- **Military Operating Temperature Range –55°C to 125°C, QML Processing**
- **Fast Instruction Cycle Time of 50 ns and 40 ns**
- **Two 1K-Word × 32-Bit Single-Cycle Dual-Access On-Chip RAM Blocks**
- **32-Bit Instruction and Data Words, 24-Bit Addresses**
- **Integer, Floating-Point, and Logical Operations**
- **40- or 32-Bit Floating-Point/Integer Multiplier and Arithmetic Logic Unit (ALU)**
- **24 × 24-Bit Integer Multiplier, 32-Bit Product**
- **32 × 32-Bit Floating-Point Multiplier, 40-Bit Product**
- **Parallel ALU and Multiplier Execution in a Single Cycle**
- **32-Bit Barrel Shifter**
- **Eight Extended-Precision Registers (Accumulators)**
- **Circular and Bit-Reversed Addressing Capabilities**
- **Two Independent Bidirectional Serial Ports With Support for 8-, 16-, 24-, or 32-Bit Transfers**
- **Two 32-Bit Timers With Control and Counter Registers**
- **Validated Ada Compiler**
- **64-Word × 32-Bit Instruction Cache**
- **On-Chip Direct Memory Access (DMA) Controller for Concurrent I/O and CPU Operation**
- **One 4K × 32-Bit Single-Cycle Dual-Access On-Chip ROM Block**
- **Two 32-Bit External Ports (24- and 13-Bit Addresses)**
- **Two Address Generators With Eight Auxiliary Registers and Two Auxiliary Register Arithmetic Units (ARAUs)**
- **Zero-Overhead Loops With Single-Cycle Branches**
- **Interlocked Instructions for Multiprocessing Support**
- **Two- and Three-Operand Instructions**
- **Conditional Calls and Returns**
- **Block-Repeat Capability**
- **Fabricated Using 0.72-μm Enhanced Performance Implanted CMOS (EPIC™) Technology by Texas Instruments**

description

The SMJ320C30KGDB digital signal processor (DSP) is a high-performance, 32-bit floating-point processor manufactured in 0.72-μm, double-level metal CMOS technology.

The SMJ320C30KGDB internal busing and special digital-signal-processing instruction set have the speed and flexibility to execute up to 50 million floating-point operations per second (MFLOPS). The SMJ320C30KGDB optimizes speed by implementing functions in hardware that other processors implement through software or microcode. This hardware-intensive approach provides performance previously unavailable on a single chip.

The SMJ320C30KGDB can perform parallel multiply and ALU operations on integer or floating-point data in a single cycle. Each processor also possesses a general-purpose register file, a program cache, dedicated ARAUs, internal dual-access memories, one DMA channel supporting concurrent I/O, and a short machine-cycle time. High performance and ease of use are results of these features.

The large address space, multiprocessor interface, internally and externally generated wait states, two external interface ports, two timers, two serial ports, and multiple interrupt structure enhanced general-purpose applications. The SMJ320C30KGDB supports a wide variety of system applications from host processor to dedicated coprocessor.

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description (Continued)

High-level language support is easily implemented through a register-based architecture, large address space, powerful addressing modes, flexible instruction set, and well-supported floating-point arithmetic.

known good die (KGD) technology

KGD options are available for use in multichip modules and chip-on-board (COB) applications. The current verification technology that supports KGD requirements for the SMJ320C30KGDB is a hot chuck probe process. This process uses standard probed product that is tested in wafer form at speed and elevated temperature to full data sheet specifications. Each individual die is then sawed, inspected, and packaged for shipment.

electrical specifications

For electrical and timing specifications, see the *SMJ320C30 Digital Signal Processor* data sheet, literature number SGUS014.

