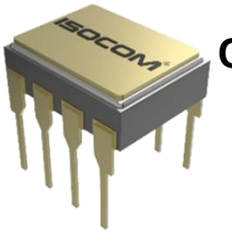
PART NUMBER **CSMR540**

COMPONENT SPECIFICATION **ISSUE 7**



Component Specification
For Hermetically Sealed, Radiation-Hard
Optically Coupled Solid State Relay

Features	Applications
▪ Complies to MIL-STD	▪ Space systems & radiation equipment
▪ High Voltage Isolation 1500 V_{DC}	▪ Military/High Reliability Systems
▪ Output Withstand Voltage 400 V	▪ Medical Instruments
▪ 8-pin DIP package	▪ MOS/CMOS Applications
▪ Low Input Requirements	▪ Logic Interfacing
▪ High Current Ratio	▪ Power Supply

DESCRIPTION

The CSMR540 is a power MOSFET optocoupler housed in an 8-pin dual-in-line hermetic ceramic package, designed for applications where independent switches with radiation-tolerant performance are necessary. With 1500 V_{DC} isolation between input/output isolated relays, the CSMR540 is well-suited for solid-state relay applications. Its performance is rated for the full military temperature range, making it ideal for demanding environments.

Functionally, the CSMR540 acts as (Single Pole Single Throw), normally open (2 Form A) solid-state relay. Each relay is activated by an input current, typically driven by a standard TTL device. The input current biases an AlGaAs emitter that is optically coupled to an integrated diode array, which in turn powers control circuitry to operate the output power MOSFET.

The device is available with screening in accordance with MIL-PRF-38534, Class K/H, or custom screening options or as COTS. The lead options support both through-hole and surface-mount assemblies, with gold-plated leads being standard, though other lead finishes are available.

Key Features:

- **Radiation Tolerant:** While the device contains radiation-hardened components, the specific radiation hardness must be determined through lot-specific testing,
- **High Voltage Isolation:** 1500 V_{DC} isolation between input/output and the relays, ensuring robust performance in high-voltage environments.
- **Versatile Packaging:** Supports both through-hole and surface-mount assembly, with various lead finishes available.

This single MOSFET optocoupler is suitable for military and aerospace applications where high reliability, radiation tolerance, and solid-state relay functionality are required.

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STANDARDS

The following specifications have been complied with in the manufacturing of this product -

Aerospace Compliance Standards

AS9100D & ISO 9001:2015 – Design & Manufacture of Electronic and Optoelectronic Components *(Ref GB15/92780)*

Military Compliance Specifications

MIL-PRF-38534 – General Specification for Hybrid Microcircuits
MIL-PRF-19500 – General Specification for Discrete Semiconductor Devices

Military Compliance Standards

MIL-STD-202 – Test Method Standard Electronic and Electrical Component Parts
MIL-STD-883 – Test Method Standard Microcircuits
MIL-STD-750 – Test Method Standard for Semiconductor Devices

SCREENING INFORMATION

Our products can be screened to MIL-PRF-38534, applying test methods from MIL-STD-883. Please contact us for more information relating to the applicable screening processes.

AMENDMENT RECORD

Issue No.	Date	Description
1	May 2016	First Issue
2	June 2016	Added Switching Test Circuit and Waveform Diagram on page 6
3	May 2017	Amended dimensions for gull wing option #30
4	February 2018	Updated standards section to include AS9100D & ISO 9001:2015
5	January 2021	Updated Quality Management Logos. Removed IECQ Logos.
6	January 2024	Updated formatting
7	August 2024	Updated Format, Updated Description, Updated Functional Diagrams and Switching Diagrams

