SPDT RF Switch ZFSW2-33HDR-75+

75Ω 5 to 3000 MHz High Power 3W

The Big Deal

- High IP3, +70 dBm typ.
- High Power P0.1dB greater than 3W
- Low Insertion Loss, 0.5 dB at 1 GHz

CASE STYLE: QY2363

Product Overview

ZFSW2-33HDR-75+ is a connector version of a high-power reflective SPDT RF switch, with reflective short on output ports in the OFF state. Made using a Silicon-on-Insulator process, it provides very high IP3 (+70 dBm typ.). This switch also has a built-in CMOS driver and negative voltage generator. ZFSW2 uses type -F female connectors for easy integration into 75 ohm test systems.

Key Features

Feature	Advantages
High IIP3: +70 dBm typ.	Outstanding third order intercept perfomance makes this part ideal for use with high modulation signals such as digital CATV, QAM and other dense waveforms
Wideband operation, 5-3000 MHz	Enables a single component to be used in a vast array of applications DOCSYS 3.1, SATCOM system, automated test stations
Low Loss, 0.5 dB at 1 GHz & high input power, 3W	Low loss and high power capability enables a single switch to be used for a variety of applications, saving inventory.
Built-in negative voltage generator	Operates with single positive supply voltage; no need for DC blocking capacitors, unless external DC is present at the RF ports.
Built-in CMOS driver	No need for external driver. Simplifies use.

SPDT RF Switch

75Ω 5-3000 MHz

Reflective RF Switch with internal driver.
Single Supply Voltage, +2.3V to +4.8V, High Power 3W

Product Features

- High IP3, +70 dBm typ. at 150 MHz
- High Power, P0.1dB 3W
- High Isolation, 41 dB typ. at 1 GHz
- Low insertion loss, 0.5 dB typ. at 1 GHz
- Low current consumption, 37 µA typ.

CASE STYLE: QY2363

ZFSW2-33HDR-75+

+RoHS Compliant
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

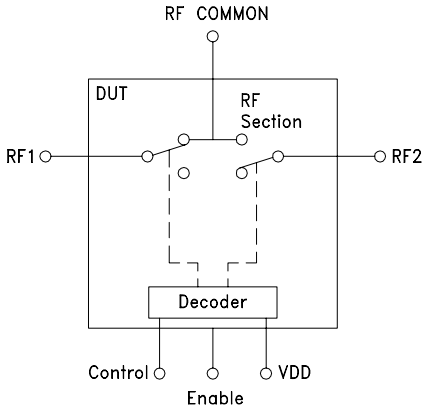
Typical Applications

- CATV systems
- SATCOM system
- Automated Test Stations

General Description

ZFSW2-33HDR-75+ is a high power (35 dBm) reflective SPDT switch with integral CMOS driver, operates with single positive supply voltage while consuming, 37µA typical. ZFSW2 is a reflective short on output port in OFF state. It has been designed for very wideband operation of 5-3000 MHz. ZFSW2 uses Type -F Female connectors for easy integration into 75 ohm test systems.

Simplified Schematic



Notes
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

RF Electrical Specifications, 5 - 3000 MHz, T_{AMB}=25°C, V_{DD}= +2.3 to 4.8V

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency Range		5		3000	MHz
Insertion Loss (ON STATE)	5 to 1000	—	0.5	0.65	dB
	1000 to 1500	—	0.6	0.85	
	1500 to 2000	—	0.85	1.15	
	2000 to 3000	—	0.95	1.30	
Input IP3 (V_{DD}=3V)	150	—	+70	—	dBm
	1800	—	+70	—	
0.1dB Input Compression(1)	20 to 3000	—	35.0	—	dBm
Isolation between RF Common and RF1/RF2 Ports	5 to 1000	39	42	—	dB
	1000 to 1500	35	38	—	
	1500 to 2000	32	35	—	
	2000 to 3000	27	30	—	
Isolation between RF1 and RF2 ports(2)	5 to 1000	40	45	—	dB
	1000 to 1500	35	41	—	
	1500 to 2000	32	37	—	
	2000 to 3000	28	32	—	
Return Loss (ON STATE), all ports	5 to 1000	—	21	—	dB
	1000 to 1500	—	17	—	
	1500 to 2000	—	15	—	
	2000 to 3000	—	16	—	

