

Data Sheet Addendum

DATE: August 1996

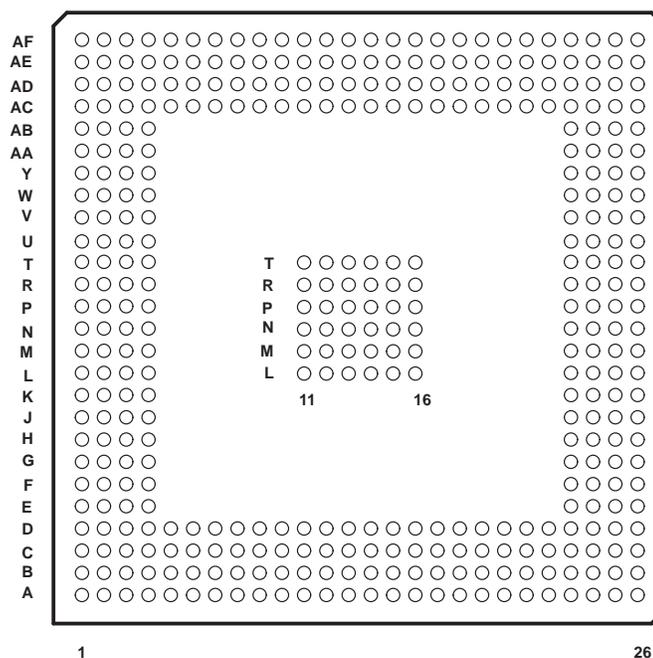
Document Addendum: GFW Plastic Ball Grid Array Package

This addendum is being added to the TMS320C44 Digital Signal Processor Data Sheet.

Literature Number Being Updated: SPRS031B

This Data Sheet Addendum (SPRU177) ships with the TMS320C44 Digital Signal Processor Data Sheet.

Documentation Addendum



**Figure 1. TMS320C44 GFW Package Pin Detail
(Bottom View)**

- NOTES:
- N/C = No connection to this frame pin
 - Numbers around the detail in Figure 1 are ball pin numbers.
 - V_{SS} ground potential ring is connected to the BGA ball pins as listed:
A1, A2, A26, B2, B25, B26, C3, C24, D4, D9, D14, D19, D23, E2 [$V_{(SUB)}$] H4, J23, L11–L16, M11–M16, N4, P23, V4, W23, AC4, AC8, AC13, AC18, AC23, AD3, AD24, AE1, AE2, AE25, AF1, AF25, AF26. (The following V_{SS} pins are also thermal connections)
L11 – L16, T11 – T16, M11 – M16, N11 – N16, P11 – P16, R11 – R16.
 - V_{DD} power potential ring is connected to the BGA ball pins as listed:
D6, D11, D16, D21, F4, F23, L4, L23, T4, T23, AA4, AA23, AC6, AC11, AC16, AC21.