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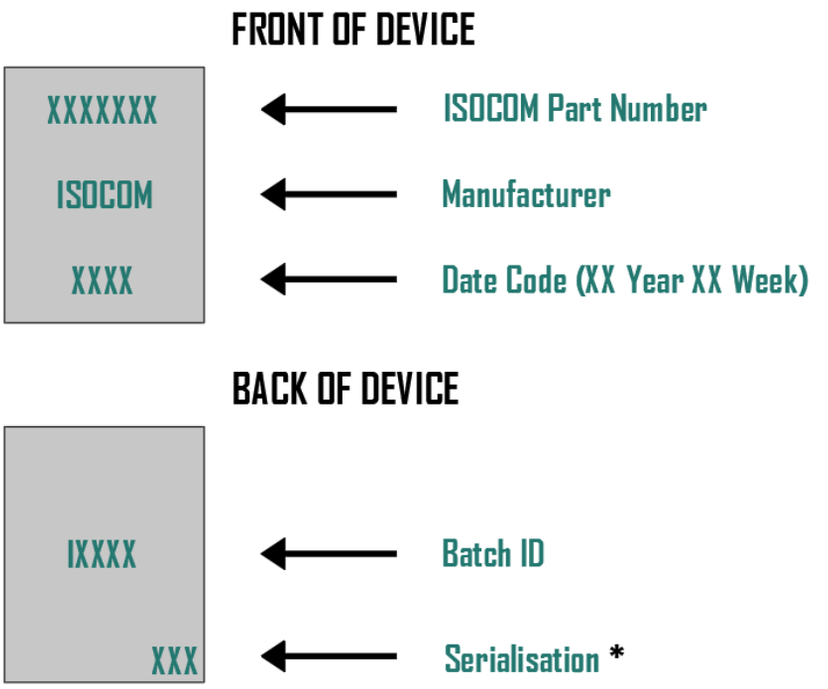
PACKAGE STYLES AND CONFIGURATION OPTIONS

Package	8-Pin DIP
Lead Style	-
Channels	1
Common Channel Wiring	-
Isocom Part Number and Options	
Commercial	CSMR540
Defense Screen Level	CSMR540/L2
Space Screen Level	CSMR540/L2S
Standard Gold Plate Finish	Gold Plate
Solder Dipped	Option #20
Gull Wing	Option #30

DEVICE MARKING



*FOR SPACE SCREENED PARTS ONLY

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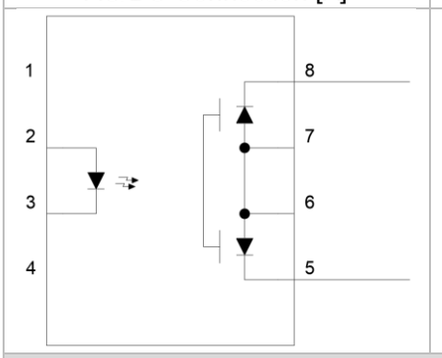
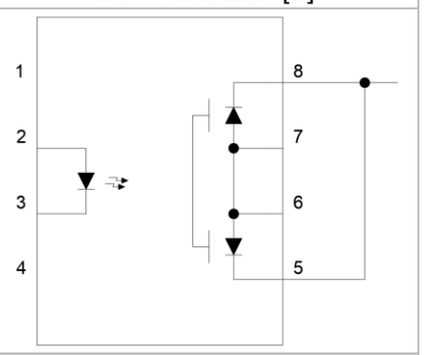
FUNCTIONAL DIAGRAMS

CSMR540	
8 Pin DIP	
AC/DC Connection [A]	DC Connection [B]
	
TRUTH TABLE	
INPUT	**OUTPUT**
LOW	CLOSED
HI	OPEN

PIN OUT INFORMATION

Pin Number	Pin Function
1	N/C
2	LED Anode
3	LED Cathode
4	N/C
5	Drain
6	Common Source
7	Common Source
8	Drain

