REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED

REV																				
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REV STATUS OF SHEETS															
	REV														
	SHEET	1	2	3	4	5	6	7	8	9	10	11			

PMIC N/A

STANDARD MICROCIRCUIT DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

PREPARED BY
Gary Zahn

CHECKED BY
Michael C. Jones

APPROVED BY
Ray Monnin

DRAWING APPROVAL DATE
99-10-20

REVISION LEVEL

DEFENSE SUPPLY CENTER COLUMBUS
P. O. BOX 3990
COLUMBUS, OHIO 43216-5000

MICROCIRCUIT, HYBRID, LINEAR, ±15 VOLT, DUAL CHANNEL, DC/DC CONVERTER

SIZE	CAGE CODE	
A	**67268**	**5962-98527**

SHEET 1 OF 11

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

1. SCOPE

1.1 Scope. This drawing documents five product assurance classes, class D (lowest reliability), class E, (exceptions), class G (lowest high reliability), class H (high reliability), and class K, (highest reliability) and a choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of radiation hardness assurance levels are reflected in the PIN.

1.2 PIN. The PIN shall be as shown in the following example:

5962	-	98527	01	H	X	A
Federal stock class designator	RHA designator (see 1.2.1)		Device type (see 1.2.2)	Device class designator (see 1.2.3)	Case outline (see 1.2.4)	Lead finish (see 1.2.5)
Drawing number						

1.2.1 Radiation hardness assurance (RHA) designator. Device classes H and K RHA marked devices shall meet the MIL-PRF-38534 specified RHA levels and shall be marked with the appropriate RHA designator. A dash (-) indicates a non-RHA device.

1.2.2 Device type(s). The device type(s) shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	MHV2815D/883, MHV2815DF/883	DC-DC converter, 15 W, ±15 V outputs

1.2.3 Device class designator. This device class designator shall be a single letter identifying the product assurance level as follows:

Device class	Device requirements documentation
D, E, G, H or K	Certification and qualification to MIL-PRF-38534

1.2.4 Case outline(s). The case outline(s) shall be as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
X	See figure 1	10	Dual-in-line
Z	See figure 1	10	Flanged package

1.2.5 Lead finish. The lead finish shall be as specified in MIL-PRF-38534.

1.3 Absolute maximum ratings. 1/

Input voltage range	-0.5 V dc to +50 V dc
Power dissipation (P_D)	10 W
Output power 2/	15.3 W
Lead temperature (soldering, 10 seconds)	+300°C
Storage temperature range	-65°C to +150°C

1/ Stresses above the absolute maximum ratings may cause permanent damage to the device, except for input voltage transients up to 60 V for no more than 120 milliseconds. Extended operation at the maximum levels may degrade performance and affect reliability.

2/ Derate output power linearly above case temperature (T_C) of +125°C to 0 W at +130°C.

1.4 Recommended operating conditions.

Input voltage range	+16 V dc to +50 V dc
Case operating temperature range (T_C)	-55° C to +125° C

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

SPECIFICATION

DEPARTMENT OF DEFENSE

MIL-PRF-38534 - Hybrid Microcircuits, General Specification for.

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-883 - Test Method Standard Microcircuits.
MIL-STD-973 - Configuration Management.
MIL-STD-1835 - Interface Standard For Microcircuit Case Outlines.

HANDBOOKS

DEPARTMENT OF DEFENSE

MIL-HDBK-103 - List of Standard Microcircuit Drawings (SMD's).
MIL-HDBK-780 - Standard Microcircuit Drawings.

(Unless otherwise indicated, copies of the specification, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Item requirements. The individual item performance requirements for device classes D, E, G, H, and K shall be in accordance with MIL-PRF-38534. Compliance with MIL-PRF-38534 may include the performance of all tests herein or as designated in the device manufacturer's Quality Management (QM) plan or as designated for applicable device class. Therefore, the tests and inspections herein may not be performed for applicable device class (see MIL-PRF-38534). Futhermore, the manufacturers may take exceptions or use alternate methods to the tests and inspections herein and not perform them. However, the performance requirements as defined in MIL-PRF-38534 shall be met for the applicable device class. The modification in the QM plan shall not affect the form, fit, or function as described herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38534 and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.4 herein and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full specified operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table I.

3.5 Marking of device(s). Marking of device(s) shall be in accordance with MIL-PRF-38534. The device shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's vendor similar PIN may also be marked as listed in MIL-HDBK-103 and QML-38534.

3.6 Data. In addition to the general performance requirements of MIL-PRF-38534, the manufacturer of the device described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, for each device type listed herein. Also, the data should include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DSCC-VA) upon request.

