

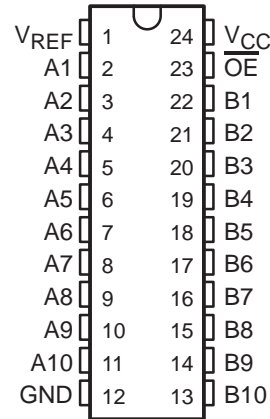
SN74CBTLV3857

LOW-VOLTAGE 10-BIT FET BUS SWITCH WITH INTERNAL PULLDOWN RESISTORS

SCDS085E – OCTOBER 1998 – REVISED OCTOBER 2003

- Enable Signal Is SSTL_2 Compatible
- Flow-Through Architecture Optimizes PCB Layout
- Designed for Use With 200 Mbit/s Double Data-Rate (DDR) SDRAM Applications
- Switch On-State Resistance Is Designed to Eliminate Series Resistor to DDR SDRAM
- Internal 10-k Ω Pulldown Resistors to Ground on B Port
- Internal 50-k Ω Pullup Resistor on Output-Enable Input
- Rail-to-Rail Switching on Data I/O Ports
- I_{off} Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II

DBQ, DGV, DW, OR PW PACKAGE
(TOP VIEW)



description/ordering information

This 10-bit FET bus switch is designed for 3-V to 3.6-V V_{CC} operation and SSTL_2 output-enable (\overline{OE}) input levels.

When \overline{OE} is low, the 10-bit bus switch is on, and port A is connected to port B. When \overline{OE} is high, the switch is open, and the high-impedance state exists between the two ports. There are 10-k Ω pulldown resistors to ground on the B port.

The FET switch on-state resistance is designed to replace the series terminating resistor in the SSTL_2 data path.

This device is fully specified for partial-power-down applications using I_{off}. The I_{off} feature ensures that damaging current will not backflow through the device when it is powered down. The device has isolation during power off.

ORDERING INFORMATION

TA	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	QSOP – DBQ	Tape and reel	SN74CBTLV3857DBQR	CL857
	SOIC – DW	Tube	SN74CBTLV3857DW	CBTLV3857
		Tape and reel	SN74CBTLV3857DWR	
	TSSOP – PW	Tape and reel	SN74CBTLV3857PWR	CL857
	TVSOP – DGV	Tape and reel	SN74CBTLV3857DGV	CL857

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE

INPUT \overline{OE}	FUNCTION
L	A port = B port
H	Disconnect



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.

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.

**TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

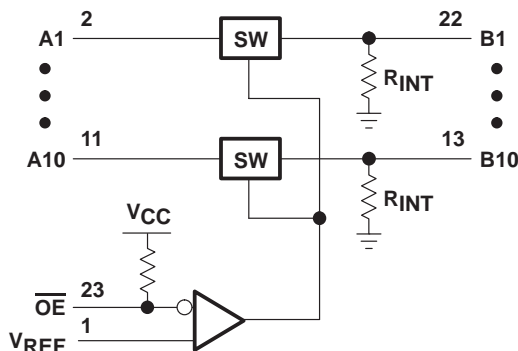
Copyright © 2003, Texas Instruments Incorporated

SN74CBTLV3857

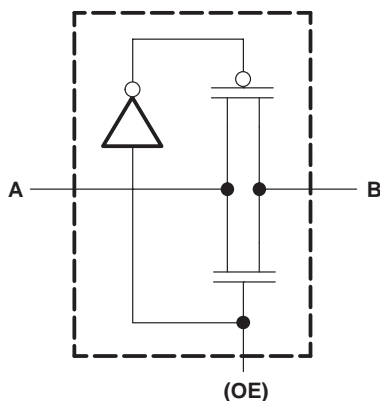
LOW-VOLTAGE 10-BIT FET BUS SWITCH WITH INTERNAL PULLDOWN RESISTORS

SCDS085E – OCTOBER 1998 – REVISED OCTOBER 2003

logic diagram (positive logic)



simplified schematic, each FET switch



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V_{CC}	-0.5 V to 4.6 V
Input voltage range (\overline{OE} only), V_I (see Note 1)	-0.5 V to $V_{CC} + 0.5$ V
Input voltage range (except \overline{OE}), V_I (see Note 1)	-0.5 V to 4.6 V
Continuous channel current	48 mA
Input clamp current, I_{IK} ($V_{I/O} < 0$)	-50 mA
Package thermal impedance, θ_{JA} (see Note 2):	
DBQ package	61°C/W
DGV package	86°C/W
DW package	46°C/W
PW package	88°C/W
Storage temperature range, T_{stg}	-65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

