



FINAL PRODUCT/PROCESS CHANGE NOTIFICATION
Generic Copy

08-DEC-2003

SUBJECT: ON Semiconductor Final Product/Process Change Notification #13014

TITLE: Dual Source Assembly/Test for Case-77 Bipolar Power Transistors at Mingxin

EFFECTIVE DATE: 08-Feb-2004

AFFECTED CHANGE CATEGORY:

Subcontractor Assembly/Test Site

AFFECTED PRODUCT DIVISION: Bipolar Discretes Products

ADDITIONAL RELIABILITY DATA: Available

Contact your local ON Semiconductor Sales Office or Laura Rivers <S20636@onsemi.com>

SAMPLES: Contact your local ON Semiconductor Sales Office or

Dianne Von Borstel <RPDR20@onsemi.com>

FOR ANY QUESTIONS CONCERNING THIS NOTIFICATION:

Contact Sales Office or Mike Schager <RMF150@onsemi.com>

NOTIFICATION TYPE:

Final Product/Process Change Notification (FPCN)

Final change notification sent to customers. FPCNs are issued at least 60 days prior to implementation of the change.

ON Semiconductor will consider this change approved unless specific conditions of acceptance are provided in writing within 30 days of receipt of this notice. To do so, contact your local ON Semiconductor Sales Office.

DESCRIPTION AND PURPOSE:

This is the Final Notification of IPCN #13014 announcing ON Semiconductor has qualified MingXin Microelectronics in Ningbo, China (ISO9002) as an additional site for the assembly and test of Case-77 (T0-225AA Type) Bipolar Power Transistors.

QUALIFICATION PLAN:

Per AEC-Q101 Guidelines.

Lot 1,2,3: BUH51

Lot 1,2,3: MJE350

High Humidity High Temperature Reverse Bias: Ta=85C, RH=85%, Bias (V=80%rated or 100V max) for 1008hrs (Sample size: 80 units/lot)

High Temperature Reverse Bias: Ta=150C, Bias(V=80%rated) for 1008hrs (Sample size: 80 units/lot)



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Intermittent Operating Life: Ta = 25C, Ton/Toff=3.5 min, delta Tj = 100C, 8572 cycles
(Sample size: 80 units/lot)

Temp Cycle: Ta=-65C/150C, Air to air, Dwell>=10min for 1000 cycles
(Sample size: 80 units/lot)

Autoclave: Ta=121C, P=15psig, RH=100% for 96hrs (Sample size: 80 units/lot)

High Temperature Bake: 150C, 1008 hours

Electical Characterization at -40C, +25C, +125C, and +150C (Sample size: 25 units/lot)

RELIABILITY DATA SUMMARY:

BUH51:	Lot 1	Lot 2	Lot 3	Control
HTRB (500 hrs)	0/80	0/80	0/80	0/80
H3TRB	0/80	0/80	0/80	0/80
IOL	0/80	0/80	0/80	0/80
TC	0/80	0/80	0/80	0/80
AC	0/80	0/80	0/80	0/80
HTB	0/80	0/80	0/80	0/80

MJE350:	Lot 1	Lot 2	Lot 3	Control
HTRB	0/80	0/80	0/80	0/80
H3TRB	0/80	0/80	0/80	0/80
IOL	0/80	0/80	0/80	0/80
TC	0/80	0/80	0/80	0/80
AC	0/80	0/80	0/80	0/80
HTB	0/80	0/80	0/80	0/80

ELECTRICAL CHARACTERISTIC SUMMARY:

Electrical Characterization summary results down below:

CHANGED PART IDENTIFICATION:

Product marked with site code NN is assembled at MingXin.

AFFECTED DEVICE LIST (WITHOUT SPECIALS):

- PART**
- 2N4918
- 2N4919
- 2N4920
- 2N4921
- 2N4922
- 2N4923
- 2N5190
- 2N5191
- 2N5192
- 2N5194
- 2N5195
- 2N5655
- 2N5657



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2N6034
2N6035
2N6036
2N6038
2N6039
BD135
BD136
BD137
BD138
BD139
BD140
BD159
BD179
BD180
BD234
BD237
BD238
BD435
BD436
BD436T
BD437
BD437T
BD438
BD439
BD440
BD441
BD442
BD675
BD675A
BD676
BD676A
BD677
BD677A
BD678
BD678A
BD679
BD679A
BD680
BD680A
BD681
BD682
BD682T
BD787
BD788
BUH51
MJE13003
MJE170
MJE171
MJE172
MJE180
MJE181
MJE182
MJE200
MJE210
MJE210T
MJE243