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ABSOLUTE MAXIMUM RATINGS

T_A = 25°C U.O.S

Storage Temperature	-65°C to +150°C
Operating Temperature	-55°C to +125°C
Lead Soldering Temperature	260°C 1.6mm from case for 10S
Operating Case Temperature (Note1)	+145°C
Input-to-Output Isolation Voltage	⇧1500V_{DC}
Input Diode	
Average Input Current	20mA
Reverse Input Voltage	5V
Peak forward Current	40mA ≤ 10µS
Power Dissipation	100mW
Output Detector	
Input to Output Isolation Voltage	1500V
Average Output Current	
Connection A	0.12A
Connection B	0.24A
Single Shot Output Current	
Connection A	3.0A
Connection B	6.0A
Output Voltage	
Connection A	400V
Connection B	400V
Power Dissipation	500mW

ELECTRICAL CHARACTERISTICS

T_A = 25°C U.O.S

Parameter	Symbol	Test Conditions	Notes	Min	Typ	Max	Units
Forward Voltage	V_F	I_F = 10mA I_F = 5mA		1.0	-	1.7	V
Reverse Voltage	V_R	I_R = 10µA		5.0	-	-	V
Output Withstand Voltage	V_o(off)	I_F = 10mA, I_O = 10µA		400	-	-	V
Output On-Resistance Connection A	R(ON)	I_F = 0mA, I_O = 120mA, (pulse duration ≤ 30ms)	1	-	-	25	Ω
Output On-Resistance Connection B	R(ON)	I_F = 0mA, I_O = 240mA, (pulse duration ≤ 30ms)		-	-	15	Ω
Output Leakage Current	I_O(OFF)	I_F = 10mA, V_O(OFF) = 400V		-	0.2	10	µA
Input to Output Insulation	I_{I-O}	RH ≤ 45%, t = 5s, V_{I-O} = 1500V_{DC}	2 & 3	-	-	1.0	µA
Isolation Voltage	V_{in-out}	T = 5s		1500	-	-	V_{DC}
Turn On Time	t_{ON}	I_F = 0mA, I_O = 120mA		-	0.3	3.0	ms
Turn Off Time	t_{OFF}	I_F = 10mA, I_O = 120mA		-	0.1	1.0	ms

Notes:
1. During the pulsed R(ON) measurement (I_O duration <30ms), ambient (T_A) and case temperature (T_C) are equal.
2. Pins 2 through 3 shorted together and pins 5 through 8 shorted together.
3. This is momentary withstand test, not an operating condition.