DC Operating Electrical Specifications

Parameter	Min.	Typ.	Max.	Units
VDD, Supply Voltage	2.3		4.8	V
Supply Current	—	37	—	µA
Control Enable Voltage Low	0	—	0.4	V
Control Enable Voltage High(3)	1.65	—	2.7	V
Control Current	—	1	—	µA
Shutdown mode - Supply Current	—	7	—	µA

Notes:
1. Do not exceed RF input power as shown in Absolute Maximum Rating table.
2. Enable voltage “HI”, either RF1 or RF2 are ON.
3. If V_{DD} < 2.7, then Max Control Voltage High=V_{DD}

Switching Specifications

Parameter	Min.	Typ.	Max.	Units
Rise/Fall Time (10 to 90% or 90 to 10% RF)	—	0.5 (Rise Time) 0.7 (Fall Time)	—	µSec
Switching Time, 50% CTRL to 90/10% RF	—	1.9 (ON Time) 1.1 (OFF Time)	—	µSec
Video Feedthrough, (control 0 to 1.65V, freq.=10 KHz)	—	3.0	—	mV_{P-P}

Truth Table (State of control and enable voltage selects the desired switch state)

State of:		RF Common to	
Control Voltage	Enable Voltage	RF1	RF2
High	High	ON	OFF
Low	High	OFF	ON
Low/High	Low	Shutdown	

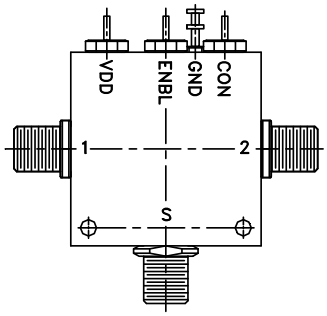
ON- low insertion loss state OFF- Isolation State

Absolute Maximum Ratings(6)

Parameter	Ratings
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to 125°C
V_{DD}, Supply Voltage	5.0V
Voltage Control	-0.2V Min. V_{DD} Max.
RF input power	5 Watt[7]

6. Operation of this device above any of these conditions may cause permanent damage.
7. Derate linearly to 2.5W at 85°C.

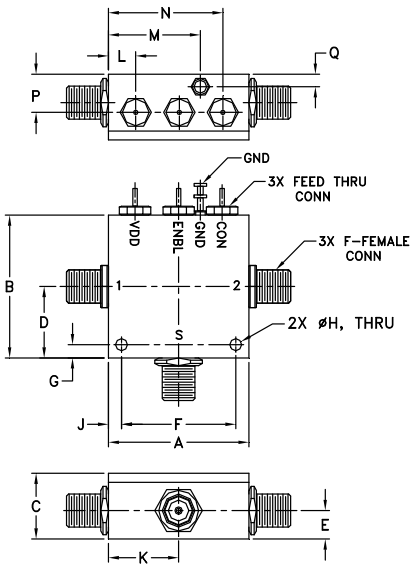
Coaxial Configuration



Coaxial Connections

Function	Port Number	Description
RF COM	S	RF Common/ SUM Port
RF1	1	RF Out #1/In Port #1
RF2	2	RF Out #2/In Port #2
Control	CON	CMOS Control IN
VDD	V_{DD}	Supply Voltage
Enable	ENBL	Shutdown mode enabled by connecting to logic low
Ground	Case Ground and GND Pin	Ground Externally

Outline Drawing (QY2363)



Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H
1.61	1.61	.74	.81	.32	1.312	.15	.136
40.89	40.89	18.80	20.57	8.13	33.32	3.81	3.45

J	K	L	M	N	P	Q	wt
.15	.81	.31	1.06	1.31	.43	.14	grams
3.81	20.57	7.87	26.92	33.27	10.92	3.56	65.0

Additional Detailed Technical Information

Additional information is available on our web site. To access this information enter the model number on our web site home page.