SN74CBTLV3857

LOW-VOLTAGE 10-BIT FET BUS SWITCH WITH INTERNAL PULLDOWN RESISTORS

SCDS085E – OCTOBER 1998 – REVISED OCTOBER 2003

recommended operating conditions (see Note 3)

		MIN	NOM	MAX	UNIT
V _{CC}	Supply voltage	3	3.3	3.6	V
V _{REF}	Reference voltage (0.38 × V _{CC})	1.15	1.25	1.35	V
V _{IH}	AC high-level control input voltage	V _{REF} + 350 mV			V
V _{IL}	AC low-level control input voltage	V _{REF} – 350 mV			V
V _{IH}	DC high-level control input voltage	V _{REF} + 180 mV			V
V _{IL}	DC low-level control input voltage	V _{REF} – 180 mV			V
T _A	Operating free-air temperature	–40		85	°C

NOTE 3: All unused control inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V _{IK}		V _{CC} = 3 V,	I _I = –18 mA			–1.2	V
I _I	$\overline{\text{OE}}$	V _{CC} = 3.6 V,	V _I = V _{CC} or GND			±1	mA
	A port					±5	μA
	B port					±1	mA
	V _{REF}					±5	μA
I _{CC}		V _{CC} = 3.6 V,	I _O = 0,	V _I = V _{CC} or GND		25	mA
C _i	Control inputs	V _I = 3 V or 0		3.5			pF
C _{io(OFF)}		V _O = 3 V or 0,	$\overline{\text{OE}}$ = V _{CC}	5			pF
r _{on‡}		V _{CC} = 3 V	V _I = 0,	I _I = 24 mA	5	8	Ω
			V _I = 0.9 V,	I _I = 24 mA	6	11	
			V _I = 1.25 V,	I _I = 24 mA	7	13	
			V _I = 1.6 V,	I _I = 24 mA	9	40	
r _{off‡}		V _{CC} = 0		1		MΩ	
		V _{CC} = 3 V to 3.6 V,	V _I = 1.65 V,	$\overline{\text{OE}}$ = V _{CC}	1		

† All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

‡ Measured by the voltage drop between the A and B terminals at the indicated current through the switch. Resistance is determined by the lower of the voltages of the two (A or B) terminals.

switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 3.3 V ± 0.3 V		UNIT
			MIN	MAX	
t _{pd} §	A or B	B or A	0.25		ns
t _{en}	$\overline{\text{OE}}$	A or B	1.4	4.2	ns
t _{dis}	$\overline{\text{OE}}$	A or B	1.4	4.8	ns

§ The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).