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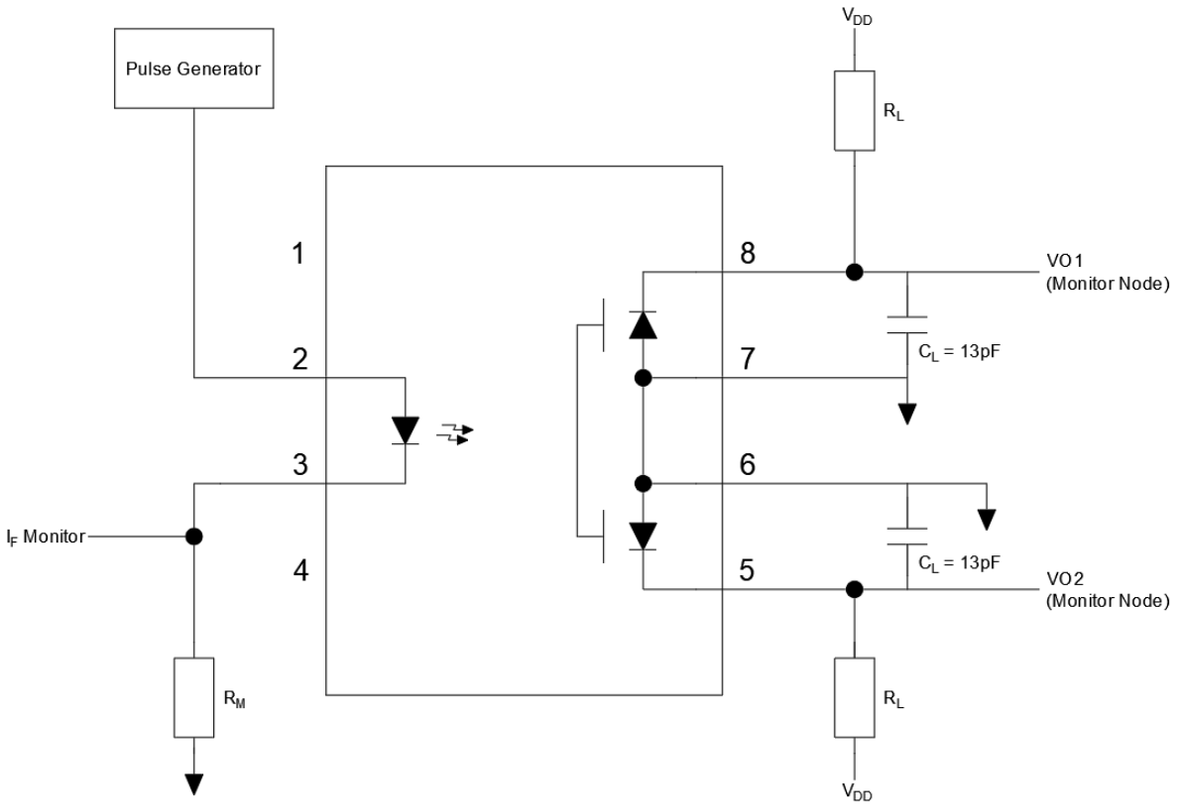
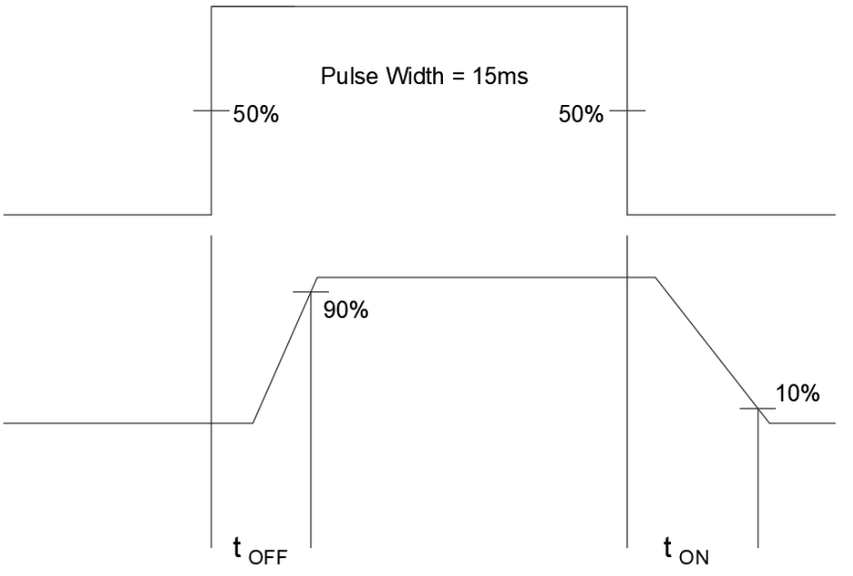
SWITCHING TEST CIRCUIT & WAVEFORM