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MJE253
MJE270
MJE271
MJE340
MJE3439
MJE344
MJE350
MJE371
MJE521
MJE700
MJE702
MJE703
MJE800
MJE802
MJE803
SJE2894

ON Semiconductor FPCN#13014

Qualification of MingXin for Case-77 Assembly Site

BUH51 DC Test Summary

Temp = 25C

Test #	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Symbol	IEBO	ICBO	ICEO	ICES	BVEBO	BVCEO	HVBCBO	HFE	HFE	HFE	HFE	VBESAT	VCESAT	VFBE	VFBC
Cond1	9.00E+00	8.00E+02	5.00E+02	8.00E+02	1.00E-03	1.00E-02	1.00E-03	1.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+00	1.00E+00	8.00E+00	8.00E+00
Cond2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+02	1.00E+03	2.00E+03	1.00E+00	2.00E+00	8.00E-01	1.00E-02	2.00E-01	2.00E-01	0.00E+00	0.00E+00
Limit	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E+01	5.00E+02	8.00E+02	8.00E+00	5.00E+00	1.00E+01	1.40E+01	1.10E+00	5.00E-01	-	-
Units	Amps	Amps	Amps	Amps	Volts	Volts	Volts	-	-	-	-	Volts	Volts	Volts	Volts
Control															
min	9.04E-09	1.79E-07	2.10E-06	1.71E-07	1.21E+01	5.12E+02	9.25E+02	1.02E+01	7.61E+00	1.41E+01	2.08E+01	9.09E-01	2.09E-01	1.39E+00	1.48E+00
max	2.49E-08	2.51E-07	6.29E-06	2.37E-07	1.26E+01	5.32E+02	9.44E+02	1.08E+01	8.02E+00	1.49E+01	2.27E+01	9.12E-01	2.60E-01	1.42E+00	1.78E+00
average	1.17E-08	1.95E-07	3.55E-06	1.85E-07	1.25E+01	5.22E+02	9.33E+02	1.05E+01	7.82E+00	1.44E+01	2.17E+01	9.11E-01	2.34E-01	1.41E+00	1.66E+00
stdev	3.68E-09	1.27E-08	1.12E-06	1.22E-08	1.00E-01	5.26E+00	6.36E+00	1.30E-01	1.07E-01	1.85E-01	5.19E-01	9.73E-04	1.00E-02	8.60E-03	6.87E-02
Cpk	9.06E+03	2.62E+03	2.86E+01	2.73E+03	8.44E+00	1.38E+00	6.98E+00	6.42E+00	8.76E+00	7.91E+00	4.91E+00	6.49E+01	8.82E+00	-	-
Test Lot 1															
min	6.63E-09	1.56E-07	2.02E-06	1.38E-07	1.26E+01	5.03E+02	9.15E+02	9.38E+00	6.87E+00	1.38E+01	2.27E+01	9.07E-01	2.19E-01	1.39E+00	1.52E+00
max	4.62E-07	2.36E-06	2.54E-05	2.19E-06	1.28E+01	5.34E+02	9.64E+02	1.12E+01	8.35E+00	1.54E+01	2.41E+01	9.55E-01	2.82E-01	1.88E+00	2.18E+00
average	2.52E-08	4.43E-07	5.00E-06	4.04E-07	1.27E+01	5.16E+02	9.32E+02	1.07E+01	7.96E+00	1.49E+01	2.33E+01	9.09E-01	2.50E-01	1.41E+00	1.70E+00
stdev	8.28E-08	5.89E-07	5.42E-06	5.15E-07	3.60E-02	7.45E+00	1.20E+01	4.11E-01	3.39E-01	3.29E-01	4.00E-01	8.74E-03	1.24E-02	8.87E-02	1.06E-01
Cpk	4.02E+02	5.63E+01	5.84E+00	6.44E+01	2.48E+01	7.13E-01	3.67E+00	2.21E+00	2.91E+00	4.94E+00	7.77E+00	7.28E+00	6.76E+00	-	-
Test Lot 2															
min	7.11E-09	1.57E-07	2.46E-06	1.46E-07	1.25E+01	5.00E+02	8.95E+02	9.79E+00	7.22E+00	1.38E+01	2.26E+01	9.05E-01	2.15E-01	1.38E+00	1.49E+00
max	1.57E-08	2.03E-07	8.34E-06	1.95E-07	1.27E+01	5.40E+02	9.69E+02	1.12E+01	8.36E+00	1.54E+01	2.42E+01	9.10E-01	2.71E-01	1.41E+00	1.86E+00
average	8.66E-09	1.73E-07	4.25E-06	1.64E-07	1.26E+01	5.18E+02	9.35E+02	1.06E+01	7.89E+00	1.47E+01	2.31E+01	9.07E-01	2.48E-01	1.39E+00	1.71E+00
stdev	1.38E-09	9.80E-09	1.32E-06	1.12E-08	4.78E-02	9.56E+00	1.64E+01	3.64E-01	3.11E-01	3.51E-01	4.24E-01	1.04E-03	1.53E-02	6.98E-03	1.02E-01
Cpk	2.42E+04	3.39E+03	2.41E+01	2.98E+03	1.83E+01	6.29E-01	2.75E+00	2.39E+00	3.10E+00	4.42E+00	7.14E+00	6.16E+01	5.51E+00	-	-
Test Lot 3															
min	7.29E-09	1.47E-07	3.27E-06	1.41E-07	1.25E+01	5.01E+02	9.12E+02	9.62E+00	7.03E+00	1.38E+01	2.27E+01	9.08E-01	2.19E-01	1.38E+00	1.51E+00
max	8.93E-09	1.73E-07	7.00E-06	1.66E-07	1.26E+01	5.39E+02	9.72E+02	1.09E+01	8.17E+00	1.52E+01	2.37E+01	9.11E-01	2.75E-01	1.40E+00	1.83E+00
average	7.85E-09	1.56E-07	4.40E-06	1.50E-07	1.26E+01	5.14E+02	9.30E+02	1.07E+01	7.91E+00	1.47E+01	2.32E+01	9.09E-01	2.47E-01	1.39E+00	1.70E+00
stdev	4.11E-10	6.16E-09	8.82E-07	6.04E-09	4.66E-02	7.73E+00	1.20E+01	2.61E-01	2.29E-01	3.04E-01	3.04E-01	8.09E-04	1.34E-02	5.56E-03	8.45E-02
Cpk	8.11E+04	5.40E+03	3.61E+01	5.51E+03	1.84E+01	6.01E-01	3.60E+00	3.40E+00	4.23E+00	5.21E+00	1.01E+01	7.87E+01	6.31E+00	-	-