Performance data, graphs

Case Style: QY2363

Environmental Ratings: ENV75

Typical Performance Data

RF FREQ (MHz)	INSERTION LOSS (dB)	
	VDD=+2.8V	
	RF COM-RF1	RF COM-RF2
1	0.15	0.15
2	0.15	0.16
3	0.16	0.16
4	0.16	0.16
5	0.16	0.16
6	0.16	0.16
8	0.16	0.17
10	0.17	0.17
30	0.18	0.18
50	0.19	0.19
70	0.19	0.20
100	0.20	0.21
300	0.27	0.27
500	0.33	0.33
700	0.41	0.41
900	0.47	0.47
1000	0.49	0.47
1100	0.48	0.47
1300	0.48	0.44
1400	0.52	0.49
1500	0.62	0.57
1600	0.72	0.70
1700	0.84	0.84
1800	0.91	0.92
1900	0.87	0.93
2000	0.83	0.81
2100	0.67	0.70
2200	0.60	0.54
2300	0.54	0.51
2400	0.60	0.50
2500	0.75	0.68
2600	0.86	0.79
2700	1.02	0.96
2800	1.04	1.02
2900	1.03	1.02
3000	0.94	0.94
3100	0.82	0.85
3200	0.75	0.75
3300	0.72	0.72
3400	0.77	0.75
3500	0.87	0.82

RF FREQ (MHz)	ISOLATION (dB)			
	VDD=+2.8V		VDD=+2.8V	
	RF COM-RF1	RF COM-RF2	RF1-RF2 RF1 (ON)	RF1-RF2 RF2 (ON)
1	74.19	73.72	74.48	73.48
2	79.21	73.87	74.92	76.82
3	74.98	74.07	75.04	74.64
4	75.65	74.96	77.18	74.60
5	75.91	73.10	74.13	73.97
6	74.00	76.14	76.33	75.65
8	73.88	76.19	75.99	75.81
10	68.79	76.56	78.65	87.54
30	72.76	72.24	73.13	75.14
50	67.51	68.37	71.22	72.43
70	64.70	64.78	67.90	68.05
100	62.10	61.73	65.34	66.16
300	52.32	52.38	56.10	56.26
500	47.91	48.10	51.68	51.42
700	45.07	45.07	48.65	48.41
900	42.33	42.41	45.70	46.02
1000	41.23	41.30	44.46	44.78
1100	40.41	40.44	43.69	43.87
1300	39.46	39.56	42.74	42.12
1400	39.04	39.23	42.71	41.78
1500	38.55	38.87	42.33	41.01
1600	37.99	38.27	41.56	40.42
1700	37.10	37.57	40.25	39.26
1800	36.18	36.39	38.83	38.48
1900	35.03	35.33	37.19	37.32
2000	34.21	34.28	36.18	36.66
2100	33.76	33.89	35.58	35.80
2200	33.52	33.70	35.78	35.52
2300	33.83	33.94	36.31	35.25
2400	33.75	34.16	36.87	35.05
2500	33.66	34.00	37.14	35.26
2600	32.99	33.57	36.54	34.74
2700	32.02	32.60	35.64	34.54
2800	31.14	31.74	34.30	33.68
2900	30.09	30.66	33.30	33.33
3000	29.49	30.05	32.19	32.35
3100	29.03	29.53	31.67	31.83
3200	29.09	29.58	31.51	31.12
3300	29.42	29.78	31.53	30.52
3400	29.55	29.95	31.67	30.11
3500	29.37	29.81	31.47	29.72

State of		RF Common to	
Control Voltage	Enable Voltage	RF1	RF2
High	High	ON	OFF
Low	High	OFF	ON
Low/High	Low	Shutdown	

