

- 25-ns, 35-ns, and 50-ns Single-Cycle Instruction Execution Time for 5-V Operation
- 50-ns Single-Cycle Instruction Execution Time for 3.3-V Operation
- Source-Code Compatible With All 'C1x and 'C2x Devices
- RAM-Based Operation
 - 9K-Word × 16-Bit Single-Access On-Chip Program/Data RAM
 - 1056-Word × 16-Bit Dual-Access On-Chip Data RAM
- 2K-Word × 16-Bit On-Chip Boot ROM
- 224K-Word × 16-Bit Maximum Addressable External Memory Space (64K-Word Program, 64K-Word Data, 64K-Word I/O, and 32K-Word Global)
- 32-Bit Arithmetic Logic Unit (ALU)
 - 32-Bit Accumulator (ACC)
 - 32-Bit Accumulator Buffer (ACCB)
- 16-Bit Parallel Logic Unit (PLU)
- 16 × 16-Bit Multiplier, 32-Bit Product
- Eleven Context Switch Registers
- Two Buffers for Circular Addressing
- Full-Duplex Synchronous Serial Port
- Time-Division Multiplexed Serial Port (TDM)
- Timer With Control and Counter Registers
- Sixteen Software-Programmable Wait-State Generators
- Divide-By-1 Clock Option
- IEEE Standard 1149.1[†] Test Access Port
- Operations are Fully Static
- Fabricated Using the Texas Instruments (TI) Enhanced Performance Implanted CMOS (EPIC[™]) 0.64-μm Technology

description

The TMP320C50KGD digital signal processor (DSP) is a high-performance, 16-bit, fixed-point processor manufactured in 0.64-μm double-level metal CMOS technology. The TMP320LC50KGD has the same functionality as the 'C50KGD except for operation at 3.3 V instead of 5 V.

Texas Instruments Military Products currently employs three primary processes for the development of a known good die (KGD), one of which is applied to the TMP320C50 and TMP320LC50 devices. This process, known as hot-chuck-probe, uses a standard probed product that is tested again, this time at full data sheet specifications, in wafer form at speed and elevated temperature (85°C). Each individual die then is sawed, inspected, and packed for shipment. This flow produces a bare die that has been temperature-tested at speed and is known to be good, without having to use a temporary package.

A number of enhancements to the basic 'C2x architecture give the 'C5x a minimum 2x performance over the previous generation. A four-deep instruction pipeline, incorporating delayed branching, delayed call to subroutine, and delayed return from subroutine, allows the 'C5x to perform instructions in fewer cycles. The addition of a PLU gives the 'C5x a method of manipulating bits in data memory without using the ACC and ALU. The 'C5x has additional shifting and scaling capability for proper alignment of multiplicands or storage of values to data memory.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

[†] IEEE Standard 1149.1-1990, IEEE Standard Test-Access Port and Boundary-Scan Architecture
EPIC is a trademark of Texas Instruments.

PRODUCTION DATA information is current as of publication date.
Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

TMP320C50KGD, TMP320LC50KGD

DIGITAL SIGNAL PROCESSOR

KNOWN GOOD DIE

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description (continued)

With the addition of the IDLE2 instruction, the 'C5x achieves low-power consumption. IDLE2 removes the functional clock from the internal hardware of the 'C5x that puts it into a total-sleep mode using only 5 μ A. A low-logic level on an external interrupt with chip duration of at least five clock cycles ends the IDLE2 mode.

TMP PRODUCT FLOW; 40 AND 57 MHz	
Multiprobe	dc test @ 25°C
Test conditions	Per commercial data sheet
DC test	Hot chuck probe @ 85°C
AC test	Hot chuck probe @ 85°C @ Speed
Visual	40x
Warranty	Datasheet upon shipment, 1 year

For electrical and timing specifications, see the *TMS320C5x*, *TMS320LC5x Digital Signal Processors* data sheet (literature number SPRS030).

SPECIFIC DIE-RELATED INFORMATION	
Die Size (approximate)	358 mils x 338 mils
Die Thickness	11 mils $\pm$ 1 mil
Backside Surface Finish	SiO ₂
Die Backside Potential	Floating
Max Allowable Die Junction Operating Temperature	125°C
Glassivation Material and Thickness	3KAOX/9KACN
Recommended Packing	GEL PAK
Die Attach Information	SILVER GLASS
Suggested Bond Wire Size	1.25 AL
Suggested Bonding Method	WEDGE
ESD Sensitivity	Class II
Max Allowable Process Temperature for Die Attach	450°C

TMP320C50KGD, TMP320LC50KGD
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TMP320C50/LC50 Pad Information†