TMS320C44 GFW Package Pin Assignments Numerical Listing by Ball Pin Number

BALL PIN		BALL PIN		BALL PIN		BALL PIN	
NUMBER	FUNCTION	NUMBER	FUNCTION	NUMBER	FUNCTION	NUMBER	FUNCTION
A1	V _{SS}	B17	LD13	D7	N/C	G25	N/C
A2	V _{SS}	B18	N/C	D8	A15	G26	N/C
A3	N/C	B19	LD16	D9	V _{SS}	H1	N/C
A4	A7	B20	LD19	D10	A21	H2	D22
A5	N/C	B21	N/C	D11	V _{DD}	H3	D21
A6	N/C	B22	LD25	D12	N/C	H4	V _{SS}
A7	A14	B23	LD27	D13	N/C	H23	LA11
A8	A18	B24	LD29	D14	V _{SS}	H24	LA10
A9	N/C	B25	V _{SS}	D15	LD6	H25	LA13
A10	A22	B26	V _{SS}	D16	V _{DD}	H26	LA12
A11	N/C	C1	A1	D17	N/C	J1	D19
A12	LD1	C2	A2	D18	N/C	J2	D20
A13	N/C	C3	V _{SS}	D19	V _{SS}	J3	D17
A14	N/C	C4	A4	D20	N/C	J4	N/C
A15	LD9	C5	A6	D21	V _{DD}	J23	V _{SS}
A16	N/C	C6	A10	D22	LD24	J24	N/C
A17	LD11	C7	N/C	D23	V _{SS}	J25	LA16
A18	LD14	C8	A13	D24	N/C	J26	LA14
A19	LD15	C9	A17	D25	LA3	K1	D16
A20	LD18	C10	A19	D26	LA1	K2	D18
A21	LD20	C11	A23	E1	D29	K3	N/C
A22	LD22	C12	N/C	E2	V _(SUB)	K4	N/C
A23	N/C	C13	LD2	E3	D30	K23	LA17
A24	LD28	C14	LD4	E4	D31	K24	LA15
A25	LD30	C15	LD5	E23	LA2	K25	N/C
A26	V _{SS}	C16	LD8	E24	LA0	K26	LA18
B1	A3	C17	N/C	E25	LA5	L1	D14
B2	V _{SS}	C18	LD12	E26	LA4	L2	D15
B3	A5	C19	N/C	F1	N/C	L3	D12
B4	A9	C20	LD17	F2	D28	L4	V _{DD}
B5	A11	C21	LD21	F3	D26	L11	V _{SS} [†]
B6	A12	C22	LD23	F4	V _{DD}	L12	V _{SS} [†]
B7	A16	C23	LD26	F23	V _{DD}	L13	V _{SS} [†]
B8	N/C	C24	V _{SS}	F24	N/C	L14	V _{SS} [†]
B9	A20	C25	N/C	F25	LA9	L15	V _{SS} [†]
B10	N/C	C26	LD31	F26	LA7	L16	V _{SS} [†]
B11	LD0	D1	N/C	G1	D24	L23	V _{DD}
B12	LD3	D2	A0	G2	D25	L24	LA19
B13	N/C	D3	N/C	G3	D23	L25	LA23
B14	LD7	D4	V _{SS}	G4	D27	L26	LA21
B15	LD10	D5	A8	G23	LA8	M1	N/C
B16	N/C	D6	V _{DD}	G24	LA6	M2	D13