ON Semiconductor FPCN#13014

Qualification of MingXin for Case-77 Assembly Site

BUH51 DC Test Summary

Temp = 125C

Test #	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Symbol	IEBO	ICBO	ICEO	ICES	BVEBO	BVCEO	HVBCBO	HFE	HFE	HFE	HFE	VBESAT	VCESAT	VFBE	VFBC
Cond1	9.00E+00	8.00E+02	5.00E+02	8.00E+02	1.00E-03	1.00E-02	1.00E-03	1.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+00	1.00E+00	8.00E+00	8.00E+00
Cond2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+02	1.00E+03	2.00E+03	1.00E+00	2.00E+00	8.00E-01	1.00E-02	2.00E-01	2.00E-01	0.00E+00	0.00E+00
Limit	-	1.00E-03	-	1.00E-03	-	-	-	6.00E+00	4.00E+00	8.00E+00	1.80E+01	-	6.00E-01	-	-
Units	Amps	Amps	Amps	Amps	Volts	Volts	Volts	-	-	-	-	Volts	Volts	Volts	Volts

Control

min	3.00E-06	5.00E-05	1.45E-03	5.14E-05	1.30E+01	5.21E+02	1.01E+03	8.46E+00	6.27E+00	1.41E+01	2.83E+01	7.87E-01	2.59E-01	1.41E+00	1.21E+00
max	7.86E-06	1.09E-04	3.64E-03	1.11E-04	1.36E+01	5.45E+02	1.03E+03	9.02E+00	6.64E+00	1.48E+01	3.18E+01	7.92E-01	3.00E-01	1.44E+00	1.40E+00
average	4.36E-06	7.16E-05	2.31E-03	7.33E-05	1.35E+01	5.34E+02	1.02E+03	8.77E+00	6.47E+00	1.44E+01	2.96E+01	7.90E-01	2.66E-01	1.42E+00	1.26E+00
stdev	1.05E-06	1.25E-05	6.28E-04	1.27E-05	1.01E-01	6.90E+00	7.08E+00	1.34E-01	1.08E-01	1.75E-01	9.37E-01	1.39E-03	8.05E-03	8.11E-03	4.06E-02
Cpk	-	2.47E+01	-	2.43E+01	-	-	-	6.92E+00	7.64E+00	1.21E+01	4.13E+00	-	1.38E+01	-	-