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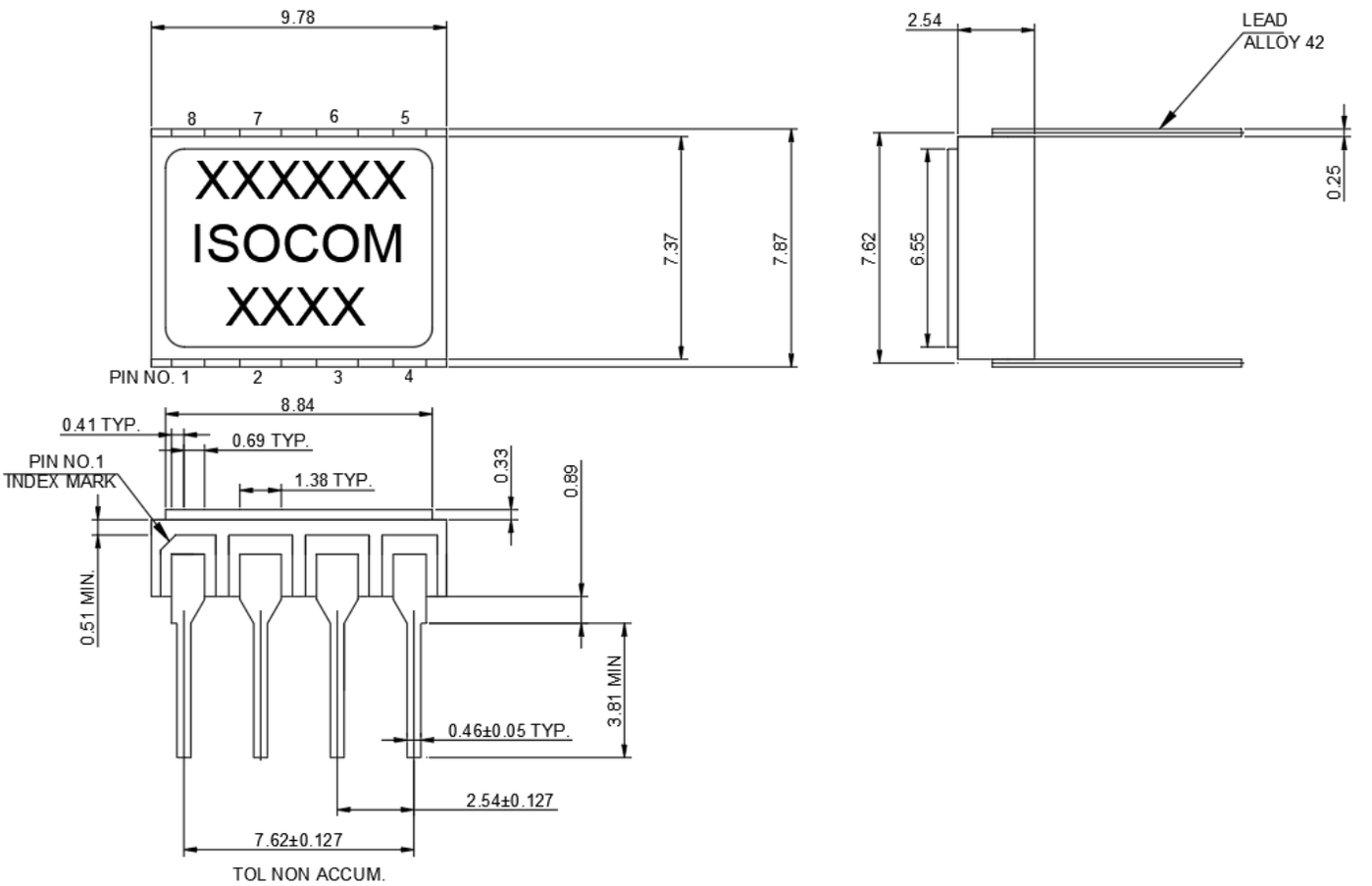
OUTLINE DRAWINGS