3.7 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to supply to this drawing. The certificate of compliance (original copy) submitted to DSCC-VA shall affirm that the manufacturer's product meets the performance requirements of MIL-PRF-38534 and herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38534 shall be provided with each lot of microcircuits delivered to this drawing.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38534 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

4.2 Screening. Screening shall be in accordance with MIL-PRF-38534. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

   (1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

   (2) T_C as specified in accordance with table I of method 1015 of MIL-STD-883.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T_C ≤ +125°C V_{IN} = 28 V dc ±0.5 V no external sync, C_L = 0 unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output voltage (±V_{OUT})	V_{OUT}	±I_{OUT} = 500 mA	1	01	14.85	15.15	V dc
			2, 3		14.70	15.30	
Output current	I_{OUT}	V_{IN} = 16 V dc, 28 V dc, and 50 V dc	1, 2, 3	01	0.0	±500	mA
Output ripple voltage 1/ (±V_{OUT})	V_{RIP}	±I_{OUT} = 500 mA, B.W. = 10 kHz to 2 MHz	1	01		40	mV p-p
			2, 3			100	
Line regulation (±V_{OUT})	VR_{LINE}	±I_{OUT} = 500 mA, V_{IN} = 16 V dc to 50 V dc	1, 2, 3	01		25	mV
Load regulation (±V_{OUT})	VR_{LOAD}	±I_{OUT} = 0 to 500 mA, both outputs changed simultaneously	1	01		25	mV
			2, 3			30	
Input current	I_{IN}	±I_{OUT} = 0, Inhibit (pin 2) = 0 V dc, (tied to pin 10)	1, 2, 3	01		10	mA
		±I_{OUT} = 0, Inhibit (pin 2) open				50	
Input ripple current	I_{RIP}	±I_{OUT} = 500 mA, L_{IN} = 5.5 µH, B.W. = 10 kHz to 10 MHz	1	01		40	mA p-p
			2, 3			200	
Efficiency	Eff	±I_{OUT} = 500 mA	1	01	80		%
			2, 3		78		
Isolation	ISO	Input to output or any pin to case (except pins 6, 7, or 8) at 500 V dc, T_C = +25°C	1	01	100		MΩ
Capacitive load 2/ 3/ (±V_{OUT})	C_L	No effect on dc performance, T_C = +25°C	4	01		100	µF
Power dissipation	P_D	Short circuit on each output individually: $P_D = P_{IN}$ - total P_{OUT}	1	01		9	W
			2, 3			10	
Switching frequency 4/	F_S	±I_{OUT} = 500 mA	4	01	260	340	kHz
			5, 6		245	355	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T_C ≤ +125°C V_{IN} = 28 V dc ±0.5 V no external sync, C_L = 0 unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
External sync range 3/ 4/	F_{SYNC}	±I_{OUT} = 500 mA, TTL level to pin 9	4, 5, 6	01	490	710	kHz
Output response to step load transient 5/	VO_{TLOAD}	50 percent load to/from 100 percent load; balanced loads on each output	4	01	-250	+250	mV pk
			5, 6		-500	+500	
Recovery time from step load transient 5/ 6/	TT_{LOAD}	50 percent load to/from 100 percent load; balanced loads on each output	4	01		800	µs
			5, 6			1500	
Output response to step line transient 3/ 7/	VO_{TLINE}	Input step 16 V dc to/from 50 V dc, ±I_{OUT} = 500 mA	4, 5, 6	01	-500	+500	mV pk
Recovery time from step line transient 3/ 6/ 7/	TT_{LINE}	Input step 16 V dc to/from 50 V dc, ±I_{OUT} = 500 mA	4, 5, 6	01		3	ms
Start up overshoot 3/ (±V_{OUT})	$Vton_{OS}$	±I_{OUT} = 500 mA, V_{IN} = 0 to 28 V dc	4	01		100	mV pk
			5, 6			300	
Start up delay (+V_{OUT}) 8/	Ton_D	+I_{OUT} = 500 mA, V_{IN} = 0 to 28 V dc	4	01		20	ms
			5, 6			22	
(-V_{OUT})		-I_{OUT} = 500 mA, V_{IN} = 0 to 28 V dc	4	01		28	
			5, 6			30	
Load fault recovery 3/ 6/ (±V_{OUT})	Tr_{LF}	±I_{OUT} = from S.C. to 500 mA	4, 5, 6	01		30	ms

1/ Bandwidth guaranteed by design. Tested for 10 kHz to 2 MHz.

2/ Capacitive load may be any value from 0 to the maximum limit without compromising dc performance.

3/ Parameter shall be tested as part of design characterization and after design or process changes; thereafter, the parameter shall be guaranteed to the limits specified in table I.

4/ A TTL level waveform (V_{IH} = 4.5 V minimum, V_{IL} = 0.8 V maximum) with a 50% ±10% duty cycle applied to the sync input pin (pin 9) within the sync range frequency shall cause the converter's switching frequency to become synchronous with one-half the frequency applied to the sync input pin (pin 9).