Test Lot 1

min	1.28E-07	1.08E-05	1.31E-04	1.09E-05	1.35E+01	5.22E+02	9.90E+02	7.67E+00	5.57E+00	1.33E+01	2.98E+01	7.88E-01	2.50E-01	1.40E+00	1.22E+00
max	1.13E-06	1.99E-04	5.72E-04	1.91E-04	1.37E+01	5.55E+02	1.05E+03	9.56E+00	7.06E+00	1.54E+01	3.26E+01	8.95E-01	3.11E-01	1.87E+00	1.79E+00
average	2.36E-07	2.60E-05	2.09E-04	2.60E-05	1.36E+01	5.37E+02	1.01E+03	9.04E+00	6.64E+00	1.48E+01	3.11E+01	7.97E-01	2.63E-01	1.42E+00	1.33E+00
stdev	1.75E-07	3.69E-05	8.95E-05	3.54E-05	3.35E-02	7.74E+00	1.52E+01	4.42E-01	3.50E-01	4.60E-01	7.78E-01	1.86E-02	1.44E-02	8.41E-02	9.38E-02
Cpk	-	8.80E+00	-	9.16E+00	-	-	-	2.29E+00	2.52E+00	4.92E+00	5.59E+00	-	7.79E+00	-	-

Test Lot 2

min	1.00E-07	2.80E-06	9.40E-05	2.79E-06	1.35E+01	5.21E+02	9.73E+02	8.13E+00	5.89E+00	1.37E+01	2.99E+01	7.87E-01	2.50E-01	1.40E+00	1.21E+00
max	2.64E-07	7.05E-06	2.39E-04	7.09E-06	1.36E+01	5.61E+02	1.06E+03	9.56E+00	7.05E+00	1.55E+01	3.32E+01	7.96E-01	2.86E-01	1.42E+00	1.36E+00
average	1.49E-07	4.38E-06	1.52E-04	4.38E-06	1.35E+01	5.39E+02	1.02E+03	8.96E+00	6.58E+00	1.46E+01	3.12E+01	7.91E-01	2.62E-01	1.41E+00	1.30E+00
stdev	3.49E-08	9.03E-07	3.48E-05	9.20E-07	5.33E-02	9.76E+00	1.91E+01	3.96E-01	3.27E-01	4.20E-01	9.33E-01	2.26E-03	1.11E-02	6.84E-03	4.82E-02
Cpk	-	3.68E+02	-	3.61E+02	-	-	-	2.50E+00	2.63E+00	5.28E+00	4.70E+00	-	1.01E+01	-	-

Test Lot 3

min	1.22E-07	2.57E-06	8.08E-05	2.54E-06	1.35E+01	5.21E+02	9.92E+02	7.90E+00	5.69E+00	1.35E+01	3.05E+01	7.86E-01	2.52E-01	1.39E+00	1.20E+00
max	3.32E-07	9.85E-06	3.47E-04	9.99E-06	1.36E+01	5.61E+02	1.06E+03	9.30E+00	6.86E+00	1.53E+01	3.34E+01	7.90E-01	2.86E-01	1.41E+00	1.43E+00
average	2.45E-07	6.95E-06	2.69E-04	7.02E-06	1.35E+01	5.35E+02	1.01E+03	8.96E+00	6.56E+00	1.47E+01	3.18E+01	7.88E-01	2.61E-01	1.40E+00	1.29E+00
stdev	4.17E-08	1.31E-06	4.93E-05	1.34E-06	3.61E-02	8.35E+00	1.39E+01	2.85E-01	2.35E-01	3.68E-01	8.83E-01	1.19E-03	7.70E-03	4.52E-03	4.39E-02
Cpk	-	2.53E+02	-	2.46E+02	-	-	-	3.46E+00	3.63E+00	6.10E+00	5.20E+00	-	1.47E+01	-	-

ON Semiconductor FPCN#13014

Qualification of MingXin for Case-77 Assembly Site

BUH51 ESD, Capacitance, & Delta V_{BE} Summary

ESD Results (Ratings)

	Human Body*	Machine**
Control	3B, >8000V	C, >400V
Test Lot 1	3B, >8000V	C, >400V
Test Lot 2	3B, >8000V	C, >400V
Test Lot 3	3B, >8000V	C, >400V

