REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add case outlines 4, 5, and 6. Add paragraphs and tables for RHA devices. gc	12-04-02	Charles F. Saffle

REV																				
SHEET																				
REV	A	A	A	A																
SHEET	15	16	17	18																

REV STATUS	REV	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
OF SHEETS	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	

PMIC N/A

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DRAWING APPROVAL DATE
10-08-29

REVISION LEVEL
A

DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990
http://www.landandmaritime.dla.mil

STANDARD MICROCIRCUIT DRAWING

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

AMSC N/A

MICROCIRCUIT, HYBRID, LINEAR, POSITIVE, ULTRA LOW DROPOUT, ADJUSTABLE AND FIXED OUTPUT, VOLTAGE REGULATOR

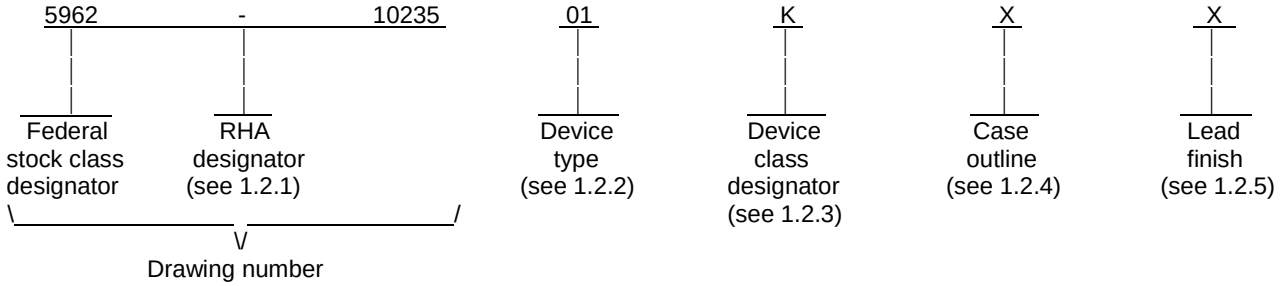
SIZE	CAGE CODE	
A	**67268**	**5962-10235**

SHEET 1 OF 18

1. SCOPE

1.1 Scope. This drawing documents five product assurance classes as defined in paragraph 1.2.3 and MIL-PRF-38534. A choice of case outlines and lead finishes which 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:



1.2.1 Radiation hardness assurance (RHA) designator. 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) identify the circuit function as follows:

Device type	Generic number	Circuit function
01	IRUH3301A1	3.3 V Input, Adjustable Output (0.8 V min)
02	IRUH3301A2	5.0 V Input, Adjustable Output (0.8 V min)
03	IRUH330118	3.3 V Input, 1.8 V Fixed Output
04	IRUH330125	3.3 V Input, 2.5 V Fixed Output
05	IRUH330133	5.0 V Input, 3.3 V Fixed Output

1.2.3 Device class designator. This device class designator shall be a single letter identifying the product assurance level. All levels are defined by the requirements of MIL-PRF-38534 and require QML Certification as well as qualification (Class H, K, and E) or QML Listing (Class G and D). The product assurance levels are as follows:

Device class	Device performance documentation
K	Highest reliability class available. This level is intended for use in space applications.
H	Standard military quality class level. This level is intended for use in applications where non-space high reliability devices are required.
G	Reduced testing version of the standard military quality class. This level uses the Class H screening and In-Process Inspections with a possible limited temperature range, manufacturer specified incoming flow, and the manufacturer guarantees (but may not test) periodic and conformance inspections (Group A, B, C, and D).
E	Designates devices which are based upon one of the other classes (K, H, or G) with exception(s) taken to the requirements of that class. These exception(s) must be specified in the device acquisition document; therefore the acquisition document should be reviewed to ensure that the exception(s) taken will not adversely affect system performance.
D	Manufacturer specified quality class. Quality level is defined by the manufacturers internal, QML certified flow. This product may have a limited temperature range.

1.2.4 Case outlines. The case outlines are as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
X	See figure 1	8	Flat pack with gull wing leads, glass sealed
Y	See figure 1	8	Flat pack with straight leads, glass sealed
4	See figure 1	5	MO-078 with straight leads, glass sealed
5	See figure 1	5	MO-078 with leads bent down, glass sealed
6	See figure 1	5	MO-078 with leads bent up, glass sealed

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

1.3 Absolute maximum ratings. 1/

Supply voltage (V_{CC})	0 V dc to +8.0 V dc
Output current (I_{OUT})	3 A
Junction temperature (T_J)	+150°C
Power Stage Thermal Resistance($R\theta_{J-C}$)	1°C/W
Storage temperature	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C