8-Pin DIP



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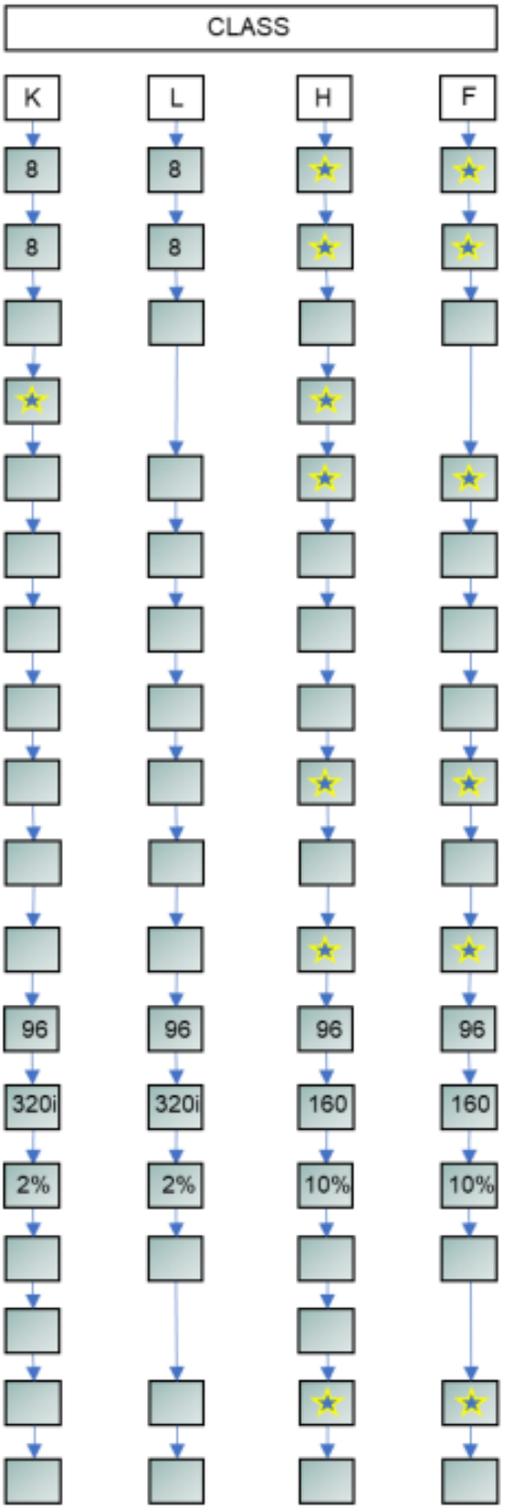
SCREENING IN ACCORDANCE WITH MIL-PRF 38534



WIRE BOND STRENGTH TEST
(DESTRUCTIVE SAMPLE BASIS, NON-DESTRUCTIVE 100% FOR SPACE)

DIE SHEAR TEST
(DESTRUCTIVE SAMPLE BASIS)

INTERNAL (PRE-CAP) VISUAL INSPECTION 100%

HERMETIC SEAL TEST (FINE & GROSS)

SERIALISATION

INITIAL DC TESTS @ 25°C

TEMPERATURE CYCLE 10 CYCLES @ -65 °C to 150°C

ACCELERATION 5000g Y1

PIND TEST

ISOLATION TEST @ 25°C

DC TEST PRE-BURN-IN @ 25°C, 125°C, -55°C AND SWITCHING

HTRB @125 °C

BURN-IN @125°C

PERCENTAGE DEFECTIVE ALLOWED – CLASS
K/L BASED ON SECOND HALF OF B.I ONLY

DC TEST POST-BURN-IN @ 25°C, 125°C, -55°C AND SWITCHING

HERMETIC SEAL TEST (FINE & GROSS)

RADIOGRAPHY

EXTERNAL VISUAL INSPECTION 100%

★ = OPTIONAL

i = INTERIM, E.G. 2 x 160 HOUR BURN-IN

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The following screening flow includes the electrical tests between each screening step, the referenced test method from MIL-STD 883 and the sample basis for Class K/L and H/F quality levels.