* all parts passed 16000V

** all parts passed 1600V

Capacitance, Cob
V_{EB} = 10 Vdc, f = 1 MHz
s.s. 15 pcs/lot
Limit: 100pF

Lot #	Control	Test lot 1	Test Lot 2	Test Lot 3
unit	pF	pF	pF	pF
min	30.42	30.32	29.99	30.31
max	30.88	30.78	30.44	30.67
average	30.71	30.45	30.24	30.52
stdev	0.14	0.12	0.11	0.11
Cpk	171	190	212	204

Capacitance, Cib
V_{EB} = 8 Vdc, f = 1 MHz
s.s. 15 pcs/lot
Limit: 500pF

Lot #	Control	Test lot 1	Test Lot 2	Test Lot 3
unit	pF	pF	pF	pF
min	167.96	165.70	166.86	169.30
max	171.40	169.70	173.40	173.23
average	170.04	166.99	169.34	170.94
stdev	1.03	1.18	1.84	1.34
Cpk	107	94	60	82

Delta V_{BE}
I_E = 2A, V_{CB} = 20V, I_m = 20mA, tp = 100mSec, Td = 100uSec
s.s. 30 pcs/lot

Lot #	Control	Test Lot 1	Test Lot 2	Test Lot 3
unit	mV	mV	mV	mV
min	273	266	265	270
max	315	278	275	279
avrg	289.1	271.5	270.1	274
stdev	12.3	3.7	2.3	2.7

ON Semiconductor FPCN#13014

Qualification of MingXin for Case-77 Assembly Site

MJE350 DC Test Summary

Temp = 25C

Test #	2	3	4	5	6	7	8	9	10
Symbol	IEBO	ICBO	ICEO	BVEBO	BVCEO	HFE	HFE	VFBE	VFBC
Cond1	3.00E+00	3.00E+02	3.00E+02	1.00E-04	1.00E-03	1.00E+01	1.00E+01	4.00E+00	4.00E+00
Cond2	0.00E+00	0.00E+00	0.00E+00	1.00E+02	6.00E+02	5.00E-02	5.00E-02	0.00E+00	0.00E+00
Limit	1.00E-04	1.00E-04	-	3.00E+00	3.00E+02	3.00E+01	2.40E+02	-	-
Units	Amps	Amps	Amps	Volts	Volts	-	-	Volts	Volts

Control

min	2.08E-11	1.10E-09	6.29E-10	1.30E+01	3.88E+02	1.28E+02	1.28E+02	1.49E+00	1.46E+00
max	3.04E-10	1.84E-09	1.62E-09	1.32E+01	4.20E+02	1.36E+02	1.36E+02	1.52E+00	1.52E+00
average	1.70E-10	1.43E-09	9.03E-10	1.31E+01	4.07E+02	1.33E+02	1.33E+02	1.50E+00	1.49E+00
stdev	6.19E-11	1.82E-10	2.36E-10	5.04E-02	9.59E+00	2.18E+00	2.18E+00	6.09E-03	1.49E-02
Cpk	5.38E+05	1.83E+05	-	6.67E+01	3.73E+00	1.57E+01	1.64E+01	-	-

Test Lot 1

min	2.27E-11	1.10E-09	1.69E-10	1.30E+01	4.09E+02	1.26E+02	1.26E+02	1.49E+00	1.56E+00
max	3.07E-10	2.03E-09	2.83E-09	1.31E+01	4.30E+02	1.36E+02	1.36E+02	1.50E+00	1.60E+00
average	1.77E-10	1.47E-09	1.71E-09	1.31E+01	4.24E+02	1.31E+02	1.31E+02	1.49E+00	1.58E+00
stdev	6.70E-11	2.35E-10	6.32E-10	4.70E-02	6.29E+00	3.16E+00	3.16E+00	4.04E-03	1.18E-02
Cpk	4.97E+05	1.42E+05	-	7.14E+01	6.56E+00	1.06E+01	1.15E+01	-	-

Test Lot 2

min	7.53E-11	1.23E-09	7.61E-10	1.30E+01	3.99E+02	1.29E+02	1.29E+02	1.48E+00	1.54E+00
max	2.87E-10	2.54E-09	3.06E-09	1.32E+01	4.25E+02	1.39E+02	1.39E+02	1.51E+00	1.60E+00
average	1.71E-10	1.56E-09	1.71E-09	1.31E+01	4.10E+02	1.34E+02	1.34E+02	1.49E+00	1.58E+00
stdev	5.82E-11	2.54E-10	5.10E-10	4.66E-02	7.81E+00	2.49E+00	2.49E+00	6.16E-03	1.35E-02
Cpk	5.73E+05	1.31E+05	-	7.20E+01	4.69E+00	1.39E+01	1.42E+01	-	-