1.4 Recommended operating conditions.

Supply voltage range (V_{CC})	
Device types 01, 03, 04	+2.97 V dc to +3.8 V dc
Device types 02, 05	+3.8 V dc to +5.8 V dc
Case operating temperature range (T_C)	-55°C to +125°C

1.5 Radiation features.

Maximum total dose available (dose rate = 50 - 300 rads(Si)/s)	300 krads (Si)
Maximum total dose available (dose rate ≤ 10 mrads(Si)/s) LDR:	100 krads(Si) 2/
Neutron Irradiation (1 MeV equivalent neutrons)	≥ 1.0 X 10^{11} (n/cm^2) 3/
Single event phenomenon (SEP) effective linear energy threshold (LET):	
SEL, SEFI	≥84 MeV-cm^2/mg 4/

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 cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATION

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

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 - Test Method Standard Microcircuits.
MIL-STD-1835 - Interface Standard for Electronic Component Case Outlines.

1/ Stresses above the absolute maximum ratings may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.
2/ The devices have been tested for Enhanced Low Dose Rate Sensitivity (ELDRS) in accordance with method 1019 paragraph 3.13.1.1 of MIL-STD-883 initial qualification. No ELDRS was observed. The devices will be re-tested after design or process changes that can affect RHA response of these devices.
3/ The measured neutrons to gamma ratio for the Fast Neutron, Irradiator facility at UMass, Lowell is 3.69 X 10^9 n/cm^2 per rad(Si).
4/ Single event performance is tested with minor transients only; no dropouts, shutdowns, latch up or burn out.

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-103 - List of Standard Microcircuit Drawings.
MIL-HDBK-780 - Standard Microcircuit Drawings.

(Copies of these documents are available online at https://assist.daps.dla.mil/quicksearch/ or 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 the applicable device class. The manufacturer may eliminate, modify or optimize the tests and inspections herein, however the performance requirements as defined in MIL-PRF-38534 shall be met for the applicable device class. In addition, the modification in the QM plan shall not affect the form, fit, or function of the device for the applicable device class.

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 outlines. The case outlines 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.

3.2.3 Radiation exposure circuit. The radiation exposure circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing and acquiring activity upon request.

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 defined in table I.

3.5 Marking of devices. Marking of devices 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.

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 (DLA Land and Maritime -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 DLA Land and Maritime -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. VERIFICATION

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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Reference voltage (Measured at Adjust Pin) 2/	V_{REF}	$2.97\ V \le V_{IN} \le 3.8\ V$ $50\ mA \le I_{OUT} \le 3.0\ A$ $T_C = 25°C$	1	01	0.788	0.812	V
			2, 3		0.776	0.824	
		F 3/	1		0.772	0.816	
	V_{REF}	$3.8\ V \le V_{IN} \le 5.5\ V$ $50\ mA \le I_{OUT} \le 3.0\ A$ $T_C = 25°C$	1	02	0.788	0.812	V
			2, 3		0.776	0.824	
		F 3/	1		0.772	0.816	
Output Voltage	V_{OUT}	$2.97\ V \le V_{IN} \le 3.8\ V$ $50\ mA \le I_{OUT} \le 3.0\ A$ $T_C = 25°C$	1	03	1.773	1.827	V
			2, 3		1.746	1.854	
		F 3/	1		1.737	1.836	
		$2.97\ V \le V_{IN} \le 3.8\ V$ $50\ mA \le I_{OUT} \le 3.0\ A$ $T_C = 25°C$	1	04	2.463	2.538	
			2,3		2.425	2.575	
		F 3/	1		2.412	2.550	
		$3.8\ V \le V_{IN} \le 5.8\ V$ $50\ mA \le I_{OUT} \le 3.0\ A$ $T_C = 25°C$	1	05	3.250	3.349	
			2, 3		3.201	3.399	
		F 3/	1		3.184	3.366	
Dropout voltage	V_{DROP}	$I_O = 3.0\ A$, V_{IN} lowered until V_{OUT} decreases by 1% 4/	1,2,3	01, 02	0	0.4	V
		F 3/	1				
		$I_O = 3.0\ A$, V_{IN} lowered until V_{OUT} decreases by 1%	123	04,05	0	0.4	
		F 3/	1				
Current limit	I_{LATCH}	$V_{IN} \le 3.3\ V$	1,2,3	01,03, 04	3.5		A
		F 3/	1				
		$V_{IN} \le 5.0\ V$	1,2,3	02, 05			
		F 3/	1				
Maximum Shutdown Temperature 4/	T_{LATCH}		2	All	125		°C
Ripple Rejection 4/	PSRR	$f = 120\ Hz$, $I_O = 50\ mA$	1, 2, 3	All	65		dB

See footnotes at end of table.