TOP	PAD	XCENTER	YCENTER	PAD NAME	BOTTOM	PAD	XCENTER	YCENTER	PAD NAME
	1	4626.18	8373.066	$\overline{IAQ}$		41	83.85	1537.224	CLKR
	2	4465.266	8373.066	$\overline{TRST}$		42	83.85	1164.852	V _{DD5}
	3	4245.852	8373.066	V _{SS1}		43	83.85	1047.852	V _{DD6}
	4	4128.852	8373.066	V _{SS2}		44	1303.38	83.85	V _{SS7}
	5	3955.38	8373.066	MP/ $\overline{MC}$		45	1420.38	83.85	V _{SS8}
	6	3579.108	8373.066	D15		46	1836.276	83.85	A0
	7	3329.508	8373.066	D14		47	2074.566	83.85	A1
	8	3038.334	8373.066	D13		48	2277.366	83.85	A2
	9	2827.734	8373.066	D12		49	2515.656	83.85	A3
	10	2613.234	8373.066	D11		50	2706.756	83.85	A4
	11	2398.734	8373.066	D10		51	2945.046	83.85	A5
LEFT	12	2089.932	8373.066	D9	RIGHT	52	3136.146	83.85	A6
	13	1830.036	8373.066	D8		53	3374.436	83.85	A7
	14	1467.336	8373.066	V _{DD1}		54	3565.536	83.85	A8
	15	1350.336	8373.066	V _{DD2}		55	3803.826	83.85	A9
	16	83.85	7404.15	V _{SS3}		56	3952.026	83.85	V _{DD7}
	17	83.85	7287.15	V _{SS4}		57	4069.026	83.85	V _{DD8}
	18	83.85	6803.55	D7		58	4235.556	83.85	TDI
	19	83.85	6592.95	D6		59	4602.234	83.85	V _{SS9}
	20	83.85	6336.876	D5		60	4719.234	83.85	V _{SS10}
	21	83.85	6141.876	D4		61	4884.906	83.85	CLKMD1
	22	83.85	5946.876	D3		62	5093.478	83.85	A10
	23	83.85	5751.876	D2		63	5331.768	83.85	A11
	24	83.85	5472.402	D1		64	5648.76	83.85	A12
	25	83.85	5277.402	D0		65	5887.05	83.85	A13
	26	83.85	5034.588	TMS		66	6089.85	83.85	A14
	27	83.85	4756.674	V _{DD3}		67	6328.14	83.85	A15
	28	83.85	4639.674	V _{DD4}		68	7100.34	83.85	V _{DD9}
	29	83.85	4274.946	TCK		69	7217.34	83.85	V _{DD10}
	30	83.85	4120.818	$\overline{MTESTEN}$		70	7487.532	83.85	$\overline{RD}$
	31	83.85	3979.404	V _{SS5}		71	7961.148	83.85	$\overline{WE}$
	32	83.85	3862.404	V _{SS6}		72	8896.134	1078.35	V _{SS11}
	33	83.85	3493.932	$\overline{INT1}$		73	8896.134	1195.35	V _{SS12}
	34	83.85	3275.688	$\overline{INT2}$		74	8896.134	1640.106	$\overline{DS}$
	35	83.85	3057.444	$\overline{INT3}$		75	8896.134	1930.11	$\overline{IS}$
	36	83.85	2766.27	$\overline{INT4}$		76	8896.134	2179.866	$\overline{PS}$
	37	83.85	2548.026	$\overline{NMI}$		77	8896.134	2489.994	R/ $\overline{W}$
	38	83.85	2329.782	DR		78	8896.134	2738.034	$\overline{STRB}$
	39	83.85	2111.538	TDR		79	8896.134	2908.074	$\overline{BR}$
	40	83.85	1755.468	FSR		80	8896.134	3133.962	NC

† Measured from corner of active area.



TMP320C50KGD, TMP320LC50KGD
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TMP320C50/LC50 Pad Information[†] (Continued)

	PAD	XCENTER	YCENTER	PAD NAME
	81	8896.134	3281.148	CLKIN2
	82	8896.134	3415.62	X2/CLKIN
	83	8896.134	3568.11	X1
	84	8896.134	3715.14	NC
	85	8896.134	3856.554	V _{DD11}
	86	8896.134	3973.554	V _{DD12}
	87	8896.134	4122.846	TDO
	88	8896.134	4398.81	V _{SS13}
	89	8896.134	4515.81	V _{SS14}
	90	8896.134	4650.282	CLKMD2
	91	8896.134	4827.186	FSX
	92	8896.134	5075.694	TFSX/TFRM
	93	8896.134	5266.95	DX
	94	8896.134	5520.294	TDX
	95	8896.134	5711.55	HOLDA
	96	8896.134	5902.806	XF
	97	8896.134	6214.65	CLKOUT1
	98	8896.134	6542.406	TACK
	99	8896.134	7002.606	V _{DD13}
	100	8896.134	7119.606	V _{DD14}
	101	8896.134	7552.818	V _{DD31}
	102	8896.134	7669.818	V _{DD32}
TOP-R	103	7966.296	8373.066	EMU0
	104	7615.452	8373.066	EMU1/ $\overline{\text{OFF}}$
	105	7393.152	8373.066	V _{SS15}
	106	7276.152	8373.066	V _{SS16}
	107	6862.596	8373.066	TOUT
	108	6656.364	8373.066	TCLKX
	109	6454.032	8373.066	CLKX
	110	6174.324	8373.066	TFSR/TADD
	111	6020.352	8373.066	TCLKR
	112	5860.608	8373.066	$\overline{\text{RS}}$
	113	5700.864	8373.066	READY
	114	5541.12	8373.066	HOLD
	115	5206.344	8373.066	$\overline{\text{BIO}}$
	116	5001.672	8373.066	V _{DD15}
	117	4884.672	8373.066	V _{DD16}