Test Lot 3

min	2.14E-11	1.07E-09	5.48E-10	1.29E+01	4.07E+02	1.27E+02	1.27E+02	1.49E+00	1.49E+00
max	3.13E-10	2.26E-09	3.17E-09	1.31E+01	4.26E+02	1.34E+02	1.34E+02	1.50E+00	1.60E+00
average	1.73E-10	1.45E-09	1.84E-09	1.30E+01	4.19E+02	1.31E+02	1.31E+02	1.49E+00	1.54E+00
stdev	7.03E-11	2.35E-10	7.38E-10	4.32E-02	5.43E+00	1.97E+00	1.97E+00	4.92E-03	3.20E-02
Cpk	4.74E+05	1.42E+05	-	7.71E+01	7.29E+00	1.71E+01	1.84E+01	-	-

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Qualification of MingXin for Case-77 Assembly Site

MJE350 DC Test Summary

Temp = - 40C

Test #	2	3	4	5	6	7	8	9	10
Symbol	IEBO	ICBO	ICEO	BVEBO	BVCEO	HFE	HFE	VFBE	VFBC
Cond1	3.00E+00	3.00E+02	3.00E+02	1.00E-04	1.00E-03	1.00E+01	1.00E+01	4.00E+00	4.00E+00
Cond2	0.00E+00	0.00E+00	0.00E+00	1.00E+02	6.00E+02	5.00E-02	5.00E-02	0.00E+00	0.00E+00
Limit	-	-	-	3.00E+00	3.00E+02	-	-	-	-
Units	Amps	Amps	Amps	Volts	Volts	-	-	Volts	Volts

Control

min	9.90E-12	2.59E-10	2.44E-10	1.24E+01	3.78E+02	8.10E+01	8.10E+01	1.51E+00	1.56E+00
max	7.41E-10	1.45E-09	3.10E-09	1.26E+01	4.08E+02	8.69E+01	8.69E+01	1.66E+00	1.76E+00
average	2.13E-10	6.34E-10	1.76E-09	1.25E+01	3.97E+02	8.43E+01	8.43E+01	1.52E+00	1.61E+00
stdev	1.41E-10	3.42E-10	7.83E-10	4.72E-02	9.24E+00	1.68E+00	1.68E+00	2.71E-02	3.24E-02
Cpk	-	-	-	6.69E+01	3.48E+00	-	-	-	-

Test Lot 1

min	9.16E-11	2.91E-10	4.81E-10	1.23E+01	3.97E+02	7.78E+01	7.78E+01	1.51E+00	1.67E+00
max	3.24E-10	1.36E-09	3.04E-09	1.25E+01	4.18E+02	8.42E+01	8.42E+01	1.53E+00	1.73E+00
average	1.79E-10	7.05E-10	1.71E-09	1.24E+01	4.12E+02	8.10E+01	8.10E+01	1.52E+00	1.70E+00
stdev	6.41E-11	2.90E-10	6.92E-10	4.49E-02	6.04E+00	1.96E+00	1.96E+00	4.16E-03	1.44E-02
Cpk	-	-	-	6.97E+01	6.18E+00	-	-	-	-

Test Lot 2

min	9.30E-12	3.07E-10	7.41E-10	1.23E+01	3.79E+02	7.95E+01	7.95E+01	1.50E+00	1.66E+00
max	7.11E-10	1.62E-09	3.10E-09	1.25E+01	4.14E+02	8.75E+01	8.75E+01	1.53E+00	1.73E+00
average	1.68E-10	7.21E-10	1.85E-09	1.24E+01	3.98E+02	8.31E+01	8.31E+01	1.51E+00	1.70E+00
stdev	1.24E-10	3.25E-10	6.03E-10	4.89E-02	8.28E+00	1.76E+00	1.76E+00	5.92E-03	1.59E-02
Cpk	-	-	-	6.43E+01	3.96E+00	-	-	-	-

Test Lot 3

min	4.96E-11	2.41E-10	7.01E-10	1.23E+01	3.96E+02	7.73E+01	7.73E+01	1.51E+00	1.60E+00
max	9.15E-10	1.79E-09	3.36E-09	1.24E+01	4.14E+02	8.31E+01	8.31E+01	1.53E+00	1.73E+00
average	1.86E-10	6.64E-10	1.82E-09	1.24E+01	4.07E+02	8.08E+01	8.08E+01	1.52E+00	1.66E+00
stdev	1.51E-10	3.70E-10	7.08E-10	3.92E-02	5.20E+00	1.56E+00	1.56E+00	5.05E-03	3.87E-02
Cpk	-	-	-	7.96E+01	6.88E+00	-	-	-	-