TABLE IA. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Shutdown Threshold "Off"	V_{SHDN}	V_{IN} = 3.3 V, Ramp from V_{SHDN}<0.8 V to V_{SHDN} >1.2 V, monitor for a 1% drop below nominal V_{OUT}	1,2,3	01,03, 04	0.8	1.2	V
		F 3/	1				
		V_{IN} = 5.0 V, Ramp from V_{SHDN}<0.8 V to V_{SHDN} >1.2 V, monitor for a 1% drop below nominal V_{OUT}	1,2,3	02,05			
		F 3/	1				
Shutdown Threshold "On"		V_{IN} = 3.3 V, Ramp from V_{SHDN}>1.2 V to V_{SHDN} <0.8 V, monitor for V_{OUT} > 500mV	1,2,3	01,03, 04			
		F 3/	1				
		V_{IN} = 5.0 V, Ramp from V_{SHDN}>1.2 V to V_{SHDN} <0.8 V, monitor for V_{OUT} > 500mV	1,2,3	02,05			
		F 3/	1				
Output Voltage at Shutdown	V_{OUT}	$R_{LOAD} \ge$ 36 Ohms, V_{SHDN} > 1.2 V, V_{IN} 3.3 V	1,2,3	01,03, 04	-0.1	0.1	V
		F 3/	1				
		$R_{LOAD} \ge$ 36 Ohms, V_{SHDN} > 1.2 V, V_{IN} 5.0 V	1,2,3	02,05			
		F 3/	1				
SHDN Pin Leakage Current 4/	I_{SHDN}	V_{SHDN} = 3.3 V	1, 2, 3	All	-10	10	µA
SHDN Pin Pull-Up Current 4/	I_{SHDN}	V_{SHDN} = 0.4 V	1	All	-98	-56	µA
			2, 3		-140	-30	
Quiescent Current 4/	I_Q	No load	1, 2, 3	All		15	mA
		I_O = 3.0 A	1, 2, 3	All		90	

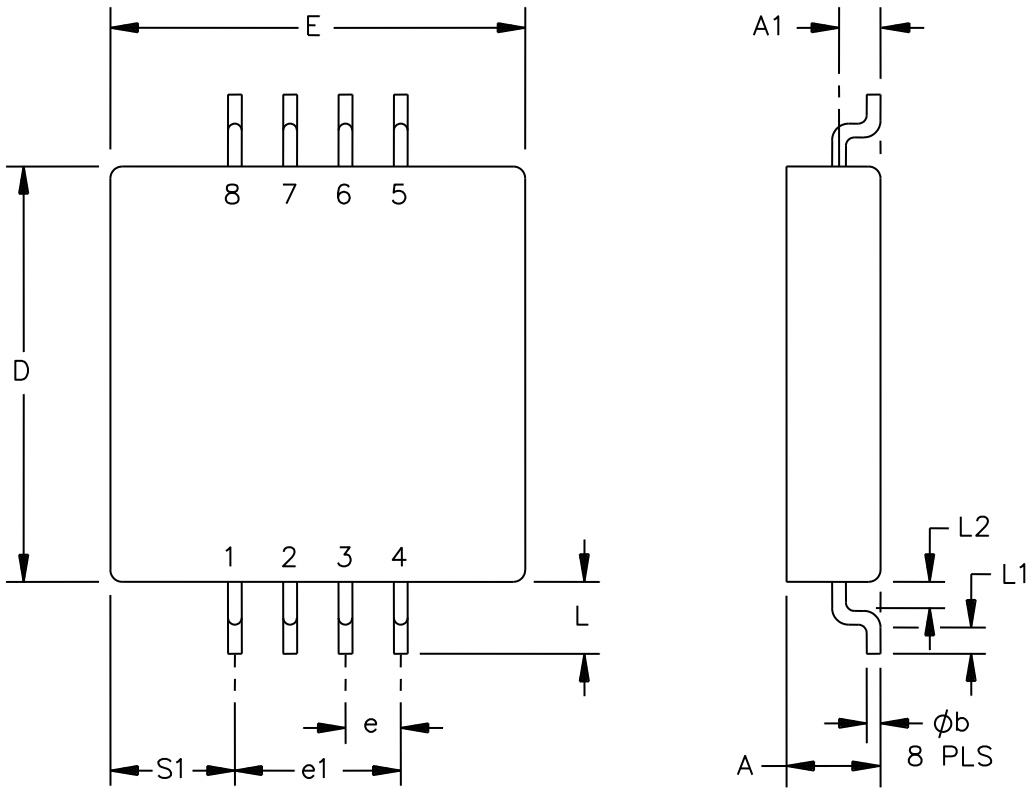
1/ When measured at the junction of the V_{OUT} and Adjust pins for Adjustable (Device Type 01 and 02) or V_{OUT} and Sense pins for Fixed (Device Type 03, 04 and 05).
2/ This parameter tested at a fixed output voltage of Vout=2.5 V using external 1060 Ohm resistor, and test limits of Device type 04.
3/ The device that is supplied to this drawing has been characterized and tested through RHA level F at the initial qualification per the manufacturer's approved RHA program. The RHA testing on the hybrid is only repeated when a change is made as defined by MIL-PRF-38534, Appendix A. The configuration control guidelines of MIL-PRF-38534, Appendix E shall apply. Each active element used in a hybrid manufacturing lot shall be limited to a single wafer and each wafer shall be qualified for RHA at element evaluation to the manufacturer's approved RHA program and MIL-PRF-38534, Appendix G.
4/ Under normal closed-loop operation. Guaranteed by design, but not tested in production or post radiation.