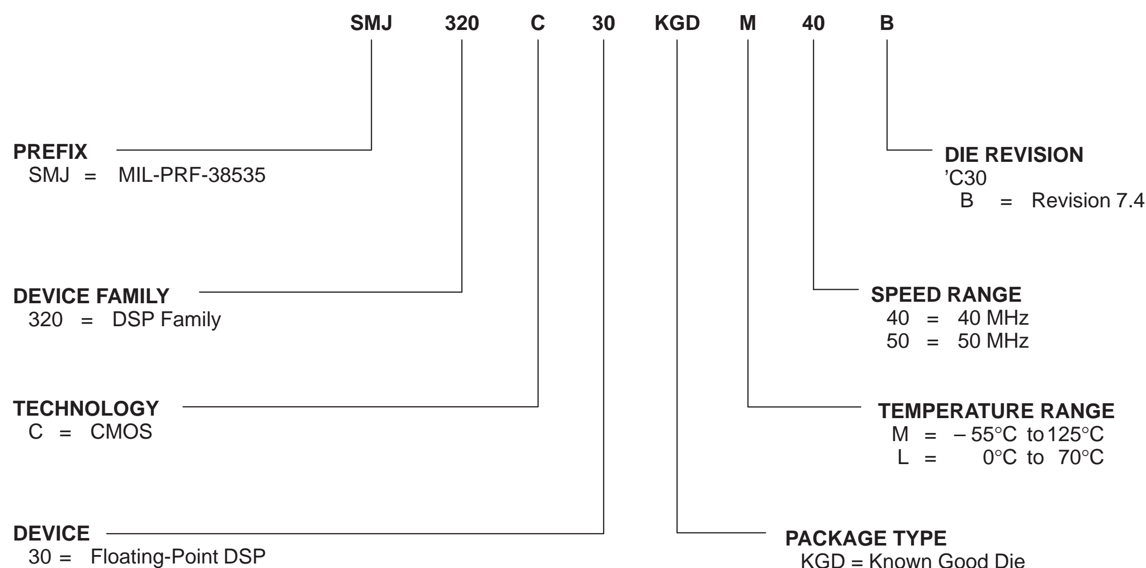

Figure 1. SMJ320C30KGDB Device Nomenclature

JEDEC STANDARD

- Die thickness is approximately 15 mils ±1 mil.
- Backside surface finish is silicon.
- Maximum allowable die junction operating temperature is 175°C.
- Glassivation material is compressive nitride.
- Bond pad metal is composed of copper-doped aluminum.
- Percent defective allowed for burned-in die is 5%.
- Life test data is available.
- Configuration control notification
- Group A attribute summary is available (SMJ only).
- Suggested die-attach material is Silverglass (QMI 3555).
- Suggested bond wire size is 1.25 mil.
- ESD rating is Class II.
- Minimum allowable peak process temperature for die attach is 325°C (for QMI 3555).
- Saw kerf is dependent on blade size used.
- Die backside potential is grounded.

SMJ320C30KGDB (rev 7.x) known good die pad information

Figure 2 shows the SMJ320C30KGDB die-numbering format. See Table 1 for SMJ320C30KGDB die pad information.

