- **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 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.

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.

For additional information when designing for cold temperature operation, please see Texas Instruments application report *320C3x, 320C4x and 320MCM42x Power-up Sensitivity at Cold Temperature*, literature number SGUA001.

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.

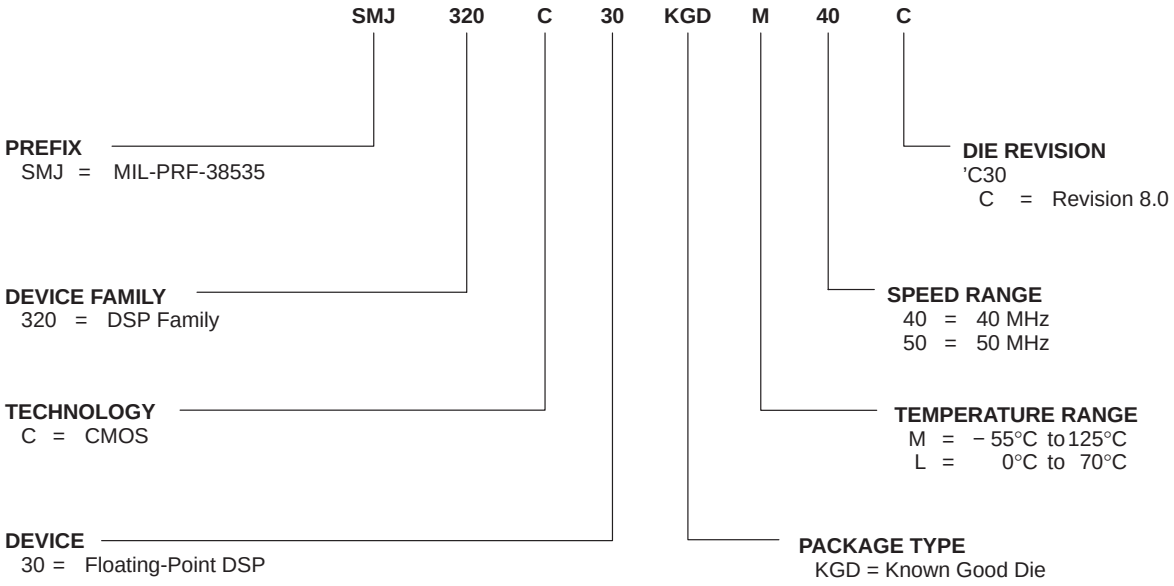

Figure 1. SMJ320C30KGDB Device Nomenclature

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.