TABLE IB. SEP test limits. 1/

Device types	SEP	Temperature (T_C)	Effective linear energy transfer (LET)
01,02,03,04,05	SEL	+100°C	$\geq$ 84 MeV-cm^2/mg
01,02,03,04,05	SEFI	+100°C	$\geq$ 84 MeV-cm^2/mg

1/ For SEP test conditions, see 4.3.5.1.1.4 herein.

Case outline X.

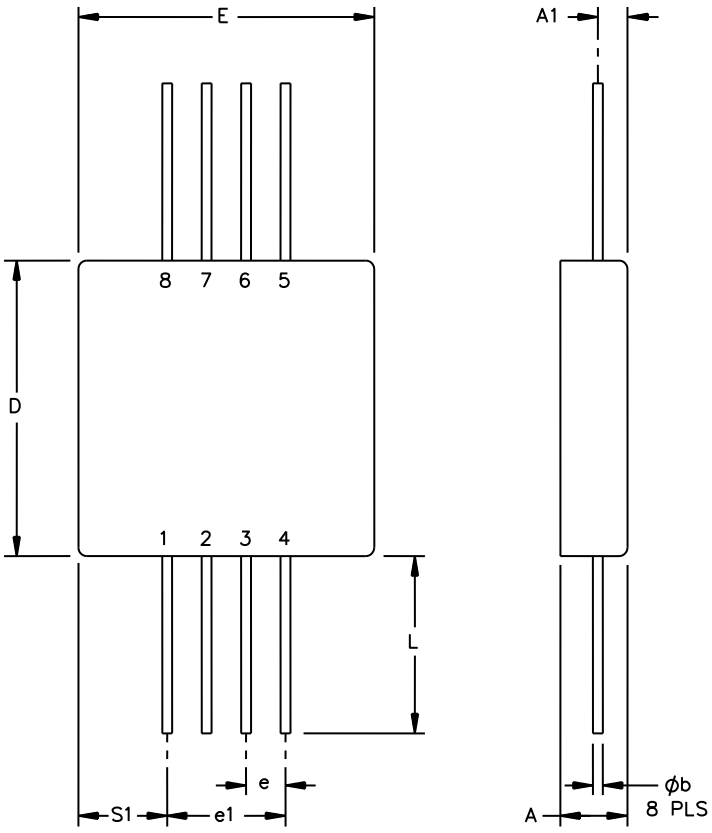


Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	4.191	4.572	.165	.18
A1	1.778	2.032	.07	.08
øb	0.5842	0.6858	.023	.027
D/E	18.923	19.177	.745	.755
e	2.413	2.667	.095	.105
e1	7.493	7.747	.295	.305
L	2.794	3.81	.11	.15
L1/L2	1.016	1.651	.04	.065
S1	5.715 REF		.225 REF	

NOTES:
1. The U. S. Government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall take precedence.
2. The case outline X is a metal hermetically sealed and isolated package.
3 Pin numbers are for reference only.
4. Case outline X weight: 6 grams typical.

FIGURE 1. Case outlines.