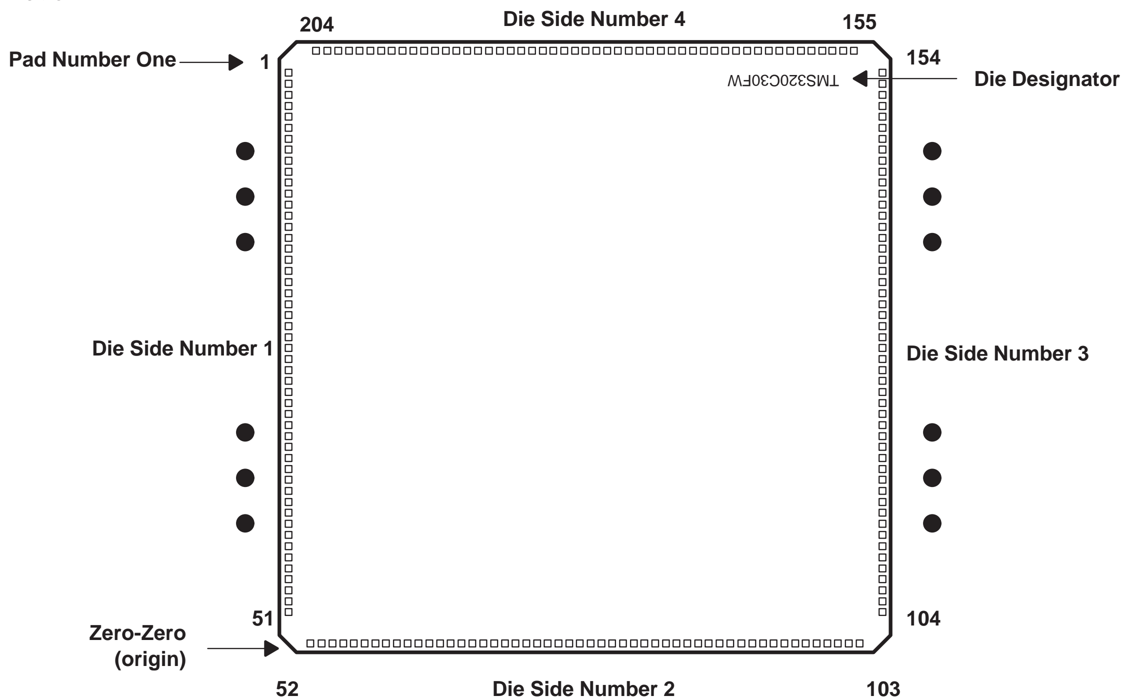

Figure 2. ’320C30KGD Die-Numbering Format (See Table 1)

Table 1 provides a reference for the following:

- The ’C30 signal identities in relation to the pad numbers
- The ’C30 X,Y coordinates, where bond pad 52 serves as the origin (0,0)

In addition, significant specifications include:

- X,Y coordinate data is in microns.
- Coordinate origin is at (0,0) (center of bond pad 52).
- The active silicon dimensions are 7779.60 µm × 9453.10 µm (306.28 mils × 372.17 mils).
- The die size is approximately 7950.20 µm × 9779.00 µm (313.00 mils × 385.00 mils).
- Bond pad dimensions are 103.50 µm × 103.50 µm (4.07 mils × 4.07 mils).

Table 1. ’320C30KGD Die Pad Information : rev 7.4 (0,72 μm)

DIE SIDE #1				
’C30 DIE BOND PAD LOCATIONS	DIE/TAB BOND PAD IDENTITY	X-COORDINATE OF THE DIE BOND PAD	Y-COORDINATE OF THE DIE BOND PAD	PITCH OF LEAD
1	PDV_{DD}	– 614.16	7165.35	135.36
2	PDV_{DD}		7029.99	134.57
3	DR0		6895.42	135.00
4	FSR0		6760.42	135.00
5	CLKR0		6625.42	135.00
6	CLKX0		6490.42	135.00
7	FSX0		6355.42	135.00
8	DX0		6220.42	135.00
9	TCLK0		6085.42	135.00
10	TCLK1		5950.42	135.00
11	PADTOG		5815.42	142.20
12	IOD0		5673.22	135.00
13	IOD1		5538.22	135.00
14	IOD2		5403.22	135.00
15	$IODV_{DD}$		5268.22	135.00
16	$IODV_{DD}$		5133.22	135.00
17	IOD3		4998.22	135.00
18	IOD4		4863.22	135.00
19	IOD5		4728.22	135.00
20	IOD6		4593.22	135.00
21	IOD7		4458.22	135.00
22	IOD8		4323.22	135.00
23	IOD9		4188.22	135.00
24	IOD10		4053.22	135.00
25	V_{DDL}		3918.22	135.00
26	V_{DDL}		3783.22	139.14
27	DV_{SS}		3644.08	140.04
28	V_{SSL}		3504.04	135.00
29	CV_{SS}		3369.04	135.00
30	IOD11		3234.04	135.00
31	IOD12		3099.04	135.00
32	IOD13		2964.04	135.00
33	IOD14		2829.04	135.00
34	IOD15		2694.04	135.00
35	IOD16		2559.04	135.00
36	IOD17		2424.04	135.00
37	IOD18		2289.04	135.00
38	IOD19		2154.04	135.00
39	IOD20		2019.04	135.00
40	IOD21		1884.04	135.00
41	IOD22		1749.04	135.00
42	IOD23		1614.04	135.00
43	IOD24		1479.04	135.00
44	IOD25		1344.04	135.00
45	IOD26		1209.04	135.00
46	IOD27		1074.04	135.00
47	IOD28		939.04	135.00
48	IOD29		804.04	135.00
49	IOD30		669.04	139.50
50	$IODV_{DD}$		529.54	134.98
51	$IODV_{DD}$		394.56	