ON-low insertion loss state; OFF-Isolation State

Typical Performance Data

RF FREQ (MHz)	VSWR (:1) VDD=+2.8V RF COM RF1 (ON)	VSWR (:1) VDD=+2.8V RF COM RF2 (ON)	VSWR (:1) VDD=+2.8V RF1 RF1 (ON)	VSWR (:1) VDD=+2.8V RF2 RF2 (ON)	RF FREQ (MHz)	VSWR (:1) VDD=+2.8V RF1 RF1 (OFF)	VSWR (:1) VDD=+2.8V RF2 RF2 (OFF)
1	1.02	1.02	1.02	1.02	1	5.62	5.61
2	1.02	1.02	1.02	1.02	2	5.62	5.62
3	1.02	1.02	1.02	1.02	3	5.62	5.62
4	1.02	1.02	1.02	1.02	4	5.62	5.62
5	1.02	1.02	1.02	1.02	5	5.61	5.61
6	1.02	1.02	1.02	1.02	6	5.62	5.61
8	1.02	1.02	1.02	1.02	8	5.62	5.61
10	1.02	1.02	1.02	1.02	10	5.62	5.61
30	1.02	1.02	1.02	1.02	30	5.60	5.59
50	1.02	1.02	1.02	1.02	50	5.59	5.58
70	1.02	1.02	1.02	1.02	70	5.57	5.57
100	1.02	1.02	1.02	1.02	100	5.55	5.53
300	1.02	1.02	1.03	1.03	300	5.44	5.42
500	1.04	1.05	1.05	1.04	500	5.35	5.34
700	1.07	1.08	1.07	1.07	700	5.27	5.29
900	1.11	1.13	1.12	1.11	900	5.20	5.25
1000	1.14	1.15	1.15	1.14	1000	5.16	5.25
1100	1.17	1.18	1.17	1.17	1100	5.13	5.19
1300	1.24	1.25	1.24	1.23	1300	5.04	5.14
1400	1.28	1.29	1.27	1.27	1400	4.99	5.07
1500	1.32	1.32	1.30	1.31	1500	4.93	5.01
1600	1.35	1.35	1.33	1.34	1600	4.82	4.91
1700	1.37	1.38	1.36	1.37	1700	4.74	4.82
1800	1.40	1.39	1.37	1.39	1800	4.67	4.69
1900	1.41	1.40	1.39	1.41	1900	4.58	4.60
2000	1.42	1.41	1.40	1.42	2000	4.52	4.48
2100	1.42	1.40	1.40	1.42	2100	4.46	4.39
2200	1.41	1.39	1.39	1.40	2200	4.39	4.31
2300	1.39	1.37	1.38	1.39	2300	4.30	4.24
2400	1.37	1.35	1.38	1.37	2400	4.21	4.21
2500	1.35	1.33	1.36	1.35	2500	4.18	4.17
2600	1.33	1.32	1.34	1.34	2600	4.15	4.13
2700	1.32	1.31	1.32	1.33	2700	4.10	4.09
2800	1.30	1.29	1.31	1.32	2800	4.14	4.07
2900	1.29	1.27	1.29	1.30	2900	4.17	4.05
3000	1.29	1.26	1.28	1.29	3000	4.17	4.05
3100	1.29	1.26	1.29	1.29	3100	4.19	4.05
3200	1.30	1.27	1.30	1.29	3200	4.21	4.07
3300	1.31	1.28	1.31	1.29	3300	4.21	4.13
3400	1.33	1.29	1.32	1.30	3400	4.22	4.18
3500	1.35	1.32	1.33	1.31	3500	4.24	4.24

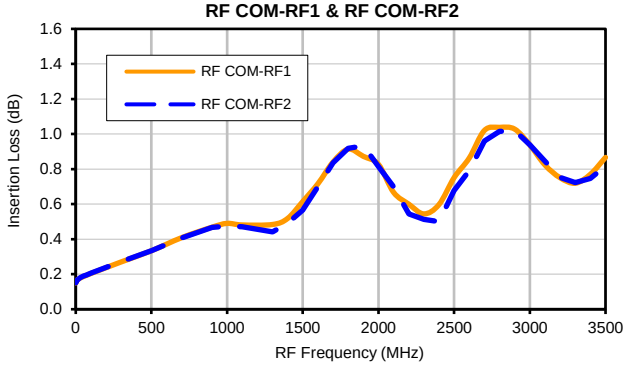
State of		RF Common to	
Control Voltage	Enable Voltage	RF1	RF2
High	High	ON	OFF
Low	High	OFF	ON
Low/High	Low	Shutdown	