Case Outline Y

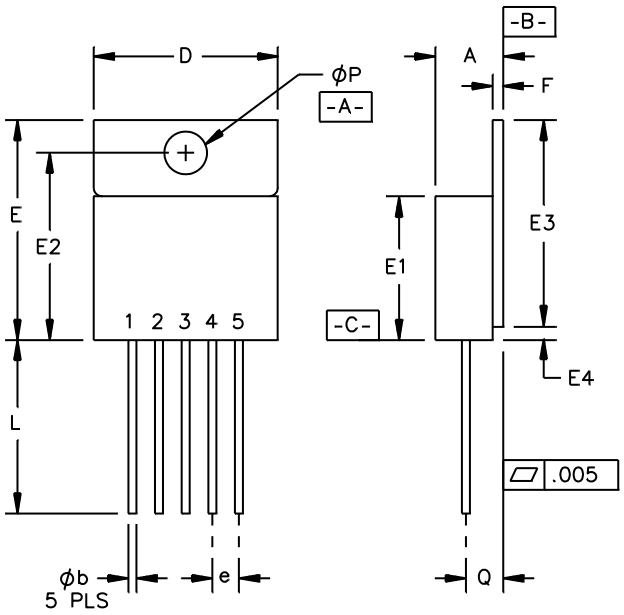


Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	4.191	4.572	.165	.18
A1	1.778	2.032	.07	.08
øb	0.5842	0.6858	.023	.027
D/E	18.923	19.177	.745	.755
e	2.413	2.667	.095	.105
e1	7.493	7.747	.295	.305
L	10.922	11.938	.43	.47
S1	5.715 REF		.225 REF	

NOTES:
1. The U. S. Government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall take precedence.
2. The case outline Y is a metal hermetically sealed and isolated package.
3 Pin numbers are for reference only.
4. Case outline Y weight: 6 grams typical.

FIGURE 1. Case outlines - Continued.

Case Outline 4

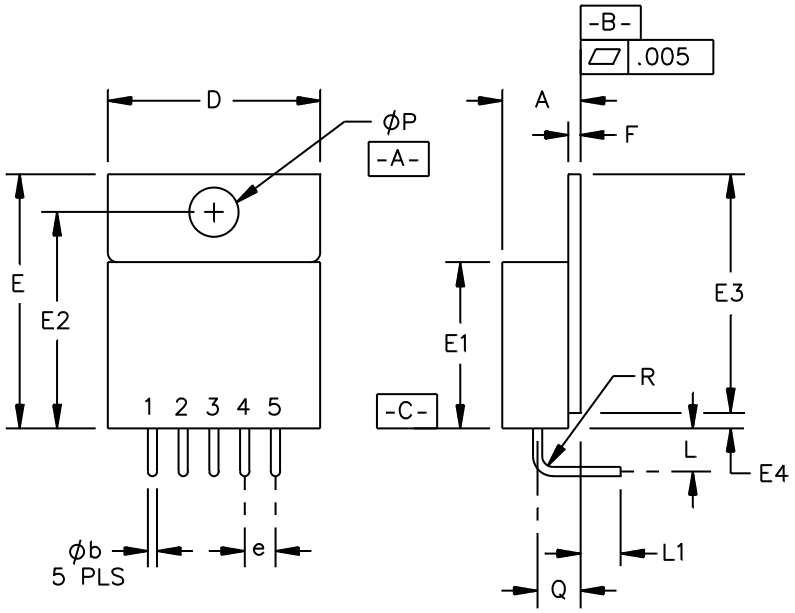


Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	6.096	6.858	.24	.27
øb	0.635	0.889	.025	.035
D	17.399	17.653	.685	.695
e	2.54 TYP		.1 TYP	
E	20.701	21.209	.815	.835
E1	13.462	13.97	.53	.55
E2	17.703	17.958	.697	.707
E3	18.872	19.228	.743	.757
E4	0	2.337	0	.092
F	0.889	1.143	.035	.045
L	12.7	19.05	.5	.75
øP	3.937	4.191	.155	.165
Q	3.556 TYP		.14 TYP	

NOTES:
1. The U. S. Government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall take precedence.
2. The case outline 4 is a metal hermetically sealed and isolated package.
3 Pin numbers are for reference only.
4. Case outline 4 weight: 8 grams typical.

FIGURE 1. Case outlines - Continued.