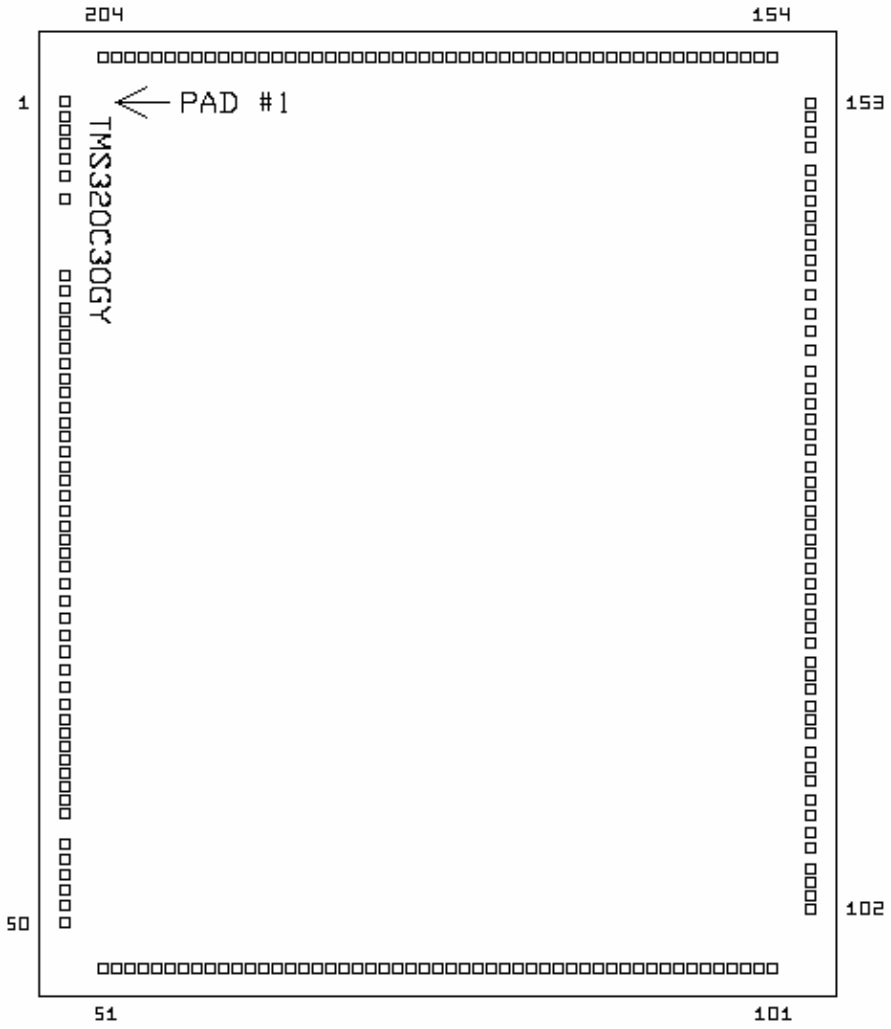

Figure 2. ’320C30KGD Die-Numbering Format (See Table 1)

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

PAD	NAME	X−COORDINATE	Y−COORDINATE	PAD PITCH
1	DV_{SS}		617.99	127
2	V_{SS}		745.13	124
3	V_{SS}		869.15	117
4	V_{SS}		986.15	139
5	X2/CLKIN		1125.31	147
6	X1		1272.26	205
7	VSUBS		1476.77	669
8	$\overline{\text{EMU5}}$		2146.17	137
9	$\overline{\text{XRDY}}$		2283.29	137
10	$\overline{\text{MSTRB}}$		2420.42	117
11	$\overline{\text{IOSTRB}}$		2537.42	117
12	XR/$\overline{\text{W}}$		2654.42	117
13	$\overline{\text{HOLDA}}$		2771.42	137
14	$\overline{\text{HOLD}}$		2908.54	137
15	DV_{DD}		3045.67	117
16	DV_{DD}		3162.67	137
17	$\overline{\text{RDY}}$		3299.79	137
18	$\overline{\text{STRB}}$		3436.91	117
19	R/$\overline{\text{W}}$		3553.91	137
20	RESET		3691.04	137
21	XF1		3828.16	117
22	$\overline{\text{XF0}}$		3945.16	117
23	$\overline{\text{IACK}}$		4062.16	137
24	INT0		4199.29	137
25	V_{DD}	6778.43	4336.41	117
26	V_{DD}		4453.41	121
27	V_{SS}		4574.47	125
28	$\overline{V_{SS}}$		4699.42	139
29	$\overline{\text{INT1}}$		4838.57	150
30	$\overline{\text{INT2}}$		4988.49	157
31	INT3		5145.74	150
32	RSV0		5295.34	150
33	RSV1		5444.95	150
34	RSV2		5594.55	150
35	RSV3		5744.15	150
36	RSV4		5893.76	143
37	RSV5		6037.12	117
38	RSV6		6154.12	117
39	RSV7		6271.12	117
40	RSV8		6388.12	117
41	RSV9		6505.12	117
42	RSV10		6622.12	117
43	DR1		6739.12	117
44	FSR1		6856.12	273
45	CLKR1		7129.12	136
46	CLKX1		7264.84	136
47	FSX1		7400.56	136
48	DX1		7536.28	136
49	V_{SS}		7672.00	136
50	V_{SS}		7807.88	

Table 1. 320C30KGD Die Pad Information (Continued)

PAD	NAME	X−COORDINATE	Y−COORDINATE	PAD PITCH
51	DV_{DD}	6437.26		117
52	DV_{DD}	6320.26		117
53	DR0	6203.26		117
54	FSR0	6086.26		117
55	CLKR0	5969.26		117
56	CLKX0	5852.26		117
57	FSX0	5735.26		117
58	DX0	5618.26		117
59	TCLK0	5501.26		117
60	TCLK1	5384.26		117
61	EMU6	5267.26		123
62	XD0	5144.02		117
63	XD1	5027.02		117
64	XD2	4910.02		117
65	DV_{DD}	4793.02		117
66	DV_{DD}	4676.02		117
67	XD3	4559.02		117
68	XD4	4442.02		117
69	XD5	4325.02		117
70	XD6	4208.02		117
71	XD7	4091.02		117
72	XD8	3974.02		117
73	XD9	3857.02		117
74	XD10	3740.02		117
75	V_{DD}	3623.02		117
76	V_{DD}	3506.02	8228.77	121
77	DV_{SS}	3385.43		121
78	V_{SS}	3264.07		117
79	V_{SS}	3147.07		117
80	XD11	3030.07		117
81	XD12	2913.07		117
82	XD13	2796.07		117
83	XD14	2679.07		117
84	XD15	2562.07		117
85	XD16	2445.07		117
86	XD17	2328.07		117
87	XD18	2211.07		117
88	XD19	2094.07		117
89	XD20	1977.07		117
90	XD21	1860.07		117
91	XD22	1743.07		117
92	XD23	1626.07		117
93	XD24	1509.07		117
94	XD25	1392.07		117
95	XD26	1275.07		117
96	XD27	1158.07		117
97	XD28	1041.07		117
98	XD29	924.07		117
99	XD30	807.07		121
100	DV_{DD}	686.17		117
101	DV_{DD}	569.17		342
102	V_{SS}	227.21		

