Gated-Class H, Dual-Port VDSL2 Line Driver

Check for Samples: THS6226

FEATURES

- **Digitally-Adjustable Quiescent Current: 7.6mA to 23.0mA**
- **1.0mA Bias Current Step**
- **Independent Voltage Boost and Main Line Driver Disable**
- **Low-Power Line Termination Mode**
- **Full Capacitor Recharge: 3ms**
- **Low Input Voltage Noise Density: 6.3 nV/√Hz Input-Referred Voltage Noise**
- **Low MTPR Distortion: 70dB with +19.8dBm G.993.2—Profile 8b**
- **–91dBc HD3 (1MHz, 60Ω Differential)**
- **High Output Current: (383mA into 60Ω)**
- **Wide Output Swing: 40V_{PP} (+12V, 60Ω Differential Load with a 1:1.4 Transformer)**
- **Wide Bandwidth: 125MHz**
- **Port-to-Port Separation of 90dB at 1MHz**
- **PSRR: 70dB at 1MHz for Good Isolation**

APPLICATIONS

- **Ideal for All VDSL2 Profiles**
- **Backwards-Compatible with ADSL/ADSL2+/ADSL2++ Systems**

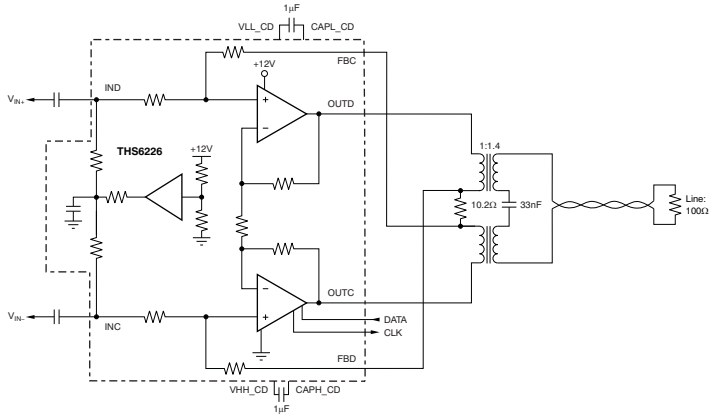
DESCRIPTION

The THS6226 is a dual-port, class H, current-feedback architecture, differential line driver amplifier system ideal for xDSL systems. The device is targeted for use in very-high-bit-rate digital subscriber line 2 (VDSL2) line driver systems that enable native DTM signals while supporting greater than +20.5dBm line power (up to 8.5MHz) with good linearity, supporting the G.993.2 VDSL2 8b profile. It is also fast enough to support central-office transmission of +14.5dBm line power up to 30MHz.

The unique architecture of the THS6226 allows quiescent current to be minimal while still achieving very high linearity. Differential distortion, under full bias conditions, is –91dBc at 1MHz and reduces to only –75dBc at 5MHz. Fixed multiple bias settings of the amplifiers offer enhanced power savings for line lengths where the full performance of the amplifier is not required. To allow for even more flexibility and power savings on all profiles, quiescent current is digitally adjustable from 7.6mA to 23mA with a bias current step of 1.0mA. For systems where additional power savings while not transmitting are desired, the THS6226 can be used in its line termination mode to maintain impedance matching.

The wide output swing on +12V power supplies, coupled with excellent current drive, allows for wide dynamic headroom, keeping distortion minimal.

The THS6226 is available in a QFN-32 PowerPAD™ package.



Typical VDSL2 Line Driver Circuit Using One Port of the THS6226

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This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

ORDERING INFORMATION(1)

PRODUCT(2)	PACKAGE-LEAD	PACKAGE DESIGNATOR	PACKAGE MARKING	TRANSPORT MEDIA, QUANTITY
THS6226IRHBT	VQFN-32	RHB	THS6226IRHB	Tape and Reel, 250
THS6226IRHBR				Tape and Reel, 3000

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or visit the device product folder at www.ti.com.
(2) The PowerPAD is electrically isolated from all other pins.

ABSOLUTE MAXIMUM RATINGS(1)

Over operating free-air temperature range, unless otherwise noted.