† Thermal connection

**TMS320C44 GFW Package Pin Assignments Numerical
Listing by Ball Pin Number (Continued)**

BALL PIN		BALL PIN		BALL PIN		BALL PIN	
NUMBER	FUNCTION	NUMBER	FUNCTION	NUMBER	FUNCTION	NUMBER	FUNCTION
M3	N/C	R3	D3	W1	N/C	AC11	V _{DD}
M4	D11	R4	D1	W2	C4D5	AC12	C5D3
M11	V _{SS} [†]	R11	V _{SS} [†]	W3	$\overline{\text{RDY0}}$	AC13	V _{SS}
M12	V _{SS} [†]	R12	V _{SS} [†]	W4	$\overline{\text{CE0}}$	AC14	N/C
M13	V _{SS} [†]	R13	V _{SS} [†]	W23	V _{SS}	AC15	C2D2
M14	V _{SS} [†]	R14	V _{SS} [†]	W24	$\overline{\text{LLOCK}}$	AC16	V _{DD}
M16	V _{SS} [†]	R15	V _{SS} [†]	W25	$\overline{\text{LAE}}$	AC17	N/C
M15	V _{SS} [†]	R16	V _{SS} [†]	W26	N/C	AC18	V _{SS}
M23	LA20	R23	$\overline{\text{IACK}}$	Y1	C4D3	AC19	N/C
M24	LA22	R24	H3	Y2	C4D4	AC20	$\overline{\text{CACK1}}$
M25	X2CLKIN	R25	C1D2	Y3	C4D0	AC21	V _{DD}
M26	N/C	R26	LSTAT3	Y4	$\overline{\text{DE}}$	AC22	N/C
N1	N/C	T1	D2	Y23	$\overline{\text{LRDY1}}$	AC23	V _{SS}
N2	N/C	T2	D4	Y24	N/C	AC24	$\overline{\text{LRW0}}$
N3	D7	T3	N/C	Y25	TCLK0	AC25	$\overline{\text{LSTRB0}}$
N4	V _{SS}	T4	V _{DD}	Y26	TCLK1	AC26	LPAGE0
N11	V _{SS} [†]	T11	V _{SS} [†]	AA1	C4D1	AD1	N/C
N12	V _{SS} [†]	T12	V _{SS} [†]	AA2	C4D2	AD2	N/C
N13	V _{SS} [†]	T13	V _{SS} [†]	AA3	$\overline{\text{CSTRB4}}$	AD3	V _{SS}
N14	V _{SS} [†]	T14	V _{SS} [†]	AA4	V _{DD}	AD4	PAGE1
N15	V _{SS} [†]	T15	V _{SS} [†]	AA23	V _{DD}	AD5	STAT0
N16	V _{SS} [†]	T16	V _{SS} [†]	AA24	$\overline{\text{LCE1}}$	AD6	STAT2
N23	H1	T23	V _{DD}	AA25	LPAGE1	AD7	PAGE0
N24	N/C	T24	N/C	AA26	$\overline{\text{LDE}}$	AD8	RESETLOC1
N25	N/C	T25	LSTAT1	AB1	$\overline{\text{CRDY4}}$	AD9	$\overline{\text{CSTRB5}}$
N26	N/C	T26	LSTAT2	AB2	TCK	AD10	C5D7
P1	D8	U1	N/C	AB3	TDO	AD11	N/C
P2	D10	U2	D0	AB4	TMS	AD12	N/C
P3	D5	U3	C4D6	AB23	$\overline{\text{LCE0}}$	AD13	N/C
P4	D9	U4	$\overline{\text{CE1}}$	AB24	$\overline{\text{LSTRB1}}$	AD14	C2D7
P11	V _{SS} [†]	U23	C1D4	AB25	$\overline{\text{LRDY0}}$	AD15	C2D4
P12	V _{SS} [†]	U24	C1D3	AB26	$\overline{\text{LRW1}}$	AD16	C2D1
P13	V _{SS} [†]	U25	N/C	AC1	$\overline{\text{TRST}}$	AD17	$\overline{\text{CRDY2}}$
P14	V _{SS} [†]	U26	LSTAT0	AC2	N/C	AD18	CDIR1
P15	V _{SS} [†]	V1	$\overline{\text{RDY1}}$	AC3	N/C	AD19	CDIR5
P16	V _{SS} [†]	V2	C4D7	AC4	V _{SS}	AD20	$\overline{\text{CREQ1}}$
P23	V _{SS}	V3	$\overline{\text{LOCK}}$	AC5	$\overline{\text{STRB1}}$	AD21	$\overline{\text{CRDY1}}$
P24	X1	V4	V _{SS}	AC6	V _{DD}	AD22	IIOF3
P25	C1D1	V23	C1D7	AC7	N/C	AD23	N/C
P26	C1D0	V24	C1D5	AC8	V _{SS}	AD24	V _{SS}
R1	N/C	V25	C1D6	AC9	$\overline{\text{STRB0}}$	AD25	N/C
R2	D6	V26	N/C	AC10	$\overline{\text{CACK5}}$	AD26	N/C