Case Outline 5

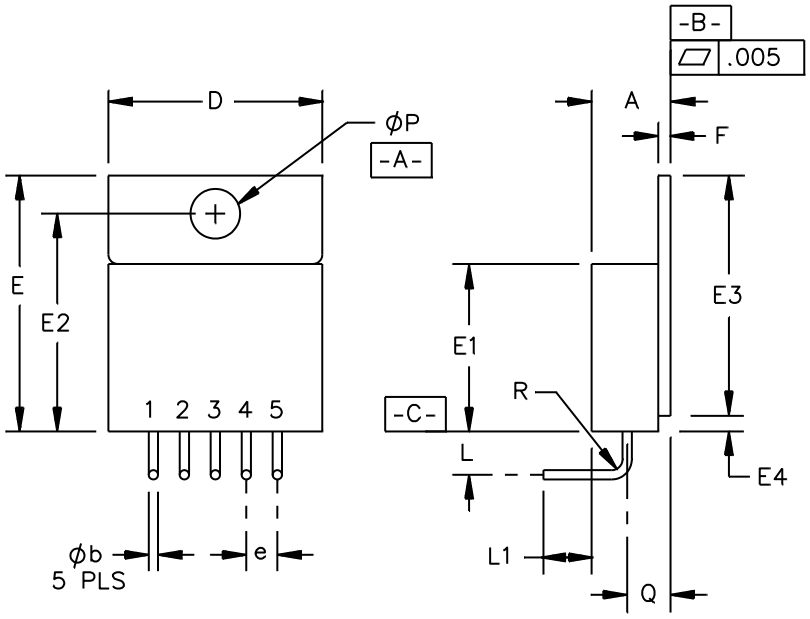


Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	6.096	6.858	.24	.27
øb	0.635	0.889	.025	.035
D	17.399	17.653	.685	.695
e	2.54 TYP		.1 TYP	
E	20.701	21.209	.815	.835
E1	13.462	13.97	0.53	.55
E2	17.703	17.958	.697	.707
E3	18.872	19.228	.743	.757
E4	0	2.337	0	.092
F	0.889	1.143	.035	.045
L	3.302	3.81	.13	.15
L1	3.302		.13	
øP	3.937	4.191	.155	0.165
Q	3.556 TYP		.14 TYP	
R	0.889		.035	

NOTES:
1. The U. S. Government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall take precedence.
2. The case outline 5 is a metal hermetically sealed and isolated package.
3 Pin numbers are for reference only.
4. Case outline 5 weight: 8 grams typical.

FIGURE 1. Case outlines - Continued.

Case Outline 6



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	6.096	6.858	.24	.27
øb	0.635	0.889	.025	.035
D	17.399	17.653	.685	.695
e	2.54 TYP		.1 TYP	
E	20.701	21.209	.815	.835
E1	13.462	13.97	0.53	.55
E2	17.703	17.958	.697	.707
E3	18.872	19.228	.743	.757
E4	0	2.337	0	.092
F	0.889	1.143	.035	.045
L	3.302	3.81	.13	.15
L1	4.064		.16	
øP	3.937	4.191	.155	0.165
Q	3.556 TYP		.14 TYP	
R	0.889		.035	

NOTES:
1. The U. S. Government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall take precedence.
2. The case outline 6 is a metal hermetically sealed and isolated package.
3 Pin numbers are for reference only.
4. Case outline 6 weight: 8 grams typical.

FIGURE 1. Case outlines - Continued.

Device Type	01, 02	03, 04, 05	01, 02	03, 04, 05
Case Outlines	X and Y		4,5, and 6	
Terminal Number	Terminal symbol			
1	GND	GND	V_{IN}	V_{IN}
2	GND	GND	GND	GND
3	Shutdown	Shutdown	V_{OUT}	V_{OUT}
4	Adjust	Sense	Shutdown	Shutdown
5	V_{OUT}	V_{OUT}	Adjust	Sense
6	V_{OUT}	V_{OUT}		
7	V_{IN}	V_{IN}		
8	V_{IN}	V_{IN}		

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	1
Final electrical parameters	1*, 2, 3
Group A test requirements	1, 2, 3
Group C end-point electrical parameters	1, 2, 3
End-point electrical parameters for radiation hardness assurance (RHA) devices	1**

* PDA applies to subgroup 1.
** Only the tests specified per note 3 of table I shall be measured at Post Irradiation.

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 DLA Land and Maritime -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 method 1015 of MIL-STD-883.

(2) T_C = +125°C minimum.

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.

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 4, 5, 6, 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 DLA Land and Maritime -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 method 1005 of MIL-STD-883.

(2) T_A 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). RHA qualification is required only for those devices with the RHA designator as specified herein. See table IIIA and IIIB.

Table IIIA. Radiation Hardness Assurance Methods Table.

RHA method Employed	**Active devices tested only as part of the hybrid device.**	**Testing at 1.5X rated total dose**		**Worst Case Analysis Yes Performed**				**End points after dose is achieved includes minimum maximum, and room temperatures**		**Statistical Confidence is applied to data**	
		Element Level	Hybrid Device Level 1/	Includes temperature effects	Combines temperature and radiation effects	Combines total dose and displacement effects	End-of-life	Element Level	Hybrid device level	Element level	Hybrid device level
	No	Yes	Yes	Yes	No	No	Yes	No	No	Yes	No

1/ Hybrid level testing is performed as a design qualification test and is only repeated if a change is made to the design as defined by MIL-PRF-38534, Appendix E.

Table IIIB. Hybrid level and element level test table.

