

## Introduction

The MachXO™ family is designed to provide migration between different density devices in the same package. However, with devices in the 100 TQFP package it is not possible to migrate across the whole density range. In the 100 TQFP package designs can migrate between the MachXO256 and MachXO640 and between the MachXO1200 and MachXO2280. ALL other packages support density migration across the FULL density spanned by the package. (See the note below regarding  $V_{CCIO}$  and GND for 100 csBGA and 100 TQFP packages.) Table 1 highlights the density migration possibilities within the MachXO family.

The number of I/O banks increases going from the MachXO256 device to the MachXO640 device. Consequently, the number of  $V_{CCIO}$  and GND I/O pins in the 100 TQFP and 100 csBGA packages change. As a result, when migrating from smaller devices to larger devices the number of I/Os decreases slightly. System designers need to reserve a few I/O pins to route the  $V_{CCIO}$  and GND pins needed to migrate from the smaller to a larger device.

**Table 1. MachXO Number of I/O and Density Migration Capabilities**

	MachXO256	MachXO640	MachXO1200	MachXO2280
TQFP 100	78	74	73	73
TQFP 144		113	113	113
csBGA 100	78	74		
csBGA 132		101	101	101
ftBGA 256		159 <sup>1</sup>	211	211
ftBGA 324				271

1. fpBGA

## Density Migration Detail

The tables below provide the pin mapping detail for density migration within the same package. The tables show the pins that are mapped to different functions such as I/O,  $V_{CCIO}$  or GNDIO. Unlisted pins are mapped to the same functions in different density devices. Refer to the MachXO Family Data Sheet for complete pinout tables.

**MachXO640 and MachXO256 Migration for 100 TQFP**

100 TQFP	MachXO640	MachXO256
10	VCCIO3	VCCIO1
12	GNDIO3	GNDIO1
24	VCCIO3	VCCIO1
25	GNDIO3	GNDIO1
29	VCCIO2	I/O
30	GNDIO2	I/O
41	VCCIO2	VCCIO1
42	GNDIO2	GNDIO1
60	VCCIO1	VCCIO0
62	GNDIO1	GNDIO0
74	VCCIO1	VCCIO0
75	GNDIO1	GNDIO0
80	VCCIO0	I/O
81	GNDIO0	I/O
92	VCCIO0	VCCIO0
93	GNDIO0	GNDIO0

**MachXO2280 and MachXO1200 Migration for 100 TQFP**

These devices are fully compatible in the 100 TQFP package.

**MachXO640 and MachXO256 Migration for 100 csBGA**

100 csBGA	MachXO640	MachXO256
G1	VCCIO3	VCCIO1
H1	GNDIO3	GNDIO1
P1	VCCIO3	VCCIO1
N2	GNDIO3	GNDIO1
P4	VCCIO2	I/O
N3	GNDIO2	I/O
P10	VCCIO2	VCCIO1
N10	GNDIO2	GNDIO1
H14	VCCIO1	VCCIO0
G14	GNDIO1	GNDIO0
A14	VCCIO1	VCCIO0
B13	GNDIO1	GNDIO0
B12	VCCIO0	I/O
A10	GNDIO0	I/O

**MachXO2280, 1200 and 640 Migration for 144 TQFP**

144 TQFP	MachXO2280	MachXO1200	MachXO640
10	VCCIO7	VCCIO7	VCCIO3
11	GNDIO7	GNDIO7	GNDIO3
26	VCCIO6	VCCIO6	VCCIO3
27	GNDIO6	GNDIO6	GNDIO3
37	GNDIO5	GNDIO5	GNDIO2
38	VCCIO5	VCCIO5	VCCIO2
63	VCCIO4	VCCIO4	VCCIO2
64	GNDIO4	GNDIO4	GNDIO2
82	VCCIO3	VCCIO3	VCCIO1
83	GNDIO3	GNDIO3	GNDIO1
98	VCCIO2	VCCIO2	VCCIO1
99	GNDIO2	GNDIO2	GNDIO1
117	VCCIO1	VCCIO1	VCCIO0
118	GNDIO1	GNDIO1	GNDIO0

