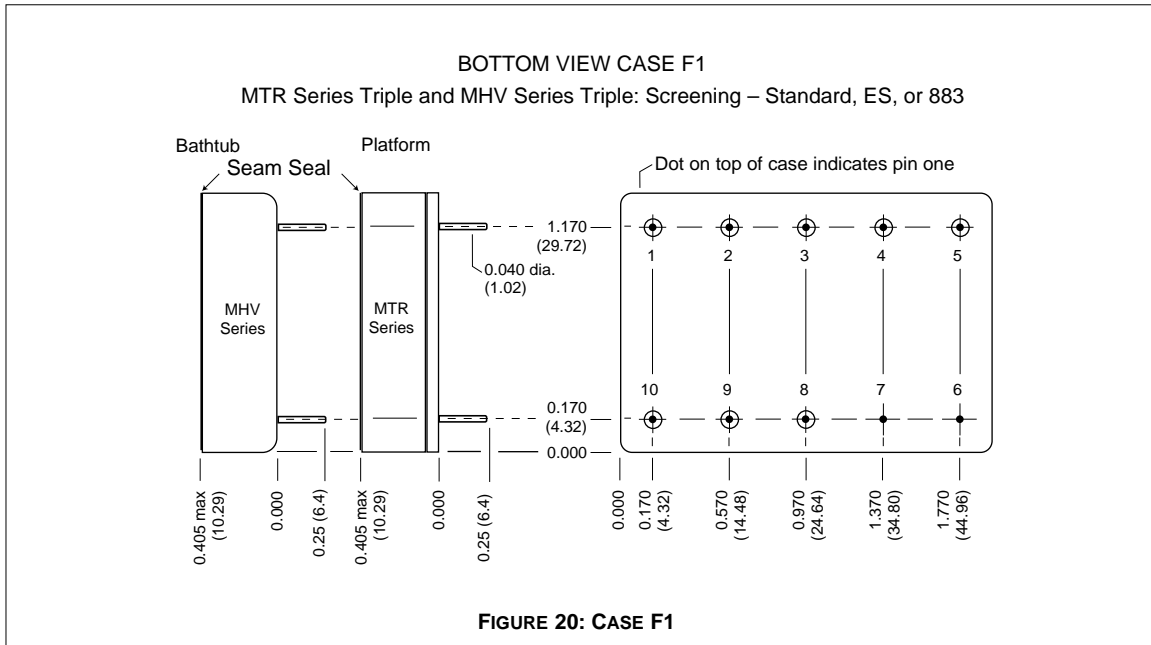
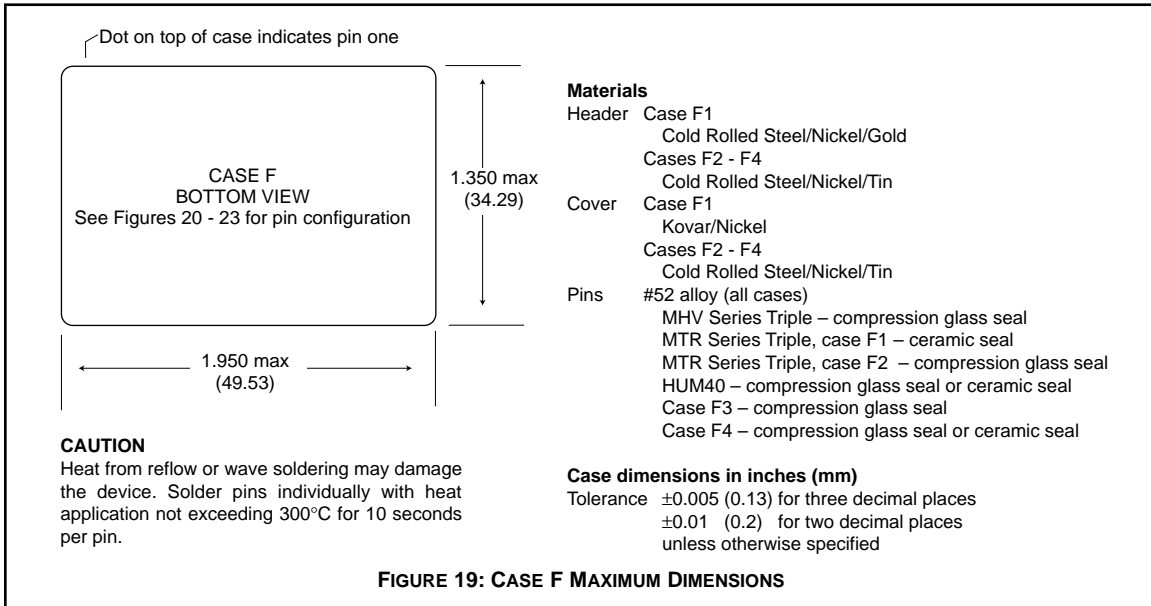