† Thermal connection

**TMS320C44 GFW Package Pin Assignments Numerical
Listing by Ball Pin Number (Continued)**

BALL PIN		BALL PIN		BALL PIN		BALL PIN	
NUMBER	FUNCTION	NUMBER	FUNCTION	NUMBER	FUNCTION	NUMBER	FUNCTION
AE1	V _{SS}	AE14	C5D1	AF1	V _{SS}	AF14	C5D0
AE2	V _{SS}	AE15	N/C	AF2	TD1	AF15	C2D6
AE3	EMU0	AE16	C2D5	AF3	EMU1	AF16	C2D3
AE4	$\overline{\text{CACK4}}$	AE17	N/C	AF4	$\overline{\text{CREQ4}}$	AF17	C2D0
AE5	$\overline{\text{RW1}}$	AE18	N/C	AF5	N/C	AF18	$\overline{\text{CSTRB2}}$
AE6	STAT1	AE19	$\overline{\text{CACK2}}$	AF6	N/C	AF19	$\overline{\text{CREQ2}}$
AE7	N/C	AE20	CDIR2	AF7	STAT3	AF20	CDIR4
AE8	$\overline{\text{RW0}}$	AE21	$\overline{\text{CSTRB1}}$	AF8	$\overline{\text{AE}}$	AF21	ROMEN
AE9	RESETLOC0	AE22	IIOF0	AF9	$\overline{\text{RESET}}$	AF22	IIOF1
AE10	$\overline{\text{CRDY5}}$	AE23	N/C	AF10	N/C	AF23	IIOF2
AE11	$\overline{\text{CREQ5}}$	AE24	$\overline{\text{NMI}}$	AF11	C5D6	AF24	N/C
AE12	C5D5	AE25	V _{SS}	AF12	C5D4	AF25	V _{SS}
AE13	N/C	AE26	N/C	AF13	C5D2	AF26	V _{SS}

† Thermal connection

TMS320C44 GFW Package Pin Assignments Alphabetical Listing by Ball Pin Function

BALL PIN		BALL PIN		BALL PIN		BALL PIN	
NUMBER	FUNCTION	NUMBER	FUNCTION	NUMBER	FUNCTION	NUMBER	FUNCTION
D2	A0	AA1	C4D1	P3	D5	E25	LA5
C1	A1	AA2	C4D2	R2	D6	G24	LA6
C2	A2	Y1	C4D3	N3	D7	F26	LA7
B1	A3	Y2	C4D4	P1	D8	G23	LA8
C4	A4	W2	C4D5	P4	D9	F25	LA9
B3	A5	U3	C4D6	P2	D10	H24	LA10
C5	A6	V2	C4D7	M4	D11	H23	LA11
A4	A7	AF14	C5D0	L3	D12	H26	LA12
D5	A8	AE14	C5D1	M2	D13	H25	LA13
B4	A9	AF13	C5D2	L1	D14	J26	LA14
C6	A10	AC12	C5D3	L2	D15	K24	LA15