Table 1. ’320C30KGD Die Pad Information : rev 7.4 (0,72 µm) (Continued)

DIE SIDE #2				
’C30 DIE BOND PAD LOCATIONS	DIE/TAB BOND PAD IDENTITY	X-COORDINATE OF THE DIE BOND PAD	Y-COORDINATE OF THE DIE BOND PAD	PITCH OF LEAD
52	DV_{SS}	0.00	0.00	139.68
53	V_{SSL}	139.68	0.00	135.00
54	IV_{SS}	274.68	0.00	135.00
55	CV_{SS}	409.68	0.00	199.80
56	IOD31	609.48	0.00	163.80
57	A23	773.28	0.00	171.00
58	A22	944.28	0.00	149.40
59	A21	1093.68	0.00	250.20
60	A20	1343.88	0.18	135.00
61	A19	1478.88	0.18	135.00
62	A18	1613.88	0.18	170.75
63	A17	1784.63	0.18	135.00
64	A16	1919.63	0.18	135.00
65	A15	2054.63	0.18	171.00
66	A14	2225.63	0.18	135.00
67	ADV_{DD}	2360.63	0.18	135.00
68	ADV_{DD}	2495.63	0.18	192.60
69	A13	2688.23	0.18	149.40
70	A12	2837.63	0.00	149.40
71	A11	2987.03	0.00	149.40
72	A10	3136.43	0.00	149.40
73	A9	3285.83	0.00	149.40
74	A8	3435.23	0.00	163.80
75	A7	3599.03	0.00	135.00
76	A6	3734.03	0.00	163.80
77	V_{DDL}	3897.83	0.00	135.00
78	V_{DDL}	4032.83	0.00	144.54
79	DV_{SS}	4177.37	0.00	144.54
80	CV_{SS}	4321.91	0.00	158.94
81	A5	4480.85	0.00	156.78
82	A4	4637.63	0.00	156.60
83	A3	4794.23	0.00	156.60
84	A2	4950.83	0.00	156.60
85	A1	5107.43	0.00	156.60
86	A0	5264.03	0.00	179.82
87	EMU0	5443.85	0.00	203.04
88	EMU1	5646.89	0.00	203.04
89	EMU2	5849.93	0.00	179.82
90	EMU3	6029.75	0.00	179.82
91	EMU4	6209.57	0.00	203.04
92	$MC/\overline{MP}$	6412.61	0.00	158.22
93	IOA12	6570.83	0.00	149.40
94	IOA11	6720.23	0.00	149.40
95	IOA10	6869.63	0.00	149.40
96	IOA9	7019.03	0.00	149.40
97	IOA8	7168.43	0.00	149.40
98	IOA7	7317.83	0.00	149.40
99	IOA6	7467.23	0.00	243.00
100	CV_{SS}	7710.23	0.00	149.40
101	IV_{SS}	7859.63	0.00	149.40
102	V_{SSL}	8009.03	0.00	149.76
103	DV_{SS}	8158.79	0.00	

Table 1. ’320C30KGD Die Pad Information : rev 7.4 (0,72 μm) (Continued)

