



Reliability Report – 2N7000

N-Channel Enhancement Mode Field Effect Transistor

MIL-PRF-38534 CLASS H QUALIFICATION DATAPACK

Performed by Tandex Test Labs



TANDEX

15849 Business Center Drive, Irwindale, CA 91706, U.S.A.

Phone (626) 962-7166, Fax (626) 960-6896

www.tandexlabs.com

CONTENTS:

- Certificate of Conformance
- Process Flow Chart + Mechanical Test Results
- Electrical Test Results at -55°C, 25°C, 125°C.





MIL-PRF-38534 CLASS H DATAPACK

Certificate of Conformance



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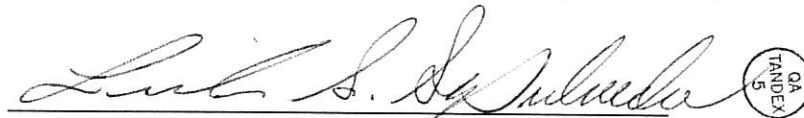
e-mail: via web site

Certificate of Conformance

CUSTOMER:	SILICON SUPPLIES LIMITED	DATE: April 30, 2019
	47 WHERRY ROAD NORWICH, NR1, 1WS UNITED KINGDOM VAT GB#114 3513 56	
TEST REPORT:	DDS-103-01-A	QUANTITY RECEIVED: 15 DIE
P.O. NUMBER:	SS313	QUANTITY REQUIRED: 10/5
DESCRIPTION:	MOSFET	QUANTITY PROCESSED: 15
PART NUMBER(S):	2N7000	QUANTITY PASSED: 15
P/N: AS RECEIVED / MFG. PART NUMBER:	2N7000	QUANTITY FAILED: 0
LOT / DATE CODE:	8ADR-4457-02 WF 48	
MANUFACTURE: CAGE CODE:	SILICON SUPPLIES	QUANTITY SHIPPING: 15*
		INCLUDES: 10 PROCESS ACCEPT 5 BOND PULL SAMPLES
TANDEX CAGE CODE:	1FE65	

METHOD OF TESTING: MIL-PRF-38534 CL. H, MIL-STD-750

I hereby certify that the subject components have been processed and inspected in accordance with instructions with specifications referenced in your purchase order. Physical records and/or data pertinent to applicable military, proprietary, and/or commercial specifications are on file and available upon request for inspection at this facility.