ON Semiconductor FPCN#13014

Qualification of MingXin for Case-77 Assembly Site

MJE350 DC Test Summary

Temp = 125C

Test #	2	3	4	5	6	7	8	9	10
Symbol	IEBO	ICBO	ICEO	BVEBO	BVCEO	HFE	HFE	VFBE	VFBC
Cond1	3.00E+00	3.00E+02	3.00E+02	1.00E-04	1.00E-03	1.00E+01	1.00E+01	4.00E+00	4.00E+00
Cond2	0.00E+00	0.00E+00	0.00E+00	1.00E+02	6.00E+02	5.00E-02	5.00E-02	0.00E+00	0.00E+00
Limit	-	-	-	3.00E+00	3.00E+02	-	-	-	-
Units	Amps	Amps	Amps	Volts	Volts	-	-	Volts	Volts

Control

min	1.95E-08	2.96E-07	6.84E-05	1.39E+01	3.97E+02	1.92E+02	1.92E+02	1.49E+00	1.30E+00
max	3.59E-08	4.21E-07	1.07E-04	1.41E+01	4.29E+02	2.07E+02	2.07E+02	1.52E+00	1.34E+00
average	2.78E-08	3.48E-07	8.63E-05	1.40E+01	4.17E+02	2.01E+02	2.01E+02	1.50E+00	1.32E+00
stdev	3.67E-09	2.83E-08	8.09E-06	5.81E-02	9.54E+00	3.78E+00	3.78E+00	6.37E-03	8.07E-03
Cpk	-	-	-	6.33E+01	4.07E+00	-	-	-	-

Test Lot 1

min	1.67E-08	2.40E-07	5.68E-05	1.39E+01	4.17E+02	1.85E+02	1.85E+02	1.49E+00	1.36E+00
max	3.36E-08	3.97E-07	9.61E-05	1.41E+01	4.40E+02	2.04E+02	2.04E+02	1.51E+00	1.39E+00
average	2.41E-08	3.23E-07	7.48E-05	1.40E+01	4.33E+02	1.95E+02	1.95E+02	1.50E+00	1.38E+00
stdev	4.22E-09	3.84E-08	9.71E-06	5.65E-02	6.53E+00	4.85E+00	4.85E+00	4.19E-03	7.40E-03
Cpk	-	-	-	6.48E+01	6.80E+00	-	-	-	-

Test Lot 2

min	2.35E-08	3.20E-07	7.88E-05	1.39E+01	4.08E+02	1.93E+02	1.93E+02	1.48E+00	1.34E+00
max	3.73E-08	4.21E-07	1.06E-04	1.41E+01	4.35E+02	2.06E+02	2.06E+02	1.51E+00	1.39E+00
average	2.88E-08	3.65E-07	8.99E-05	1.40E+01	4.19E+02	2.01E+02	2.01E+02	1.49E+00	1.37E+00
stdev	3.54E-09	2.77E-08	7.13E-06	5.27E-02	7.77E+00	3.57E+00	3.57E+00	7.02E-03	1.01E-02
Cpk	-	-	-	6.98E+01	5.09E+00	-	-	-	-

Test Lot 3

min	2.51E-08	3.11E-07	7.43E-05	1.39E+01	4.16E+02	1.91E+02	1.91E+02	1.49E+00	1.32E+00
max	3.79E-08	4.04E-07	9.81E-05	1.40E+01	4.35E+02	2.00E+02	2.00E+02	1.51E+00	1.37E+00
average	3.09E-08	3.61E-07	8.62E-05	1.39E+01	4.28E+02	1.96E+02	1.96E+02	1.50E+00	1.35E+00
stdev	3.17E-09	2.29E-08	6.12E-06	4.80E-02	5.54E+00	2.71E+00	2.71E+00	5.79E-03	1.45E-02
Cpk	-	-	-	7.60E+01	7.70E+00	-	-	-	-

ON Semiconductor FPCN#13014

Qualification of MingXin for Case-77 Assembly Site

MJE350 DC Test Summary

Temp = 150C

Test #	2	3	4	5	6	7	8	9	10
Symbol	IEBO	ICBO	ICEO	BVEBO	BVCEO	HFE	HFE	VFBE	VFBC
Cond1	3.00E+00	3.00E+02	3.00E+02	1.00E-04	1.00E-03	1.00E+01	1.00E+01	4.00E+00	4.00E+00
Cond2	0.00E+00	0.00E+00	0.00E+00	1.00E+02	6.00E+02	5.00E-02	5.00E-02	0.00E+00	0.00E+00
Limit	-	-	-	3.00E+00	3.00E+02	-	-	-	-
Units	Amps	Amps	Amps	Volts	Volts	-	-	Volts	Volts