PARAMETER		THS6226	UNIT
Supply voltage, GND to V_{S+}, class AB only		15	V
Supply voltage, GND to V_{S+}, class H only		12.5	V
Input voltage, V_I		15	V
Output current, I_O: static dc(2)		±100	mA
Continuous power dissipation		See Thermal Information table	
Normal storage temperature		–40 to +85	°C
Maximum junction temperature, any condition, T_J(3)		+150	°C
Maximum junction temperature, continuous operation, long-term reliability, T_J(4)		+130	°C
Storage temperature range, T_{STG}		–65 to +150	°C
ESD ratings:	Human body model (HBM)	2000	V
	Charged device model (CDM)	500	V
	Machine model (MM)	100	V

(1) Stresses above 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 degrade device reliability.
(2) The THS6226 incorporates a PowerPAD on the underside of the chip. This acts as a heatsink and must be connected to a thermally dissipating plane for proper power dissipation. Failure to do so may result in exceeding the maximum junction temperature which could permanently damage the device. See TI Technical Brief SLMA002 for more information about utilizing the PowerPAD thermally-enhanced package. Under high-frequency ac operation (> 10kHz), the short-term output current capability is much greater than the continuous dc output current rating. This short-term output current rating is about 8.5x the dc capability, or approximately ±850mA.
(3) The absolute maximum junction temperature under any condition is limited by the constraints of the silicon process.
(4) The absolute maximum junction temperature for continuous operation is limited by the package constraints. Operation above this temperature may result in reduced reliability and/or lifetime of the device.

THERMAL INFORMATION

THERMAL METRIC(1)		THS6226 RHB 32 PINS	UNITS
θ_{JA}	Junction-to-ambient thermal resistance	35.1	°C/W
θ_{JCtop}	Junction-to-case (top) thermal resistance	22.1	
θ_{JB}	Junction-to-board thermal resistance	7.0	
ψ_{JT}	Junction-to-top characterization parameter	0.3	
ψ_{JB}	Junction-to-board characterization parameter	6.9	
θ_{JCbot}	Junction-to-case (bottom) thermal resistance	1.3	

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, SPRA953.

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ELECTRICAL CHARACTERISTICS: V_S = +12V

Boldface limits are tested at **+25°C.**

At T_A = +25°C, with R_{MATCH} = 10.2Ω, transformer turn ratio 1:1.4, R_L = 100Ω differential at transformer output, Full Bias Mode, and active impedance circuit configuration, unless otherwise noted. Each port is tested independently.

PARAMETER	CONDITIONS	THS6226IRHB			UNIT	TEST LEVEL(1)
		MIN	TYP	MAX		
AC PERFORMANCE						
Small-signal bandwidth, –3dB	V_O = $2V_{PP}$, differential at OUTCD and OUTAB, gain = 19V/V		125		MHz	C
0.1dB bandwidth flatness	V_O = $2V_{PP}$		37		MHz	C
Large-signal bandwidth	V_O = $10V_{PP}$		125		MHz	C
Slew rate (10% to 90% level)	V_O = 15V step, differential		1500		V/µs	C
Rise and fall time	V_O = $2V_{PP}$		2.8		ns	C
Harmonic distortion	V_O = $2V_{PP}$, R_L = 60Ω differential					C
Second harmonic	Full bias, f = 1MHz		–91		dBc	C
Third harmonic	Full bias, f = 1MHz		–91		dBc	C
Second harmonic	Full bias, f = 5MHz		–70		dBc	C
	Low bias, f = 5MHz		–64		dBc	C
Third harmonic	Full bias, f = 5MHz		–75		dBc	C
	Low bias, f = 5MHz		–47		dBc	C
Differential input voltage noise	f = 1MHz, input-referred		6.3		nV/√Hz	C
DC PERFORMANCE						
Differential gain			19		V/V	C
Differential gain error(2)				**±2.5**	%	A
Input offset voltage			±1	**±5**	mV	A
	–40°C to +85°C			±6	mV	B
Input offset voltage drift				15	µV/°C	B
Input offset voltage matching	Channels 1 to 2 and 3 to 4 only		±1	**±5**	mV	A
INPUT CHARACTERISTICS						
Noninverting input resistance			500 || 2		kΩ || pF	C
Input bias voltage		**5.8**	6	**6.2**	V	A
OUTPUT CHARACTERISTICS						
Class H output voltage swing	R_L = 60Ω differential, class H operation(3)(4), each output	**+16/–4**	+17.5/–5.5		V	A
	–40°C to +85°C(3)(4)	+15.7/–3.7			V	B
Class H output current (sourcing, sinking)	R_L = 60Ω differential, class H operation	**±333**	±383		mA	A
	–40°C to +85°C	±323			mA	B
Class AB output voltage swing	R_L = 60Ω differential, normal operation(3), each output	**+9.9/+2.1**	+10.1/+1.9		V	A
	–40°C to +85°C(3)	+9.8/+2.2			V	B
Class AB output current (sourcing, sinking)	R_L = 60Ω differential, normal operation	**±130**	±137		mA	A
	–40°C to +85°C	±126			mA	B
Short-circuit output current			1		A	C
Output impedance	f = 1MHz, differential		0.2		Ω	C
Crosstalk	f = 1MHz, V_{OUT} = $2V_{PP}$, port 1 to port 2		–90		dB	C