ON-low insertion loss state; OFF-Isolation State

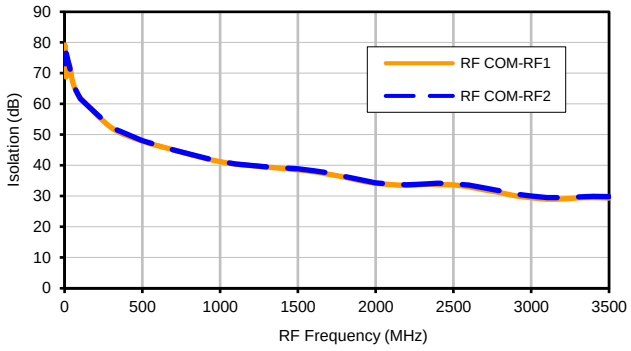
Typical Performance Curves

VDD=2.8V

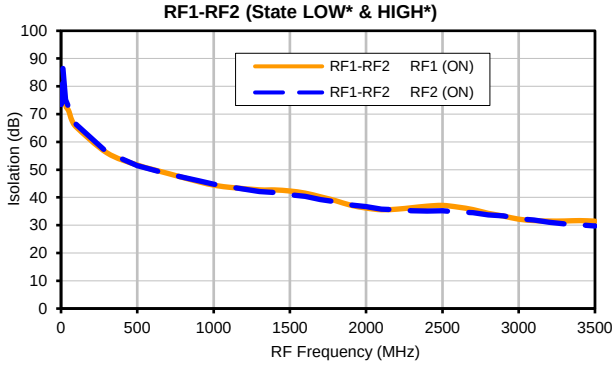
INSERTION LOSS
RF COM-RF1 & RF COM-RF2



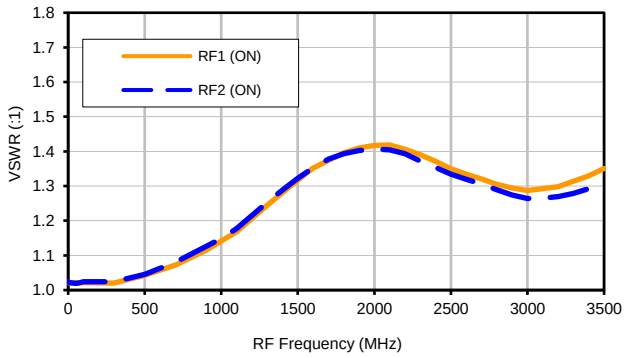
ISOLATION
RF COM-RF1 & RF COM-RF2



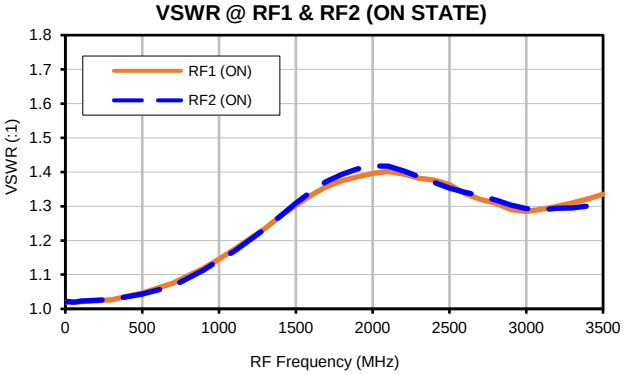
ISOLATION
RF1-RF2 (State LOW* & HIGH*)