DIE SIDE #3				
’C30 DIE BOND PAD LOCATIONS	DIE/TAB BOND PAD IDENTITY	X-COORDINATE OF THE DIE BOND PAD	Y-COORDINATE OF THE DIE BOND PAD	PITCH OF LEAD
104	ADV$_{DD}$		394.56	134.98
105	ADV$_{DD}$		529.54	135.00
106	IOA5		664.54	135.00
107	IOA4		799.54	135.00
108	IOA3		934.54	135.00
109	IOA2		1069.54	135.00
110	IOA1		1204.54	135.00
111	IOA0		1339.54	142.20
112	D31		1481.74	135.00
113	D30		1616.74	135.00
114	D29		1751.74	135.00
115	D28		1886.74	135.00
116	D27		2021.74	135.00
117	D26		2156.74	135.00
118	DDV$_{DD}$		2291.74	135.00
119	DDV$_{DD}$		2426.74	135.00
120	D25		2561.74	135.00
121	D24		2696.74	135.00
122	D23		2831.74	135.00
123	D22		2966.74	135.00
124	D21		3101.74	135.00
125	D20		3236.74	135.00
126	D19		3371.74	135.00
127	D18		3506.74	135.00
128	V$_{DDL}$		3641.74	135.00
129	V$_{DDL}$	8618.31	3776.74	136.26
130	DV$_{SS}$		3913.00	142.74
131	CV$_{SS}$		4055.74	135.00
132	V$_{SSL}$		4190.74	135.00
133	D17		4325.74	135.00
134	D16		4460.74	135.00
135	D15		4595.74	135.00
136	D14		4730.74	135.00
137	D13		4865.74	135.00
138	D12		5000.74	135.00
139	D11		5135.74	135.00
140	D10		5270.74	135.00
141	D9		5405.74	135.00
142	D8		5540.74	135.00
143	D7		5675.74	135.00
144	D6		5810.74	135.00
145	D5		5945.74	135.00
146	D4		6080.74	135.00
147	D3		6215.74	135.00
148	D2		6350.74	135.00
149	D1		6485.74	135.00
150	D0		6620.74	135.00
151	H1		6755.74	134.82
152	H3		6890.56	135.11
153	DDV$_{DD}$		7025.67	134.64
154	DDV$_{DD}$		7160.31	

Table 1. ’320C30KGD Die Pad Information : rev 7.4 (0,72 μm) (Continued)

DIE SIDE #4				
’C30 DIE BOND PAD LOCATIONS	DIE/TAB BOND PAD IDENTITY	X-COORDINATE OF THE DIE BOND PAD	Y-COORDINATE OF THE DIE BOND PAD	PITCH OF LEAD
155	DV_{SS}	8167.43		146.70
156	V_{SSL}	8020.73		143.10
157	IV_{SS}	7877.63		135.00
158	CV_{SS}	7742.63		160.56
159	X2/CLKIN	7582.07		169.56
160	X1	7412.51		235.98
161	V_{SUBS}	7176.53		772.38
162	EMU5	6404.15		158.22
163	$\overline{IORDY}$	6245.93		158.22
164	$\overline{MSTRB}$	6087.71		135.00
165	IOSTRB	5952.71		135.00
166	$IOR/\overline{W}$	5817.71		135.00
167	$\overline{HOLDA}$	5682.71		158.22
168	$\overline{HOLD}$	5524.49		158.22
169	MDV_{DD}	5366.27		135.00
170	MDV_{DD}	5231.27		158.22
171	$\overline{RDY}$	5073.05		158.22
172	$\overline{STRB}$	4914.83		135.00
173	$R/\overline{W}$	4779.83		158.22
174	$\overline{RESET}$	4621.61		158.22
175	XF1	4463.39		135.00
176	XF0	4328.39		135.00
177	$\overline{IACK}$	4193.39		158.22
178	$\overline{INT0}$	4035.17		158.22
179	V_{DDL}	3876.95	7558.83	135.00
180	V_{DDL}	3741.95		139.68
181	V_{SSL}	3602.27		144.18
182	IV_{SS}	3458.09		160.56
183	INT1	3297.53		172.98
184	INT2	3124.55		181.44
185	INT3	2943.11		172.62
186	RSV0	2770.49		172.62
187	RSV1	2597.87		172.62
188	RSV2	2425.25		172.62
189	RSV3	2252.63		172.62
190	RSV4	2080.01		165.42
191	RSV5	1914.59		135.00
192	RSV6	1779.59		134.75
193	RSV7	1644.84		135.00
194	RSV8	1509.84		135.00
195	RSV9	1374.84		135.00
196	RSV10	1239.84		135.00
197	DR1	1104.84		135.00
198	FSR1	969.84		315.00
199	CLKR1	654.84		156.60
200	CLKX1	498.24		156.60
201	FSX1	341.64		156.60
202	DX1	185.04		156.60
203	CV_{SS}	28.44		156.60
204	DV_{SS}	–128.16		

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