IR HIREL	Radiation Test								
SMD 5962-10235	Total Dose			Heavy Ion		Proton		Neutron	
Hybrid Level Testing	Low Dose Rate	High Dose Rate (HDR)	ELDRS Characterization	SEU (upset)	SEL (latch-up)	Low Energy	High Energy	SEE (upset)	Displacement Damage (DD)
	X (100 krads)	X (500 krads)	(Y)	(N))	X(84 MeV-cm^2/mg)	(N)	(N)	(N)	X(1.0X10^{11} n/cm$^{2)}$
Element Level Testing									
CMOS Discrete (SOI)	N/A	X (500 krads)	N/A	(N)	(N)	(N)	(N)	(N)	(N)
Bipolar Discrete Devices	(N)	X (500 krads)	(N)	(N)	(N)	(N)	(N)	(N)	(N)

See notes at end of table.

Table IIIB. Hybrid level and element level test table. – Continued.

IR HIREL	Radiation Test		
SMD 5962-10235	Prompt Dose		
Hybrid Level Testing	DRU (upset)	DRL (latch)	Parametric (survive)
	(N)	(N)	(N)
Element Level Testing			
CMOS (SOI)	(N)	(N)	(N)
Bipolar Discrete Devices	(N)	(N)	(N)

NOTES:
X = Radiation Testing Done Level
G = Device Mfr Guaranteed (QML-V or Class S)
(N) = Not yet tested
N/A = Not Applicable
P = Program-Specific testing

4.3.5.1 Radiation Hardness Assurance (RHA) inspection. RHA qualification is required for those devices with the RHA designator as specified herein. End-point electrical parameters for radiation hardness assurance (RHA) devices shall be specified in table II. Radiation testing will be in accordance with the qualifying activity (DLA Land and Maritime -VQ) approved plan and with MIL-PRF-38534, Appendix G.

a. The hybrid device manufacturer shall establish procedures controlling component radiation testing, and shall establish radiation test plans used to implement component lot qualification during procurement. Test plans and test reports shall be filed and controlled in accordance with the manufacturer's configuration management system.

b. The hybrid device manufacturer shall designate a RHA program manager to oversee component lot qualification, and to monitor design changes for continued compliance to RHA requirements.

4.3.5.1.1 Hybrid level qualification.

4.3.5.1.1.1 Qualification by similarity. A family is defined by the family model designator e.g. IRUH3301. All parts with this designator share a common design and use the same active elements. Device type 5962P1023502KXA was tested and all other devices on this SMD are qualified by similarity.

4.3.5.1.1.2 Total ionizing dose irradiation testing. A minimum of one representative hybrid of the hybrid family (family model designator, e.g. IRUH3301) is initially characterized and tested and after any design or process changes which may affect the RHA response of the device type. A minimum of twenty samples are tested at initial qualification and after any design or process changes which may affect the RHA response of the device. Five biased and five unbiased are tested at High Dose Rate (HDR) in accordance with condition A of method 1019 of MIL-STD-883 to 500 krads(Si) by 1.5 times the rated value. Another ten devices were tested at Low Dose Rate (LDR) in accordance with condition D of Method 1019 of MIL-STD-883 to 100 krads(Si). The resulting data was evaluated in accordance with paragraph 3.13.1.1, ELDRS characterization. Testing was completed on two assembly lots that contained two different diffusion lots of CMOS integrated circuits.

4.3.5.1.1.3 Neutron Irradiation testing. A minimum of one representative hybrid of the hybrid family (family model designator, e.g. IRUH3301) is initially characterized and tested and after any design or process changes which may affect the RHA response of the device type. A minimum of ten samples are tested at initial qualification and after any design of process changes which may affect the RHA response of the device. The samples are exposed to a minimum fluence of 1 MeV in accordance with method 1017 of MIL-STD-883 using Fast Neutron Irradiator at The University of Massachusetts Lowell facility. One MeV is equivalent to 1 X 10^{11} neutron/cm^2. The measured neutron to gamma ratio for the Fast Neutron Irradiator facility at UMass, Lowell is 3.69E+9 per rad(Si).

4.3.5.1.1.4 Single event phenomena (SEP). A minimum of one representative hybrid of the hybrid family (family model designator, e.g. IRUH3301) is initially characterized and tested and after any design or process changes which may affect the RHA response of the device type. A sample of eight devices shall be tested in accordance with ASTM F1192 using the Cyclotron Institute at Texas A&M. Test conditions for SEP are as follows:

a. The ion beam angle of incidence shall be normal to the die surface. No shadowing of the ion beam due to fixturing is allowed.

b. The fluence shall be $\geq 1x10^6$ particles/cm^2.

c. The flux shall be between 10^2 and 10^5 ions/cm^2/s.

d. The particle range shall be a minimum of 35 micron in silicon.

e. The characterization is performed at input voltage of 6.8 V and 3.8 V with a load of 1.5 A, and at 3.8 V and loads of 2.75 A and .06 A, and the test temperature shall be case temperatures 25°C ±10°C and 100ºC ±10ºC in air.

f. For SEP test limits, see table IB herein.