SN74CBTLV3857

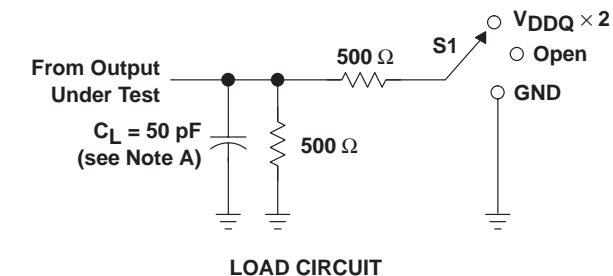
LOW-VOLTAGE 10-BIT FET BUS SWITCH

WITH INTERNAL PULLDOWN RESISTORS

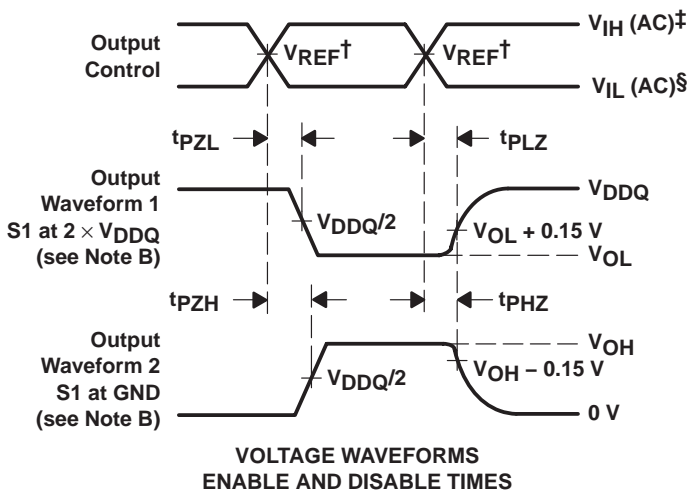
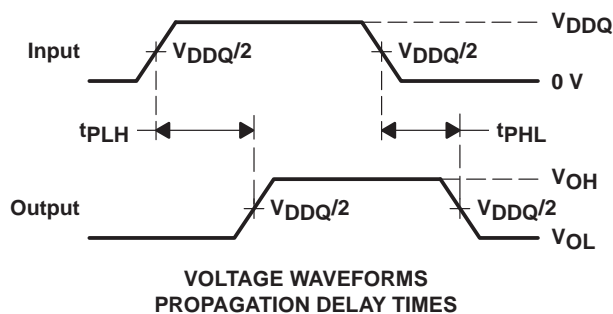
SCDS085E – OCTOBER 1998 – REVISED OCTOBER 2003

PARAMETER MEASUREMENT INFORMATION

$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ AND $V_{DDQ} = 2.5 \pm 0.2\text{ V}$



TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	$V_{DDQ} \times 2$
t_{PHZ}/t_{PZH}	GND



$\dagger V_{REF} = 0.38 \times V_{CC}$

$\ddagger V_{IH}(AC) = V_{REF} + 350\text{ mV}$

$\S V_{IL}(AC) = V_{REF} - 350\text{ mV}$

NOTES: A. C_L includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.

Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 2\text{ ns}$, $t_f \leq 2\text{ ns}$.

D. The outputs are measured one at a time with one transition per measurement.

E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .

F. t_{PZL} and t_{PZH} are the same as t_{en} .

G. t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
74CBTLV3857DBQRE4	ACTIVE	SSOP/QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
74CBTLV3857DBQRG4	ACTIVE	SSOP/QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
74CBTLV3857DGVRE4	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74CBTLV3857DGVRG4	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74CBTLV3857DWRE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74CBTLV3857DWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74CBTLV3857PWRE4	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74CBTLV3857PWRG4	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBTLV3857DBQR	ACTIVE	SSOP/QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
SN74CBTLV3857DGV	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBTLV3857DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBTLV3857DWE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBTLV3857DWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBTLV3857DWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBTLV3857PWR	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽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.

OBSELETE: 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.

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74CBTLV3857DBQR	SSOP/QSOP	DBQ	24	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74CBTLV3857DGVR	TVSOP	DGV	24	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74CBTLV3857DWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
SN74CBTLV3857PWR	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74CBTLV3857DBQR	SSOP/QSOP	DBQ	24	2500	346.0	346.0	33.0
SN74CBTLV3857DGVR	TVSOP	DGV	24	2000	346.0	346.0	29.0
SN74CBTLV3857DWR	SOIC	DW	24	2000	346.0	346.0	41.0
SN74CBTLV3857PWR	TSSOP	PW	24	2000	346.0	346.0	33.0