(1) Test levels: **(A)** 100% tested at +25°C. Over temperature limits set by characterization and simulation. **(B)** Limits set by characterization and simulation. **(C)** Typical value only for information.
(2) Negative feedback loop only.
(3) Measured at amplifier output (pin 17, 20, 21, and 24).
(4) Capacitor fully charged, no droop.

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ELECTRICAL CHARACTERISTICS: V_S = +12V (continued)

Boldface limits are tested at **+25°C.**

At T_A = +25°C, with R_{MATCH} = 10.2Ω, transformer turn ratio 1:1.4, R_L = 100Ω differential at transformer output, Full Bias Mode, and active impedance circuit configuration, unless otherwise noted. Each port is tested independently.

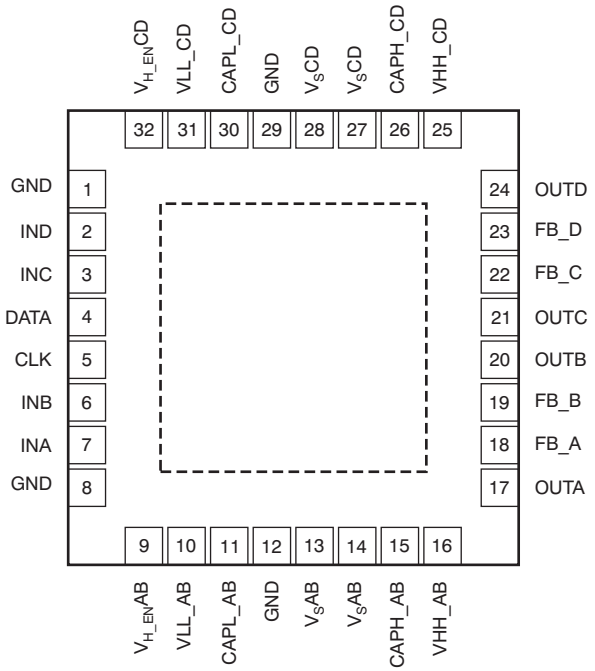
PARAMETER	CONDITIONS	THS6226IRHB			UNIT	TEST LEVEL(1)
		MIN	TYP	MAX		
POWER SUPPLY						
Maximum operating voltage	Class AB	**+10**	+12	**+15**	V	A
	–40°C to +85°C	+10		+15	V	B
	Class H	+10	+12	+12.5	V	B
	–40°C to +85°C	+10		+12.5		B
I_{S+} quiescent current	Per port, full bias, class H enable (power supply connected together)	**22.5**	23.5	**24.5**	mA	A
	–40°C to +85°C	**21.8**		**25.2**	mA	B
	Per port, full bias, class H disable (power supply connected together)	**22.0**	23.0	**24.0**	mA	A
	–40°C to +85°C	**21.3**		24.7	mA	B
	Bias current step		1.0		mA	C
	Per port, low bias, class H disable (power supply connected together)	**7.2**	7.6	**8**	mA	A
	–40°C to +85°C	**6.9**		8.3	mA	B
	Per port, line termination mode (B9 = B8 =B7 = B6 = 0) (power supply connected together)		4.4		mA	C
	Both ports, main amplifiers and class H disable (B9 = B8 = B7 = B6 = 0)		1.7	**2.2**	mA	A
	–40°C to +85°C			2.3	mA	B
Power-supply rejection (PSRR)	Differential, from +12V, GND	**60**	70		dB	A
	–40°C to +85°C	58			dB	B
LOGIC						
Logic pin logic threshold	Logic 1, with respect to GND(5)	1.9			V	C
	Logic 0, with respect to GND(5)			0.8	V	C
Logic pin quiescent current	Logic X = 0.5V (logic 0)		10	**25**	µA	A
	–40°C to +85°C			30	µA	B
	Logic X = 3.3V (logic 1)		66	**125**	µA	A
	–40°C to +85°C			130	µA	B
Turn-on time delay (t_{ON})	Time for I_S to reach 50% of final value		1		µs	C
Turn-off time delay (t_{OFF})	Time for I_S to reach 50% of final value		1		µs	C
Logic pin input impedance			50 || 1		kΩ || pF	C

(5) The GND pin usable range is from $V_{S–}$ to (V_{S+} – 5V).