4.3.5.1.2 Component level qualification.

4.3.5.1.2.1 Total Ionizing Dose Irradiation. Every initial wafer of semiconductor components shall be characterized and tested at HDR in accordance with condition A of method 1019 of MIL-STD-883 to 500 krads(Si) to ensure 300 krads (Si) by 1.5 times the rated value. A minimum of twelve die per wafer of CMOS integrated circuits (all biased in the on-state) shall be tested. A minimum of sixteen die per wafer of discrete bipolar transistors (eight biased and eight unbiased) shall be tested.

4.3.5.2 Lot Acceptance. Each active element used in a hybrid manufacturing lot shall be limited to a single wafer, and each wafer shall be qualified for RHA at element evaluation. Each wafer of active elements shall be evaluated for acceptance in accordance with MIL-PRF-38534 and herein.

4.3.5.2.1 Total Ionizing Dose. Every wafer of semiconductor components shall be RLAT (Radiation Lot Acceptance Testing) tested in accordance with condition A of method 1019 of MIL-STD-883 to 500 krads (Si) to ensure 300 krads (Si) by 1.5 times the rated value. 0.9900/90% statistics are applied to the device parameter degradations which are compared against established limits for lot acceptance. A minimum of twelve die per wafer of CMOS integrated circuits (all biased in the on-state) shall be tested. A minimum of sixteen die per wafer of discrete bipolar transistors (eight biased and eight unbiased) shall be tested.

4.3.5.2.2 Technologies not being tested. All active die are tested..

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 as specified in MIL-PRF-38534.

6.4 Record of users. Military and industrial users shall inform DLA Land and Maritime when a system application requires configuration control and the applicable SMD. DLA Land and Maritime 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 DLA Land and Maritime -VA, telephone (614) 692-0544.

6.5 Comments. Comments on this drawing should be directed to DLA Land and Maritime -VA, Columbus, Ohio 43218-3990, or telephone (614) 692-1081.

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 DLA Land and Maritime -VA and have agreed to this drawing.

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 12-04-02

Approved sources of supply for SMD 5962-10235 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38534 during the next revisions. 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 DLA Land and Maritime -VA. This information bulletin is superseded by the next dated revisions of MIL-HDBK-103 and QML-38534. DLA Land and Maritime maintains an online database of all current sources of supply at http://www.landandmaritime.dla.mil/Programs/Smcr/.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/
5962-1023501KXA	3/	IRUH3301A1AK
5962-1023501KYA	3/	IRUH3301A1AKC
5962F1023501KXA	69210	IRUH3301A1AK
5962F1023501KYA	69210	IRUH3301A1AKC
5962F1023501K4A	69210	IRUH3301A1BK
5962F1023501K5A	69210	IRUH3301A1BKA
5962F1023501K6A	69210	IRUH3301A1BKB
5962-1023502KXA	3/	IRUH3301A2AK
5962-1023502KYA	3/	IRUH3301A2AKC
5962F1023502KXA	69210	IRUH3301A2AK
5962F1023502KYA	69210	IRUH3301A2AKC
5962F1023502K4A	69210	IRUH3301A2BK
5962F1023502K5A	69210	IRUH3301A2BKA
5962F1023502K6A	69210	IRUH3301A2BKB
5962-1023503KXA	3/	IRUH330118AK
5962-1023503KYA	3/	IRUH330118AKC
5962F1023503KXA	69210	IRUH330118AK
5962F1023503KYA	69210	IRUH330118AKC
5962F1023503K4A	69210	IRUH330118BK
5962F1023503K5A	69210	IRUH330118BKA
5962F1023503K6A	69210	IRUH330118BKB
5962-1023504KXA	3/	IRUH330125AK
5962-1023504KYA	3/	IRUH330125AKC
5962F1023504KXA	69210	IRUH330125AK
5962F1023504KYA	69210	IRUH330125AKC
5962F1023504K4A	69210	IRUH330125BK
5962F1023504K5A	69210	IRUH330125BKA
5962F1023504K6A	69210	IRUH330125BKB
5962-1023505KXA	3/	IRUH330133AK
5962-1023505KYA	3/	IRUH330133AKC
5962F1023505KXA	69210	IRUH330133AK
5962F1023505KYA	69210	IRUH330133AKC
5962F1023505K4A	69210	IRUH330133BK
5962F1023505K5A	69210	IRUH330133BKA
5962F1023505K6A	69210	IRUH330133BKB

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 its 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.

3/ This device is no longer available from an approved source.

Vendor CAGE number	Vendor name and address
69210	International Rectifier Corporation Hi-Rel Division 205 Crawford Street Leominster, MA 01453