B5	A11	AF12	C5D4	K1	D16	J25	LA16
B6	A12	AE12	C5D5	J3	D17	K23	LA17
C8	A13	AF11	C5D6	K2	D18	K26	LA18
A7	A14	AD10	C5D7	J1	D19	L24	LA19
D8	A15	AC20	$\overline{\text{CACK1}}$	J2	D20	M23	LA20
B7	A16	AE19	$\overline{\text{CACK2}}$	H3	D21	L26	LA21
C9	A17	AE4	$\overline{\text{CACK4}}$	H2	D22	M24	LA22
A8	A18	AC10	$\overline{\text{CACK5}}$	G3	D23	L25	LA23
C10	A19	AD18	CDIR1	G1	D24	W25	$\overline{\text{LAE}}$
B9	A20	AE20	CDIR2	G2	D25	AB23	$\overline{\text{LCE0}}$
D10	A21	AF20	CDIR4	F3	D26	AA24	$\overline{\text{LCE1}}$
A10	A22	AD19	CDIR5	G4	D27	B11	LD0
C11	A23	W4	$\overline{\text{CE0}}$	F2	D28	A12	LD1
AF8	$\overline{\text{AE}}$	U4	$\overline{\text{CE1}}$	E1	D29	C13	LD2
P26	C1D0	AD21	$\overline{\text{CRDY1}}$	E3	D30	B12	LD3
P25	C1D1	AD17	$\overline{\text{CRDY2}}$	E4	D31	C14	LD4
R25	C1D2	AB1	$\overline{\text{CRDY4}}$	Y4	$\overline{\text{DE}}$	C15	LD5
U24	C1D3	AE10	$\overline{\text{CRDY5}}$	AE3	EMU0	D15	LD6
U23	C1D4	AD20	$\overline{\text{CREQ1}}$	AF3	EMU1	B14	LD7
V24	C1D5	AF19	$\overline{\text{CREQ2}}$	N23	H1	C16	LD8
V25	C1D6	AF4	$\overline{\text{CREQ4}}$	R24	H3	A15	LD9
V23	C1D7	AE11	$\overline{\text{CREQ5}}$	R23	$\overline{\text{IACK}}$	B15	LD10
AF17	C2D0	AE21	$\overline{\text{CSTRB1}}$	AE22	IIOF0	A17	LD11
AD16	C2D1	AF18	$\overline{\text{CSTRB2}}$	AF22	IIOF1	C18	LD12
AC15	C2D2	AA3	$\overline{\text{CSTRB4}}$	AF23	IIOF2	B17	LD13
AF16	C2D3	AD9	$\overline{\text{CSTRB5}}$	AD22	IIOF3	A18	LD14
AD15	C2D4	U2	D0	E24	LA0	A19	LD15
AE16	C2D5	R4	D1	D26	LA1	B19	LD16
AF15	C2D6	T1	D2	E23	LA2	C20	LD17
AD14	C2D7	R3	D3	D25	LA3	A20	LD18
Y3	C4D0	T2	D4	E26	LA4	B20	LD19