Linda S. Sepulyeda
QUALITY ASSURANCE



QMF 30



MIL-PRF-38534 CLASS H DATAPACK

Process Flow Chart + Mechanical Test Results



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PAGE 1 OF 3

PROCESS FLOW CHART

FLOW NUMBER: DDS-103-01-A REV. 0

CUSTOMER: DIE DEVICES P.O. NUMBER: ~~SS131~~ **SS313** 

PART NUMBER: 2N7000 GENERIC: 2N7000








PART TYPE: MOSFET DRAWING: MIL-PRF-38534 CLASS H

PROMISE DATE: 5/02/19 JOB NUMBER: DDS-103-01-A

LOT / DATE CODE: 8ADR-4457-02 WF 48 RECIEVED QUANTITY: 15

QUOTE NUMBER: DDS14634-1 MFG: SILICON SUPPLIES QUANTITY REQUIRED: 10/5

CAUTION: ESD REFER TO TTL DRAWING #P1025

01	FLO		FLOW PREPARED BY: <u>LSS</u> ON: <u>4/08/19</u>																								
			<p>CONTRACTUAL AGREEMENT REVIEW</p> <table border="0"> <tr> <td>Y</td> <td>N</td> <td>NOT SPECIFIED</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/> Q-CLAUSES</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/> DPAS</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/> DFAR</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/> ITAR</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/> OTHER SPECIFIED</td> </tr> </table>	Y	N	NOT SPECIFIED	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Q-CLAUSES	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> DPAS	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> DFAR	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> ITAR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> OTHER SPECIFIED						
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<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Q-CLAUSES																									
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<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> OTHER SPECIFIED																									
02	QCI		TANDEX QUALITY CONTROL INSPECTION.																								
			FLOW APPROVED BY: <u>JMI</u> ON: <u>4/08/19</u>																								
			<u>APPROVED BY SAL BARCORDAR: N/A</u> DATE: <u>✓</u>																								
03	RCV		VERIFY PART NUMBER. ENTER INTO INCOMING LOG.																								
			<u>X</u> CUSTOMER COUNT	10/5			4/08/19																				
SEQ	PROC	REF #	DESCRIPTION	QTY	REJ	ACCEPT	DATE	INSP.																			
04	VIS	P-1041	PERFORM 100% DIE VISUAL PER MIL-STD-750 METHOD 2072 AND MIL-PRF-38534 PARA C.3.3.2.	15	∅	15	4/11/19																				
			EQUIPMENT USED: <u>Olympus</u> ASSET #: <u>20091</u>																								
			ESD MAT DUE DATE: <u>4/27/19</u>																								
05	ASSY	P-4020	PACKAGE SUFFICIENT DEVICES FOR CLASS H ELEMENT EVALUATION / ELECTRICAL AND BOND PULL PER MIL-PRF-38534 REFERENCE DIE GEOMETRY FOR ORIENTATION AND PIN - OUTS.	10	∅	10	4/18/19																				
			DIE ATTACH:																								
			EPOXY	10 ELEMENT EVALUATION																							
			Lot# <u>0480AK0829</u> Exp. Date: <u>5/20/19</u>																								
			* Package Type: <u>LA TO-18</u>	5 BOND PULL																							
			WIRE BOND:	5	∅	5	4/19/19																				
			Utilize 1 Mil Au Wire (.001)																								
			1 Mil Au bonder <u>MECH-EL</u> Asset #: <u>20060</u>																								
			Gold Wire:	15	∅	15	4/22/19																				
			Lot# <u>9003011960</u> Exp. Date: <u>3/16/2020</u>																								
			ESD MAT DUE DATE: <u>4/27/19</u>																								
			P-4010																								

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PROCESS FLOW CHART

FLOW NUMBER: DDS-103-01-A REV. 0

SS313
SS131 QA
TANDEX
5

CUSTOMER:	DIE DEVICES	P.O. NUMBER:	SS313
PART NUMBER:	2N7000	GENERIC:	2N7000
PART TYPE:	MOSFET	DRAWING:	MIL-PRF-38534 CLASS H
PROMISE DATE:	5/02/19	JOB NUMBER:	DDS-103-01-A
LOT / DATE CODE:	8ADR-4457-02 WF 48	RECIEVED QUANTITY:	15
QUOTE NUMBER:	DDS14634-1 MFG: SILICON SUPPLIES	QUANTITY REQUIRED:	10/5

CAUTION: ESD REFER TO TTL DRAWING #P1025

SEQ	PROC	REF #	DESCRIPTION	QTY	REJ	ACCEPT	DATE	INSP.
06	VIS		PERFORM INTERNAL VISUAL INSPECTION PER MIL-STD-750 METHOD 2072 EQUIPMENT USED: <u>NIKON SMZ645</u> , ASSET #: <u>LA 30 30663</u>	15	0	15	4/22/19	TTL 30
			ESD MAT DUE DATE: <u>4/27/19</u>					
07	SEL		SEAL DEVICES VACUUM BAKE: Pre Seal Bake: Temp: <u>125°C</u> Time: <u>24 hrs</u> Actual Time in: <u>1:10 pm - 4/22/19</u> Actual Time out: <u>3:15 pm - 4/23/19</u> Actual Temperature: <u>125°C</u> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <div style="display: flex; justify-content: space-around; font-size: small;"> CAP WELD LDC STAMP </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">1916</div> <div style="border: 1px solid black; border-radius: 50%; padding: 2px;">TTL 30</div> </div> </div>	10 5	0 0	10 5	4/23/19 4/23/19	TTL 30 TTL 30
			ESD MAT DUE DATE: <u>4/27/19</u>					
08	ELEC		PERFORM 100% ELECTRICAL TEST PER PER MFG DATA SHEET AT AMBIENT, HIGH AND LOW OPERATING TEMPERATURE. READ AND RECORD +25°C - <u>55</u> °C +125°C EQUIPMENT USED: <u>TESEC</u> , ASSET #: <u>15053</u> TEST FIXTURE: <u>1114</u> SOFTWARE ID: <u>2N7000</u> REV <u>A</u> <u>2N7000C</u> TEMPERATURE SOAK TIME: <u>30</u> SEC. <u>2N7000H</u>	10 10 10	0 0 0	10 10 10	4/26/19 4/26/19 4/26/19	TTL 35 TTL 35 TTL 35
			ESD MAT DUE DATE: <u>5/17/19</u>					