Note: Although every effort has been made to render the case drawings at actual size, variations in the printing process may cause some distortion. Please refer to the numerical dimensions for accuracy.



CASE F

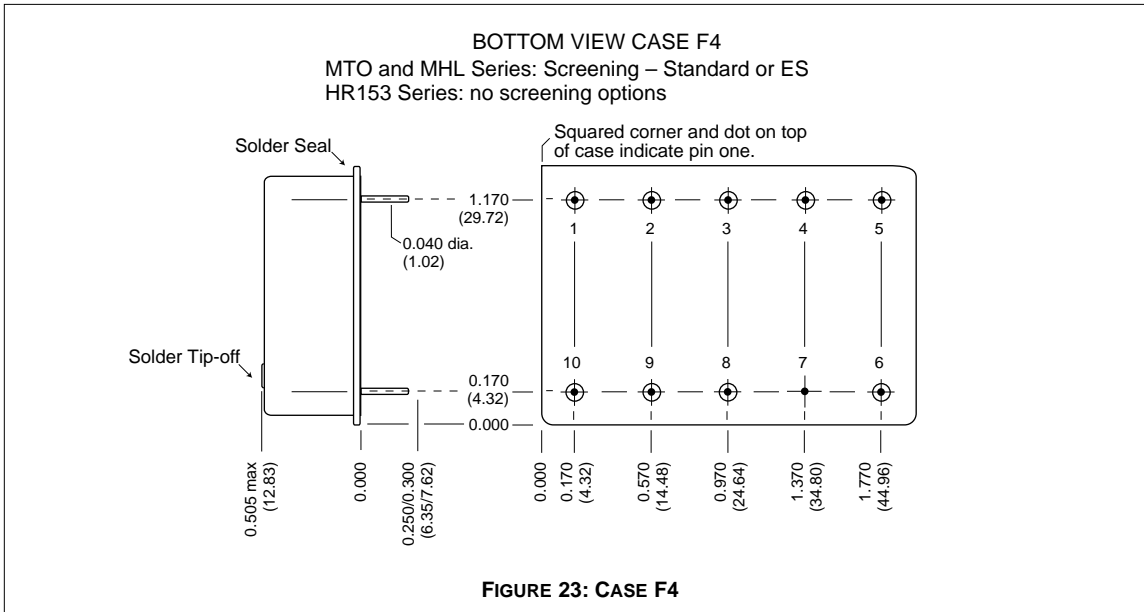
CASES



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.

CASE F

CASES



HR PRODUCTS

TEST (HR products)	STANDARD
PRE-CAP INSPECTION Method 2017	yes
FINAL ELECTRICAL TEST MIL-PRF-38534, Group A Subgroups 1 and 4: +25°C case	yes
HERMETICITY TESTING Gross Leak, Dip (1×10^{-3})	yes
FINAL VISUAL INSPECTION Method 2009	yes

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

Applies to the following products:

HR700 Series
HR300 Series
HR150 Series
HR120 Series
HR40 Series