† Thermal connection

**TMS320C44 GFW Package Pin Assignments
Alphabetical Listing by Ball Pin Function (Continued)**

BALL PIN		BALL PIN		BALL PIN		BALL PIN	
NUMBER	FUNCTION	NUMBER	FUNCTION	NUMBER	FUNCTION	NUMBER	FUNCTION
A21	LD20	AC7	N/C	G25	N/C	AB2	TCK
C21	LD21	AD1	N/C	G26	N/C	Y25	TCLK0
A22	LD22	AD11	N/C	H1	N/C	Y26	TCLK1
C22	LD23	AD12	N/C	J24	N/C	AF2	TD1
D22	LD24	AD13	N/C	J4	N/C	AB3	TDO
B22	LD25	AD2	N/C	K25	N/C	AB4	TMS
C23	LD26	AD23	N/C	K3	N/C	AC1	$\overline{\text{TRST}}$
B23	LD27	AD25	N/C	K4	N/C	AA23	V _{DD}
A24	LD28	AD26	N/C	M1	N/C	AA4	V _{DD}
B24	LD29	AE13	N/C	M26	N/C	AC11	V _{DD}
A25	LD30	AE15	N/C	M3	N/C	AC16	V _{DD}
C26	LD31	AE17	N/C	N1	N/C	AC21	V _{DD}
AA26	$\overline{\text{LDE}}$	AE18	N/C	N2	N/C	AC6	V _{DD}
W24	$\overline{\text{LLOCK}}$	AE23	N/C	N24	N/C	D11	V _{DD}
V3	$\overline{\text{LOCK}}$	AE26	N/C	N25	N/C	D16	V _{DD}
AC26	LPAGE0	AE7	N/C	N26	N/C	D21	V _{DD}
AA25	LPAGE1	AF10	N/C	R1	N/C	D6	V _{DD}
AB25	$\overline{\text{LRDY0}}$	AF24	N/C	T24	N/C	F23	V _{DD}
Y23	$\overline{\text{LRDY1}}$	AF5	N/C	T3	N/C	F4	V _{DD}
AC24	$\overline{\text{LRW0}}$	AF6	N/C	U1	N/C	L23	V _{DD}
AB26	$\overline{\text{LRW1}}$	B10	N/C	U25	N/C	L4	V _{DD}
U26	LSTAT0	B13	N/C	V26	N/C	T23	V _{DD}
T25	LSTAT1	B16	N/C	W1	N/C	T4	V _{DD}
T26	LSTAT2	B18	N/C	W26	N/C	A1	V _{SS}
R26	LSTAT3	B21	N/C	Y24	N/C	A2	V _{SS}
AC25	$\overline{\text{LSTRB0}}$	B8	N/C	AE24	$\overline{\text{NMI}}$	A26	V _{SS}
AB24	$\overline{\text{LSTRB1}}$	C12	N/C	AD7	PAGE0	B2	V _{SS}
A11	N/C	C17	N/C	AD4	PAGE1	B25	V _{SS}
A13	N/C	C19	N/C	W3	$\overline{\text{RDY0}}$	B26	V _{SS}
A14	N/C	C25	N/C	V1	$\overline{\text{RDY1}}$	C24	V _{SS}
A16	N/C	C7	N/C	AF9	$\overline{\text{RESET}}$	C3	V _{SS}
A23	N/C	D1	N/C	AE9	RESETLOC0	D14	V _{SS}
A3	N/C	D12	N/C	AD8	RESETLOC1	D19	V _{SS}
A5	N/C	D13	N/C	AF21	ROMEN	D23	V _{SS}
A6	N/C	D17	N/C	AE8	$\overline{\text{RW0}}$	D4	V _{SS}
A9	N/C	D18	N/C	AE5	$\overline{\text{RW1}}$	D9	V _{SS}
AC14	N/C	D20	N/C	AD5	STAT0	H4	V _{SS}
AC17	N/C	D24	N/C	AE6	STAT1	J23	V _{SS}
AC19	N/C	D3	N/C	AD6	STAT2	L11	V _{SS} [†]
AC2	N/C	D7	N/C	AF7	STAT3	L12	V _{SS} [†]
AC22	N/C	F1	N/C	AC9	$\overline{\text{STRB0}}$	L13	V _{SS} [†]
AC3	N/C	F24	N/C	AC5	$\overline{\text{STRB1}}$	L14	V _{SS} [†]