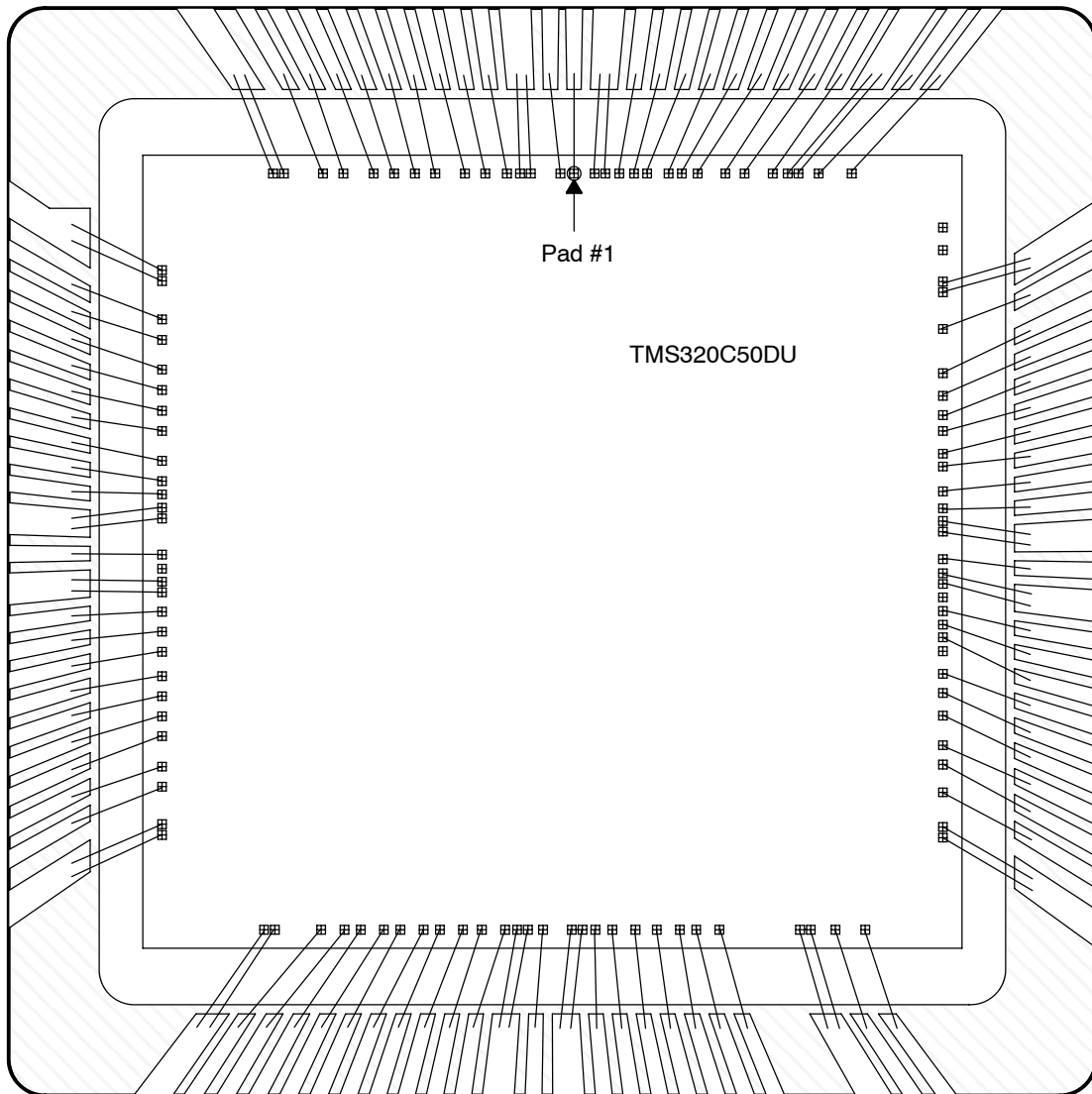
[†] Measured from corner of active area.



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MECHANICAL DATA

MOUNT AND BOND



PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TMP320C50KGD40B	OBSOLETE	XCEPT	KGD	0		TBD	Call TI	Call TI
TMP320C50KGD457C	OBSOLETE	XCEPT	KGD	0		TBD	Call TI	Call TI
TMP320C50KGD480C	OBSOLETE	XCEPT	KGD	0		TBD	Call TI	Call TI

⁽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⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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		Wireless	www.ti.com/wireless-apps