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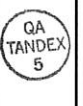
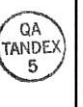
PROCESS FLOW CHART

FLOW NUMBER: DDS-103-01-A REV. 0

55313
-SS13+ 

CUSTOMER: DIE DEVICES P.O. NUMBER:
 PART NUMBER: 2N7000 GENERIC: 2N7000
 PART TYPE: MOSFET DRAWING: MIL-PRF-38534 CLASS H
 PROMISE DATE: 5/02/19 JOB NUMBER: DDS-103-01-A
 LOT / DATE CODE: 8ADR-4457-02 WF 48 RECIEVED QUANTITY: 15
 QUOTE NUMBER: DDS14634-1 MFG: SILICON SUPPLIES QUANTITY REQUIRED: 10/5

CAUTION: ESD REFER TO TTL DRAWING #P1025

SEQ	PROC	REF #	DESCRIPTION	QTY	REJ	ACCEPT	DATE	INSP.
10	DBP		PERFORM WIRE BOND PULL PER MIL-STD-883 METHOD 2011, & MIL-PRF-38534 C.3.3.3, C3.3.5. TEN (10) WIRES, *DO NOT USE ELECTRICAL TEST SAMPLES* EQUIPMENT USED: <u>DAEE</u> , ASSET #: <u>30075</u>	5	0	5	4/29/19	
			ESD MAT DUE DATE: <u>5/27/19</u>					
11	QCI		TANDEX QUALITY CONTROL INSPECTION QCI VERIFY CAR IN SEQ 01 IS COMPLIANT	15	0	15	4/30/19	
12	PKG		USE ORIGINAL CONTAINER OR TANDEX PACKAGING.	15	0	15	4/30/19	
13	QAR	P-1213	TANDEX QUALITY ASSURANCE REVIEW. * INCLUDES 10 PROCESS ACCEPT 5 BOND PULL SHIP VIA: SHIP / BILL TO: DIE DEVICES 47 WHERRY ROAD NORWICH, NR1, 1WS UNITED KINGDOM VAT GB#114 3513 56	* 15			4/30/19	

TANDEX TEST LABS TTL# DDS-103-01-A
BOND PULL
BOND STRENGTH TESTING

TTL Job No. DDS-103-01-A	Part Number 2N7000	Part Type MOSFET	Date April 29, 2019
Lot Date Code LOT# 8ADR-4457-02 W# 48	Sample Qty. 5	Serial Numbers 11-15	Test Specifications Mil-Std-883 Method 2011
Misc.	Qty Accept 5	Qty Reject 0	Suspect 0

WIRE TYPE Au	PACKAGE/POST Au	BOND TYPE BALL BOND
DIE METALIZATION Al	WIRE SIZE 0.001	MINIMUM PULL STRENGTH 2.5gm

S/N 11			S/N 12			S/N 13			S/N 14			S/N 15			S/N		
WIRE NO	FORCE	CODE	WIRE NO	FORCE	CODE	WIRE NO	FORCE	CODE	WIRE NO	FORCE	CODE	WIRE NO	FORCE	CODE	WIRE NO	FORCE	CODE
1	7.0	G	1	4.0	G	1	8.5	G	1	9.5	G	1	6.0	G	1		
2	6.5	G	2	4.0	G	2	7.5	G	2	8.0	G	2	8.5	G	2		
3			3			3			3			3			3		
4			4			4			4			4			4		
5			5			5			5			5			5		

CODE INDEX

- A. NO BREAKS UP TO _____gms.
- B. BOND LIFTS FROM DIE.
- C. BOND LIFTS FROM POST.
- D. WIRE BREAKS AT SUBSTRATE/HEAL.
- E. BOND REMOVES UNDERLYING METALLIZATION.
- F. NO CONNECTION.
- G. WIRE BREAKS AT DIE/HEAL.
- H. WIRE BREAKS AT POST/HEAL.
- J. WIRE BREAKS AT SPAN.
- X. BOND DAMAGE PRIOR TO TESTING.