Control

min	2.01E-07	1.27E-06	3.49E-04	1.42E+01	3.81E+02	2.08E+02	2.08E+02	1.50E+00	1.27E+00
max	3.22E-07	1.64E-06	4.96E-04	1.44E+01	4.08E+02	2.23E+02	2.23E+02	1.54E+00	1.32E+00
average	2.61E-07	1.46E-06	4.21E-04	1.43E+01	3.97E+02	2.17E+02	2.17E+02	1.51E+00	1.28E+00
stdev	2.59E-08	9.13E-08	3.19E-05	5.79E-02	7.90E+00	3.50E+00	3.50E+00	8.40E-03	9.46E-03
Cpk	-	-	-	6.50E+01	4.08E+00	-	-	-	-

Test Lot 1

min	1.60E-07	1.04E-06	2.77E-04	1.41E+01	3.97E+02	1.98E+02	1.98E+02	1.50E+00	1.31E+00
max	2.96E-07	1.67E-06	4.58E-04	1.43E+01	4.28E+02	2.17E+02	2.17E+02	1.51E+00	1.33E+00
average	2.24E-07	1.35E-06	3.61E-04	1.42E+01	4.17E+02	2.07E+02	2.07E+02	1.51E+00	1.33E+00
stdev	3.54E-08	1.54E-07	4.56E-05	5.61E-02	6.96E+00	5.02E+00	5.02E+00	4.22E-03	4.97E-03
Cpk	-	-	-	6.66E+01	5.61E+00	-	-	-	-

Test Lot 2

min	2.43E-07	1.41E-06	3.93E-04	1.42E+01	3.87E+02	2.06E+02	2.06E+02	1.49E+00	1.30E+00
max	3.25E-07	1.74E-06	4.98E-04	1.44E+01	4.11E+02	2.21E+02	2.21E+02	1.52E+00	1.34E+00
average	2.79E-07	1.57E-06	4.45E-04	1.43E+01	3.97E+02	2.14E+02	2.14E+02	1.50E+00	1.32E+00
stdev	2.02E-08	8.28E-08	2.43E-05	5.32E-02	6.90E+00	3.79E+00	3.79E+00	7.03E-03	8.16E-03
Cpk	-	-	-	7.05E+01	4.70E+00	-	-	-	-

Test Lot 3

min	2.10E-07	1.23E-06	3.33E-04	1.41E+01	3.97E+02	2.03E+02	2.03E+02	1.49E+00	1.29E+00
max	3.21E-07	1.68E-06	4.65E-04	1.42E+01	4.18E+02	2.12E+02	2.12E+02	1.51E+00	1.32E+00
average	2.59E-07	1.46E-06	3.93E-04	1.41E+01	4.10E+02	2.08E+02	2.08E+02	1.50E+00	1.31E+00
stdev	2.73E-08	1.10E-07	3.25E-05	4.96E-02	5.54E+00	2.83E+00	2.83E+00	6.00E-03	9.04E-03
Cpk	-	-	-	7.50E+01	6.61E+00	-	-	-	-

ON Semiconductor FPCN#13014

Qualification of MingXin for Case-77 Assembly Site

MJE350 ESD, Capacitance, & Delta V_{BE} Summary

ESD Results (Ratings)

	Human Body	Machine
Control	2	C
Test Lot 1	2	C
Test Lot 2	2	C
Test Lot 3	2	C

Capacitance
V_{EB} = 10 Vdc, f = 1 MHz
s.s. 10 pcs/lot

Lot #	Control	Test lot 1	Test Lot 2	Test Lot 3
unit	pF	pF	pF	pF
min	23.61	22.16	24.18	24.71
max	25.55	24.73	26.54	25.20
average	24.35	24.11	25.53	24.85
stdev	0.68	0.74	0.81	0.15

Delta V_{BE}
I_E = 0.4A, V_{CB} = 50V, I_m = 20mA, t_p = 100mSec, T_d = 100uSec
s.s. 25 pcs/lot

Lot #	Control	Test Lot 1	Test Lot 2	Test Lot 3
unit	mV	mV	mV	mV
min	234	220	224	223
max	252	232	239	240
avrg	240.6	226.4	230.7	230.3
stdev	4.3	3.7	3.7	3.9