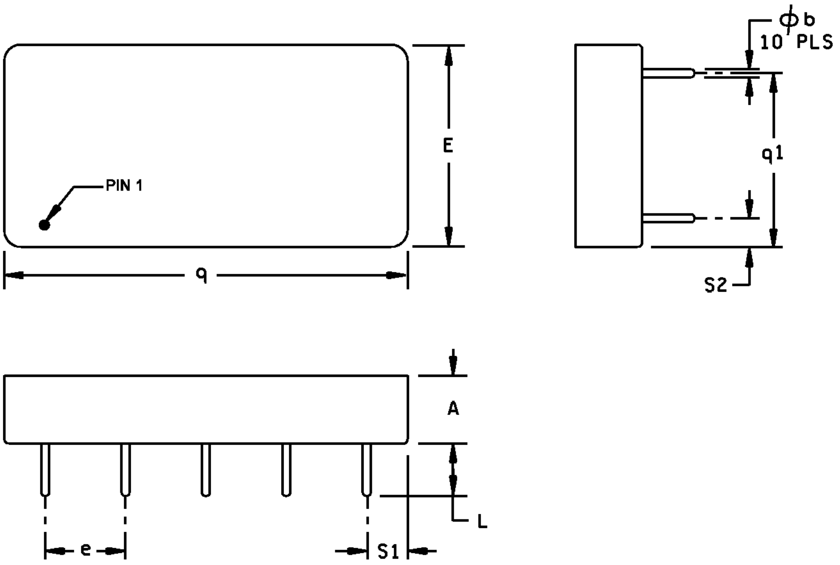
5/ Load step transition time greater than10 µs.

6/ Recovery time is measured from the initiation of the transient to where ±V_{OUT} has returned to within ±1 percent of ±V_{OUT} final value.

7/ Input step transition time greater than 10 µs.

8/ Start up delay time measurement is either for a step application of power at the input or the removal of a ground signal from the inhibit pin (pin 2) while power is applied to the input.

Case outline X.



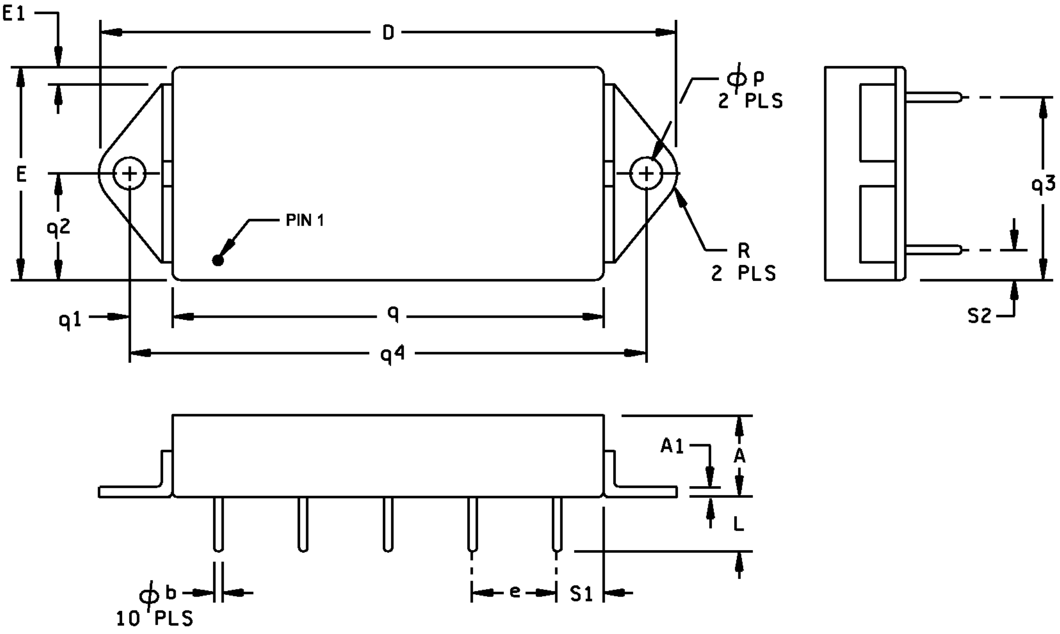
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A		10.16		0.400
øb	0.97	1.07	0.038	0.042
e	10.16 BSC		0.400 BSC	
E		28.45		1.120
L	6.22	6.48	0.245	0.255
q		53.34		2.100
q1	20.32 BSC		0.800 BSC	
S1	6.48 BSC		0.245 BSC	
S2	4.19 BSC		0.165 BSC	

NOTES:

1. Pins 6, 7, and 8 are connected directly to the metal base to form an electrical case ground. Each pin (1, 2, 3, 4, 5, 9, and 10) is insulated from the metal base by a glass bead.
2. The U. S. preferred system of measurement is the metric SI. This case outline was originally designed using inch-pound units of measurement, in the event of conflict between the metric and inch-pound units, the inch-pound shall take precedence.
3. Device weight - 50 grams maximum.