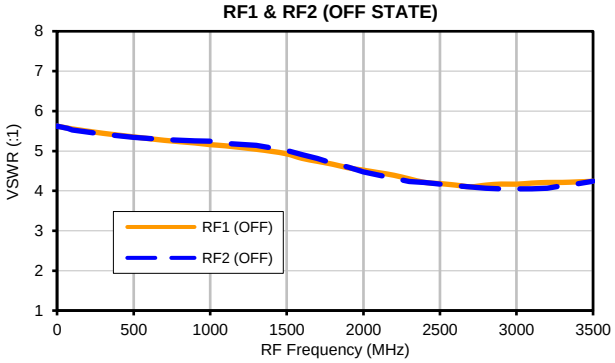
VSWR @ RF COM



VSWR @ RF1 & RF2 (ON STATE)



VSWR
RF1 & RF2 (OFF STATE)



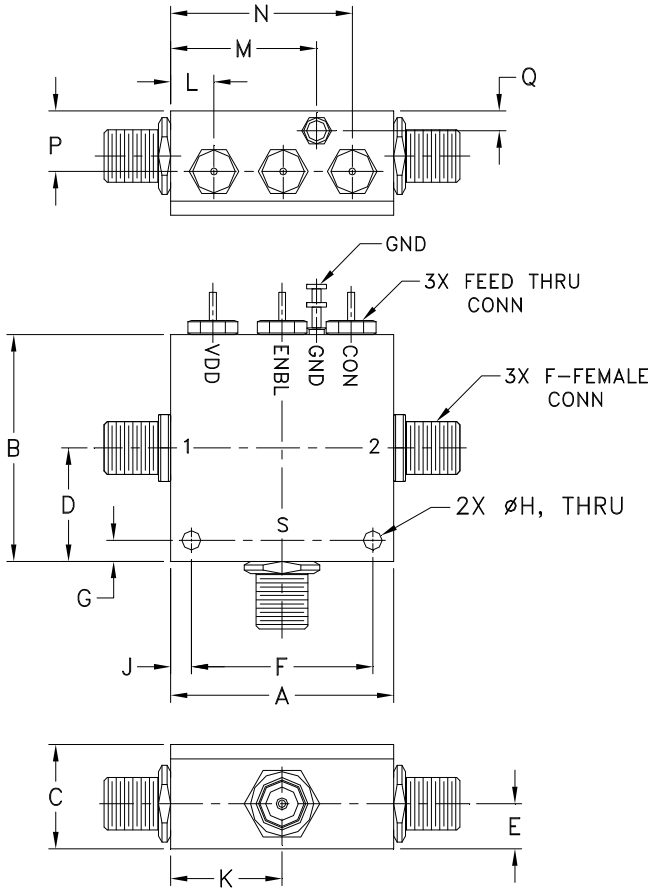
State of		RF Common to	
Control Voltage	Enable Voltage	RF1	RF2
High	High	ON	OFF
Low	High	OFF	ON
Low/High	Low	Shutdown	

ON-low insertion loss state; OFF-Isolation State

Case Style QY

QY2363

Outline Dimensions



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N
QY2363	1.61 (40.89)	1.61 (40.89)	.74 (18.80)	.81 (20.57)	.32 (8.13)	1.312 (33.32)	.15 (3.81)	.136 (3.45)	.15 (3.81)	.81 (20.57)	.31 (7.87)	1.06 (26.92)	1.31 (33.27)

CASE#	P	Q	R	S	T	WT. GRAMS
QY2363	.43 (10.92)	.14 (3.56)	-- --	-- --	-- --	65

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .03; 3 Pl. ± .015

Notes:

1. Case material: Aluminum alloy.
2. Case finish:
   For RoHS Case Styles: Clear chemical conversion coating, non-chrome or trivalent chrome based.

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Environmental Specifications ENV75

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 85° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-65° to 150° C / -40° to 125° C / -55° to 150° C Ambient Environment	Individual Model Data Sheet
Temperature Cycling	-65° to 150°C, 500 cycles	JESD22-A104, condition C
HAST	130°C, 85% RH, 33 PSIA, 96 hours, nominal bias	JESD22-A110
High Temp Storage	150°C 1000 hours	JESD22-A103
Solderability	Per Reference Spec	JESD22-B102
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 260°C peak	J-STD-020 D.01