Operation No.	Operation	MIL-STD 883 TEST METHOD	Class	
			H/F (L2)	K/L (L2S)
1	Wire bond strength (ND)	(883) 2023	Optional	100%
2	Wire bond strength (D)	(883) 2011	Optional	8 devices
3	Die Shear	(883) 2019	Optional	8 devices
4	Internal Visual	(883) 2017	100%	100%
5	Fine leak, Helium bomb, Leak detector	(883) 1014, Con A1	Optional	Optional
6	Gross leak, Liquid bomb, -Bubble chamber	(883) 1014, Con C1	Optional	Optional
7	Serialisation of devices		Optional	100%
8	Electrical Test 25°C		100%	100%
9	Temp cycle @ -65°C to 150°C	(883) 1010, Con C, 10 cycles	100%	100%
10	Electrical Test 25°C		100%	100%
11	Constant acceleration	(883) 2001, 3000g, Y1	100%	100%
12	Electrical Test 25°C		100%	100%
13	P.I.N.D	(883) 2020, Con A	Optional	100%
14	Electrical Test 25°C		100%	100%
15	Isolation 100% @ 25°C	(MIL-STD 202) 301	100%	100%
16	Electrical Test 25°C		100%	100%
17	Electrical Test 125°C		Optional	100%
18	Electrical Test -55°C		Optional	100%
19	Switching time 100% @ 25°C		Optional	100%
20	HTRB @ 125°C - 96 hrs	(883) 1015, con A	100%	100%
21	Electrical Test 25°C		100%	100%
22	Burn in @ 125°C	(883) 1015, con B	100% 160 hours	100% 160 hrs
23	Electrical Test 25°C		100%	100%
24	Burn in @ 125°C	(883) 1015, con B	N/A	100% 160 hrs
25	Percentage defective allowable	Pre/post Burn-in electrical and delta at 25°C only	Max. 10%	Max. 2%
26	Electrical Test 25°C	Group A - SG1	100%	100%
27	Electrical Test 125°C	Group A - SG2	100%	100%
28	Electrical Test -55°C	Group A - SG3	100%	100%
29	Switching time 100% @ 25°C	Group A - SG9	100%	100%
30	Fine leak, Helium bomb, Leak detector	(883) 1014, Con A1	100%	100%
31	Gross leak, Liquid bomb, -Bubble chamber	(883) 1014, Con C1	100%	100%
32	Radiography	(883) 2012	Optional	100%
33	External Visual	(883) 2009	100%	100%

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MIL-PRF 38534 TYPICAL QCI TESTING
PROCESS FLOW

Group	Sub Group	Parameters	Quantity (accept number)		
			TM	K	H
A (CI)	1	Static tests at +25°C	Datasheet	100%	100%
	2	Static tests at max. rated operating temp.	Datasheet	100%	100%
	3	Static tests at min. rated operating temp.	Datasheet	100%	100%
	9	Switching tests at +25°C	Datasheet	100%	100%
B (PI)	1	Physical dimension	883-2016	2 (0)	2 (0)
	4	Internal visual and mechanical	883-2014	1 (0)	1 (0)
	5	Bond strength: Ultrasonic (on hotplate)	883-2011	2 (0)	2 (0)
	6	Die shear strength	883-2019	2 (0)	2 (0)
	7	Solderability	883-2003	1 (0)	1 (0)
	8	Seal: a. Fine, b. Gross	883-1014	N/A	15 (0)
C (PI)	1	External visual	883-2009	5 (0)	5 (0)
		Temperature Cycling	883-1010	5 (0)	5 (0)
		Constant acceleration	883-2001	X	5 (0)
		Seal (fine and gross)	883-1014	5 (0)	5 (0)
		PIND	883-2020	5 (0)	5 (0)
		Visual examination	883-1010	5 (0)	5 (0)
		End-point electrical	GRP-A	5 (0)	5 (0)
	2	Steady-state life test	883-1005	22 (0) or 5 (0)	22 (0) or 5 (0)
		End-point electrical	GRP-A	22 (0) or 5 (0)	22 (0) or 5 (0)
	3	Internal gas analysis Moisture 10,000 ppmv limit	883-1018	3 (0) or 5 (1)	3 (0) or 5 (1)
D (PI)	1	Thermal shock	883-1011	5 (0)	5 (0)
		Stabilization bake	883-1008	5 (0)	5 (0)
		Lead integrity	883-2004	1 (0)	1 (0)
		Seal: a. Fine, b. Gross	883-1014	5 (0)	5 (0)

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