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

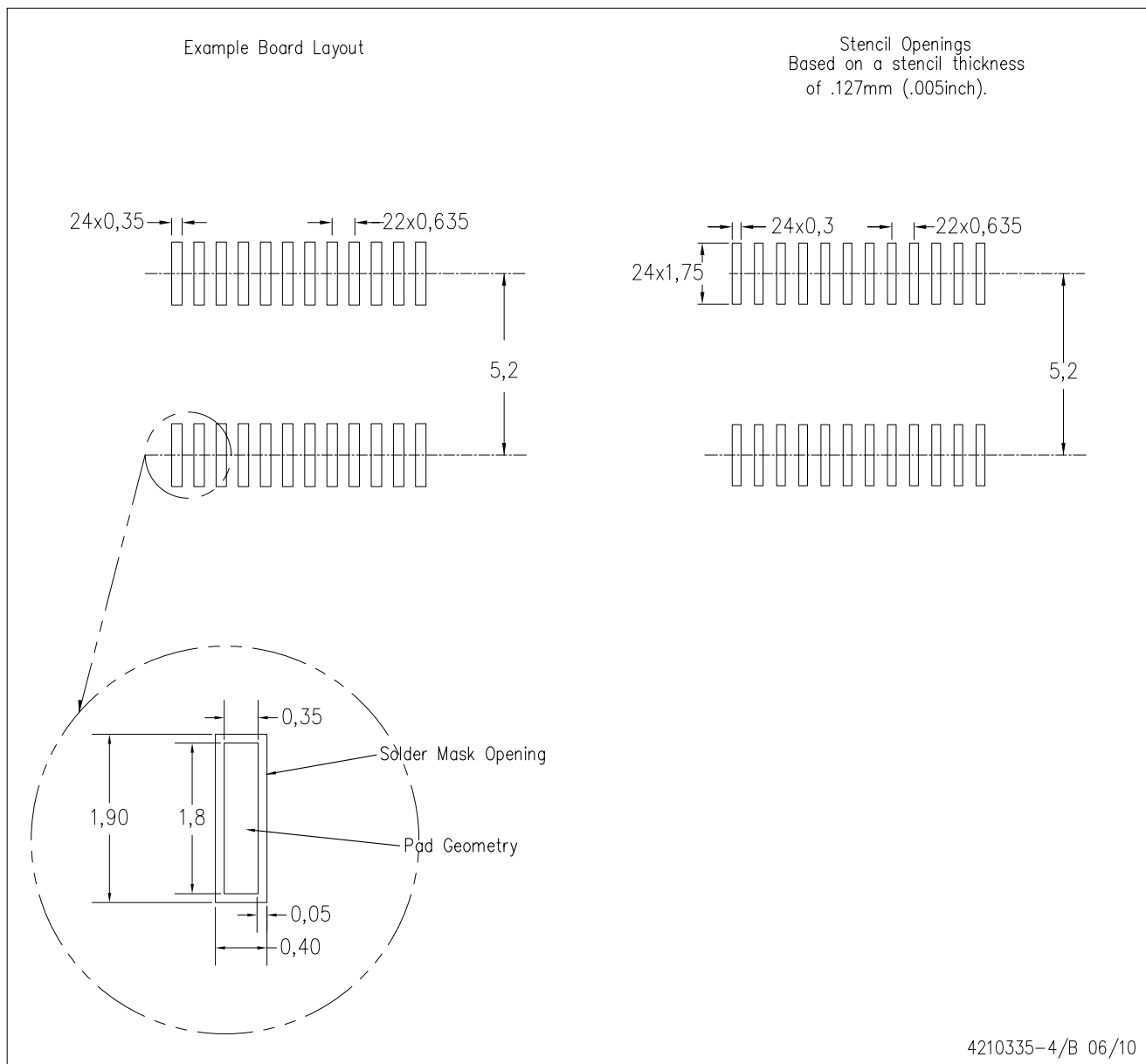
24 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

DBQ (R-PDSO-G24)

PLASTIC SMALL OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - D. Publication IPC-7351 is recommended for alternate designs.
 - E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-153

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DLP® Products	www.dlp.com	Communications and Telecom	www.ti.com/communications
DSP	dsp.ti.com	Computers and Peripherals	www.ti.com/computers
Clocks and Timers	www.ti.com/clocks	Consumer Electronics	www.ti.com/consumer-apps
Interface	interface.ti.com	Energy	www.ti.com/energy
Logic	logic.ti.com	Industrial	www.ti.com/industrial
Power Mgmt	power.ti.com	Medical	www.ti.com/medical
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
RFID	www.ti-rfid.com	Space, Avionics & Defense	www.ti.com/space-avionics-defense
RF/IF and ZigBee® Solutions	www.ti.com/lprf	Video and Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless-apps