FIGURE 1. Case outline(s).

Case outline Z.



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A		10.16		0.400
A1	1.40	1.65	0.055	0.065
øb	0.97	1.07	0.038	0.042
D		74.04		2.915
e	10.16 BSC		0.400 BSC	
E		28.45		1.120
E1		1.91		0.075
L	6.22	6.48	0.245	0.255
øp	4.06	4.17	0.160	0.164
q		53.34		2.100
q1	5.84 BSC		0.230 BSC	
q2	14.10 BSC		0.555 BSC	
q3	24.26 BSC		0.955 BSC	
q4	64.52	65.02	2.540	2.560
R	4.19	4.44	0.165	0.175
S1	6.22 BSC		0.245 BSC	
S2	3.94 BSC		0.155 BSC	

NOTES:

1. Pins 6, 7, and 8 are connected directly to the metal base to form an electrical case ground. Each pin (1, 2, 3, 4, 5, 9, and 10) is insulated from the metal base by a glass bead.
2. The U. S. preferred system of measurement is the metric SI. This case outline was originally designed using inch-pound units of measurement, in the event of conflict between the metric and inch-pound units, the inch-pound shall take precedence.
3. Device weight: 55 grams maximum.

FIGURE 1. Case outline(s) - Continued.

STANDARD MICROCIRCUIT DRAWING DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43216-5000	SIZE **A**		**5962-98527**
		REVISION LEVEL	SHEET 8

Device type	01
Case outline	X and Z
Terminal number	Terminal symbol
1	Input
2	Inhibit
3	Positive output
4	Output common
5	Negative output
6	Case ground
7	Case ground
8	Case ground
9	Sync input
10	Input common

FIGURE 2. Terminal connections.

TABLE II. Electrical test requirements.

MIL-PRF-38534 test requirements	Subgroups (in accordance with MIL-PRF-38534, group A test table)
Interim electrical parameters	-----
Final electrical parameters	1*, 2, 3, 4, 5, 6
Group A test requirements	1, 2, 3, 4, 5, 6
Group C end-point electrical parameters	1
End-point electrical parameters for radiation hardness assurance (RHA) devices	Not applicable

* PDA applies to subgroup 1.

4.3 Conformance and periodic inspections. Conformance inspection (CI) and periodic inspection (PI) shall be in accordance with MIL-PRF-38534 and as specified herein.

4.3.1 Group A inspection (CI). Group A inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. Tests shall be as specified in table II herein.

b. Subgroups 7, 8, 9, 10, and 11 shall be omitted.

4.3.2 Group B inspection (PI). Group B inspection shall be in accordance with MIL-PRF-38534.

4.3.3 Group C inspection (PI). Group C inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005 of MIL-STD-883.

(2) T_C as specified in accordance with table I of method 1005 of MIL-STD-883.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.3.4 Group D inspection (PI). Group D inspection shall be in accordance with MIL-PRF-38534.

4.3.5 Radiation hardness assurance (RHA) insepction. RHA inspection is currently not applicable to this drawing.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38534.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-973 using DD Form 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform Defense Supply Center Columbus when a system application requires configuration control and the applicable SMD. DSCC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronic devices (FSC 5962) should contact DSCC-VA, telephone (614) 692-0544.

6.5 Comments. Comments on this drawing should be directed to DSCC-VA, P. O. Box 3990, Columbus, Ohio 43216-5000, or telephone (614) 692-0512.

6.6 Sources of supply. Sources of supply are listed in MIL-HDBK-103 and QML-38534. The vendors listed in MIL-HDBK-103 and QML-38534 have submitted a certificate of compliance (see 3.7 herein) to DSCC-VA and have agreed to this drawing.

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 99-10-20

Approved sources of supply for SMD 5962-98527 are listed below for immediate acquisition only and shall be added to MIL-HDBK-103 and QML-38534 during the next revision. MIL-HDBK-103 and QML-38534 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DSCC-VA. This bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38534.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/
5962-9852701HXA 5962-9852701HXC	50821 50821	MHV2815D/883 MHV2815D/883
5962-9852701HZA 5962-9852701HZC	50821 50821	MHV2815DF/883 MHV2815DF/883

1/ The lead finish shown for each PIN, representing a hermetic package, is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the Vendor to determine availability.

2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number	Vendor name and address
50821	Interpoint Corporation 10301 Willows Road Redmond, WA 98073-9705