TECHNICIAN STAMP: _____



MIL-PRF-38534 CLASS H DATAPACK

Test Results at -55°C



DDS-103-01-A
PN 2N7000

TANDEX TEST LABS
-55C,SEQ 8

4/26/2019
DDS-103-01-A.XLS.xls

TEST#	2	
SYMBOL	VGSth	
COND.1	5.00 V	
COND.2	1.00mA	
MAX LIMIT		
MIN LIMIT		
SER #	BIN	V
1	1	1.841
2	1	1.861
3	1	1.843
4	1	1.843
5	1	1.849
6	1	1.855
7	1	1.849
8	1	1.851
9	1	1.847
10	1	1.839



MIL-PRF-38534 CLASS H DATAPACK

Test Results at 25°C



TEST#		2	3	4	5	6	7	8	9	10	11	12	13
SYMBOL		BVDSS	IDSS	IGSSF	IGSSR	VGStH	SAME	RDON	RDON	VDSON	VDSON	IDON	GMP
COND.1		10.0uA	48.0 V	15.0 V	15.0 V	5.00 V	6	500mA	75.0mA	500mA	75.0mA	10.0 V	10.0 V
COND.2						1.00mA		10.0 V	4.50 V	10.0 V	4.50 V	4.50 V	200mA
MAX LIMIT			1.000uA	10.00nA	10.00nA		3.000 V	5.000 R	5.300 R	2.500 V	400.0mV		
MIN LIMIT		60.00 V				800.0mV						75.00mA	100.0mS
SER #	BIN	V	A	A	A	V	V	R	R	V	V	A	S
1	1	76.79	2.510n	380.0p	2.500p	1.658	1.658	1.368	1.619	684.5m	121.5m	1.030	380.9m
2	1	77.95	1.630n	295.0p	108.2p	1.667	1.667	1.383	1.638	691.9m	123.2m	1.012	358.4m
3	1	78.00	2.240n	312.0p	163.0p	1.657	1.657	1.379	1.631	689.9m	122.1m	1.017	387.5m
4	1	78.79	2.390n	77.00p	212.9p	1.645	1.645	1.362	1.606	681.8m	120.2m	1.030	383.1m
5	1	77.99	2.050n	140.0p	283.3p	1.653	1.653	1.378	1.628	689.3m	121.9m	1.029	368.3m
6	1	78.99	3.250n	119.0p	112.7p	1.661	1.661	1.381	1.633	691.0m	122.9m	1.017	392.9m
7	1	77.99	2.420n	197.0p	54.00p	1.649	1.649	1.395	1.638	698.4m	123.5m	1.020	380.9m
8	1	75.89	2.430n	196.0p	137.9p	1.652	1.652	1.366	1.610	683.7m	120.9m	1.029	375.2m
9	1	78.19	2.530n	147.0p	195.1p	1.646	1.646	1.369	1.616	685.3m	120.9m	1.025	373.1m
10	1	79.19	2.950n	1.153n	269.2p	1.644	1.644	1.389	1.630	695.2m	122.4m	1.030	392.9m



MIL-PRF-38534 CLASS H DATAPACK

Test Results at +125°C



DDS-103-01-A
PN 2N7000

TANDEX TEST LABS
+125C,SEQ 8

4/26/2019
DDS-103-01-A.XLS.xls

TEST#		2	3
SYMBOL		IDSS	RDON
COND.1		48.0 V	500mA
COND.2			10.0 V
MAX LIMIT		1.000mA	9.000 R
MIN LIMIT			
SER #	BIN	A	R
1	1	308.0n	2.370
2	1	314.0n	2.406
3	1	324.0n	2.414
4	1	329.0n	2.378
5	1	352.0n	2.438
6	1	273.0n	2.334
7	1	344.0n	2.438
8	1	300.0n	2.365
9	1	320.0n	2.374
10	1	308.0n	2.370