Table 1. 320C30KGD Die Pad Information (Continued)

PAD	NAME	X−COORDINATE	Y−COORDINATE	PAD PITCH
103	V_{SS}		7575.75	117
104	V_{SS}		7458.59	117
105	V_{SS}		7341.59	173
106	XD31		7168.43	142
107	A23		7026.47	148
108	A22		6878.27	129
109	A21		6748.79	217
110	A20		6531.95	117
111	A19		6414.95	117
112	A18		6297.95	148
113	A17		6149.75	117
114	A16		6032.75	117
115	A15		5915.75	148
116	A14		5767.55	117
117	DV_{DD}		5650.55	117
118	DV_{DD}		5533.55	167
119	A13		5366.63	129
120	A12		5237.15	129
121	A11		5107.67	129
122	A10		4978.19	129
123	A9		4848.71	129
124	A8		4719.23	142
125	A7		4577.27	117
126	A6		4460.27	142
127	V_{DD}		4318.31	117
128	V_{DD}	227.21	4201.31	125
129	DV_{SS}		4076.05	125
130	V_{SS}		3950.78	138
131	A5		3813.03	136
132	A4		3677.15	136
133	A3		3541.43	136
134	A2		3405.71	136
135	A1		3269.99	136
136	A0		3134.27	156
137	EMU0		2978.43	176
138	EMU1		2802.46	176
139	EMU2		2626.49	156
140	EMU3		2470.65	156
141	EMU4/$\overline{SHZ}$		2314.81	176
142	MC/$\overline{MP}$		2138.84	137
143	XA12		2001.71	129
144	XA11		1872.23	129
145	XA10		1742.75	129
146	XA9		1613.27	129
147	XA8		1483.79	129
148	XA7		1354.31	129
149	XA6		1224.83	211
150	V_{SS}		1014.23	129
151	V_{SS}		884.75	129
152	V_{SS}		755.27	130
153	V_{SS}		625.48	625

Table 1. 320C30KGD Die Pad Information (Continued)

PAD	NAME	X−COORDINATE	Y−COORDINATE	PAD PITCH
154	DV_{DD}	569.17		117
155	DV_{DD}	686.17		117
156	XA5	803.17		117
157	XA4	920.17		117
158	XA3	1037.17		117
159	XA2	1154.17		117
160	XA1	1271.17		117
161	XA0	1388.17		123
162	D31	1511.41		117
163	D30	1628.41		117
164	D29	1745.41		117
165	D28	1862.41		117
166	D27	1979.41		117
167	D26	2096.41		117
168	DV_{DD}	2213.41		117
169	DV_{DD}	2330.41		117
170	D25	2447.41		117
171	D24	2564.41		117
172	D23	2681.41		117
173	D22	2798.41		117
174	D21	2915.41		117
175	D20	3032.41		117
176	D19	3149.41		117
177	D18	3266.41		117
178	V_{DD}	3383.41		117
179	V_{DD}	3500.41	227.21	118
180	DV_{SS}	3618.50		124
181	V_{SS}	3742.21		117
182	V_{SS}	3859.21		117
183	D17	3976.21		117
184	D16	4093.21		117
185	D15	4210.21		117
186	D14	4327.21		117
187	D13	4444.21		117
188	D12	4561.21		117
189	D11	4678.21		117
190	D10	4795.21		117
191	D9	4912.21		117
192	D8	5029.21		117
193	D7	5146.21		117
194	D6	5263.21		117
195	D5	5380.21		117
196	D4	5497.21		117
197	D3	5614.21		117
198	D2	5731.21		117
199	D1	5848.21		117
200	D0	5965.21		117
201	H1	6082.21		117
202	H3	6199.21		117
203	DV_{DD}	6316.21		117
204	DV_{DD}	6433.21		

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9052604Q9B	LIFEBUY	XCEPT	KGD	0	36	TBD	Call TI	N / A for Pkg Type	-55 to 125		
SMJ320C30KGDM40C	LIFEBUY	XCEPT	KGD	0	36	TBD	Call TI	N / A for Pkg Type	-55 to 125		

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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