† Thermal connection

**TMS320C44 GFW Package Pin Assignments
Alphabetical Listing by Ball Pin Function (Continued)**

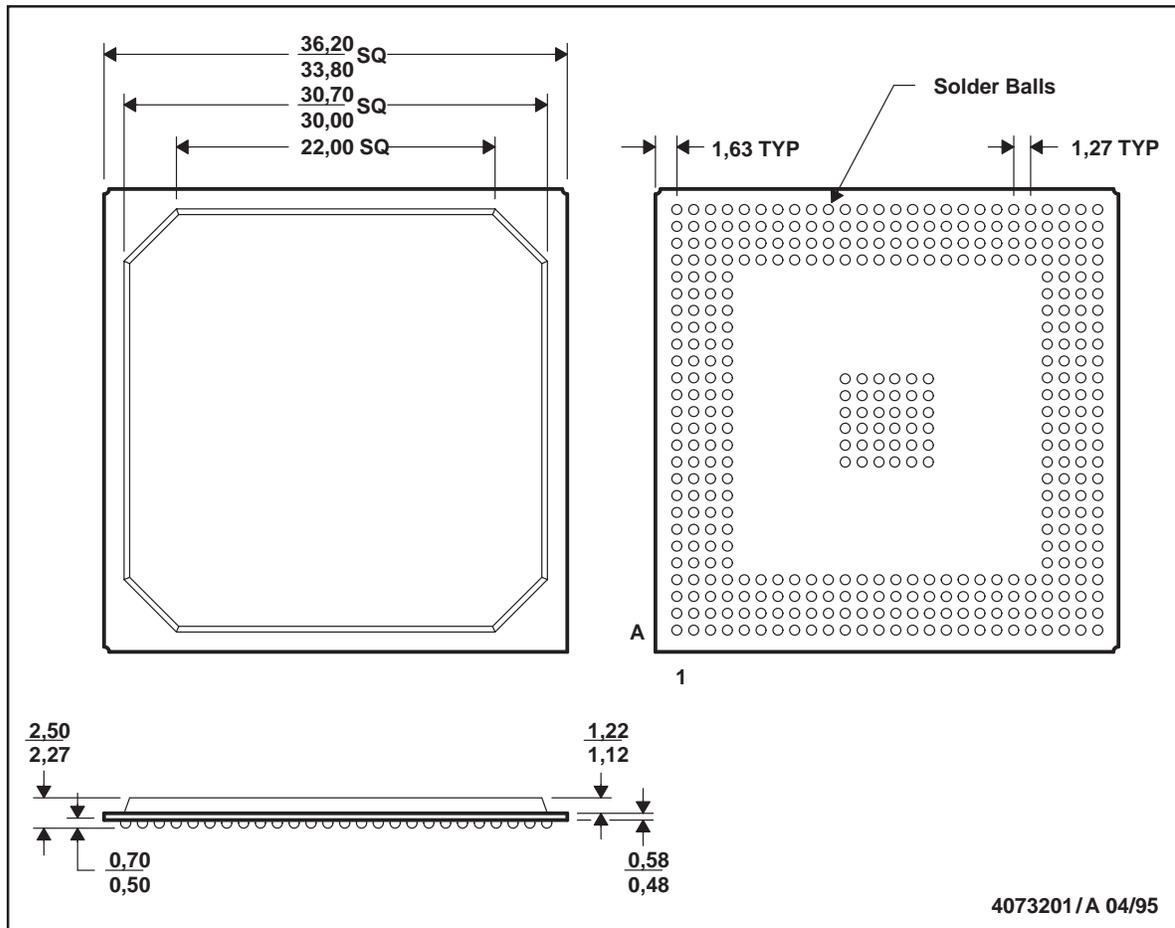
BALL PIN NUMBER FUNCTION		BALL PIN NUMBER FUNCTION		BALL PIN NUMBER FUNCTION		BALL PIN NUMBER FUNCTION	
L15	V _{SS} [†]	N4	V _{SS}	T11	V _{SS} [†]	AE1	V _{SS}
L16	V _{SS} [†]	P11	V _{SS} [†]	T12	V _{SS} [†]	AE2	V _{SS}
M11	V _{SS} [†]	P12	V _{SS} [†]	T13	V _{SS} [†]	AE25	V _{SS}
M12	V _{SS} [†]	P13	V _{SS} [†]	T14	V _{SS} [†]	AF1	V _{SS}
M13	V _{SS} [†]	P14	V _{SS} [†]	T15	V _{SS} [†]	AF25	V _{SS}
M14	V _{SS} [†]	P15	V _{SS} [†]	T16	V _{SS} [†]	AF26	V _{SS}
M15	V _{SS} [†]	P16	V _{SS} [†]	V4	V _{SS}	E2	V(SUB)
M16	V _{SS} [†]	P23	V _{SS}	W23	V _{SS}	P24	X1
N11	V _{SS} [†]	R11	V _{SS} [†]	AC4	V _{SS}	M25	X2CLKIN
N12	V _{SS} [†]	R12	V _{SS} [†]	AC8	V _{SS}		
N13	V _{SS} [†]	R13	V _{SS} [†]	AC13	V _{SS}		
N14	V _{SS} [†]	R14	V _{SS} [†]	AC18	V _{SS}		
N15	V _{SS} [†]	R15	V _{SS} [†]	AC23	V _{SS}		
N16	V _{SS} [†]	R16	V _{SS} [†]	AD24	V _{SS}		

† Thermal connection

MECHANICAL DATA

GFW (S-PBGA-N388)

PLASTIC BALL GRID ARRAY



- NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.