**MachXO2280, 1200 and 640 Migration for 132 csBGA**

132 csBGA	MachXO2280	MachXO1200	MachXO640
D2	VCCIO7	VCCIO7	VCCIO3
E1	GNDIO7	GNDIO7	GNDIO3
K3	VCCIO6	VCCIO6	VCCIO3
L2	GNDIO6	GNDIO6	GNDIO3
P2	GNDIO5	GNDIO5	GNDIO2
N2	VCCIO5	VCCIO5	VCCIO2
M10	VCCIO4	VCCIO4	VCCIO2
N11	GNDIO4	GNDIO4	GNDIO2
L12	VCCIO3	VCCIO3	VCCIO1
L13	GNDIO3	GNDIO3	GNDIO1
E12	VCCIO2	VCCIO2	VCCIO1
D13	GNDIO2	GNDIO2	GNDIO1
B11	VCCIO1	VCCIO1	VCCIO0
A10	GNDIO1	GNDIO1	GNDIO0

**MachXO2280, 1200 and 640 Migration for 256 ft/ftBGA**

256 fp/ftBGA	MachXO2280	MachXO1200	MachXO640
H6	VCCIO7	VCCIO7	VCCIO3
G6	VCCIO7	VCCIO7	VCCIO3
K6	VCCIO6	VCCIO6	VCCIO3
J6	VCCIO6	VCCIO6	VCCIO3
L8	VCCIO5	VCCIO5	VCCIO2
L7	VCCIO5	VCCIO5	VCCIO2
L9	VCCIO4	VCCIO4	VCCIO2
L10	VCCIO4	VCCIO4	VCCIO2
K11	VCCIO3	VCCIO3	VCCIO1
J11	VCCIO3	VCCIO3	VCCIO1
H11	VCCIO2	VCCIO2	VCCIO1
G11	VCCIO2	VCCIO2	VCCIO1
F9	VCCIO1	VCCIO1	VCCIO0
F10	VCCIO1	VCCIO1	VCCIO0
F8	VCCIO0	VCCIO0	VCCIO0
F7	VCCIO0	VCCIO0	VCCIO0
E4	I/O	I/O	NC
E5	I/O	I/O	NC
F5	I/O	I/O	NC
F6	I/O	I/O	NC
C3	I/O	I/O	NC
C2	I/O	I/O	NC
G4	I/O	I/O	NC
G5	I/O	I/O	NC
H4	I/O	I/O	NC
H5	I/O	I/O	NC
K5	I/O	I/O	NC
K4	I/O	I/O	NC
M5	I/O	I/O	NC
M4	I/O	I/O	NC
P2	I/O	I/O	NC
P3	I/O	I/O	NC
N5	I/O	I/O	NC
N6	I/O	I/O	NC

256 fp/ftBGA	MachXO2280	MachXO1200	MachXO640
M7	I/O	I/O	NC
M8	I/O	I/O	NC
N10	I/O	I/O	NC
N11	I/O	I/O	NC
R15	I/O	I/O	NC
R16	I/O	I/O	NC
P15	I/O	I/O	NC
P16	I/O	I/O	NC
M11	I/O	I/O	NC
L11	I/O	I/O	NC
N12	I/O	I/O	NC
N13	I/O	I/O	NC
M13	I/O	I/O	NC
M12	I/O	I/O	NC
K12	I/O	I/O	NC
J12	I/O	I/O	NC
F12	I/O	I/O	NC
F13	I/O	I/O	NC
E12	I/O	I/O	NC
E13	I/O	I/O	NC
D13	I/O	I/O	NC
D14	I/O	I/O	NC
B15	I/O	I/O	NC
A15	I/O	I/O	NC
C14	I/O	I/O	NC
B14	I/O	I/O	NC
E11	I/O	I/O	NC
E10	I/O	I/O	NC
E6	I/O	I/O	NC
E7	I/O	I/O	NC
D4	I/O	I/O	NC
D3	I/O	I/O	NC
B3	I/O	I/O	NC
B2	I/O	I/O	NC

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