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PIN CONFIGURATIONS

QFN-32(1)(2)
RHB PACKAGE
(TOP VIEW)



(1) The PowerPAD is electrically isolated from all other pins and can be connected to any potential voltage range from V_{S-} to V_{S+}. Typically, the PowerPAD is connected to the GND plane because this plane tends to physically be the largest and is able to dissipate the most amount of heat.

(2) The THS6226 defaults to the disabled mode at power-up.

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PIN DESCRIPTIONS

NAME	PIN	DESCRIPTION
GND	1	Analog ground
IND	2	Input D of amplifier CD
INC	3	Input C of amplifier CD
DATA	4	Serial interface data pin
CLK	5	Serial interface CLK pin
INB	6	Input B of amplifier AB
INA	7	Input A of amplifier AB
GND	8	Analog ground
V_{H_EN}AB	9	Class H mode control pin for amplifier AB
VLL_AB	10	Amplifier AB low pump supply
CAPL_AB	11	Amplifier AB negative voltage pump capacitor pin
GND	12	Analog ground
V_SAB	13	Amplifier AB supply voltage
V_SAB	14	Amplifier AB supply voltage
CAPH_AB	15	Amplifier AB positive voltage pump capacitor pin
VHH_AB	16	Amplifier AB high pump supply
OUTA	17	Output A of amplifier AB
FB_A	18	Feedback for active output impedance of amplifier AB
FB_B	19	Feedback for active output impedance of amplifier AB
OUTB	20	Output B of amplifier AB
OUTC	21	Output C of amplifier CD
FB_C	22	Feedback for active output impedance of amplifier CD
FB_D	23	Feedback for active output impedance of amplifier CD
OUTD	24	Output D of amplifier CD
VHH_CD	25	Amplifier CD high pump supply
CAPH_CD	26	Amplifier CD positive voltage pump capacitor pin
V_SCD	27	Amplifier CD supply voltage
V_SCD	28	Amplifier CD supply voltage
GND	29	Analog ground
CAPL_CD	30	Amplifier CD negative voltage pump capacitor pin
VLL_CD	31	Amplifier CD low pump supply
V_{H_EN}CD	32	Class H mode control pin for amplifier CD

TIMING CHARACTERISTICS

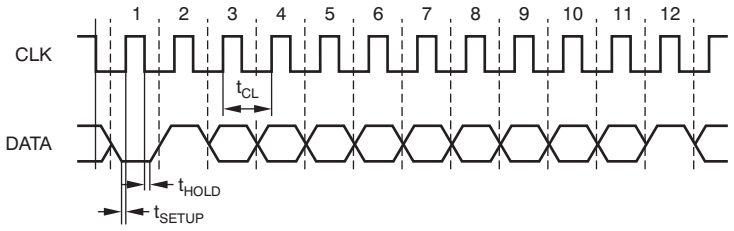


Figure 1. Serial Interface Timing

PARAMETER	DESCRIPTION	THS6226		UNITS
		MIN	MAX	
t_{SETUP}	Setup time	3		ns
t_{HOLD}	Hold time	0.5		ns
t_{CL}	Clock period	200		ns

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TYPICAL CHARACTERISTICS: V_S = +12V

At T_A = +25°C and Full Bias Mode, unless otherwise noted

SMALL-SIGNAL FREQUENCY RESPONSE

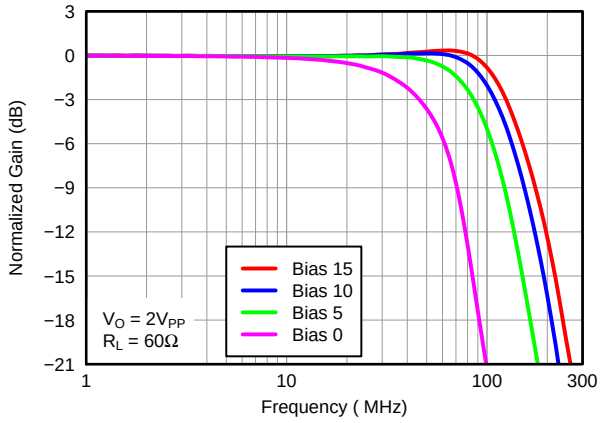


Figure 2.

LARGE-SIGNAL FREQUENCY RESPONSE

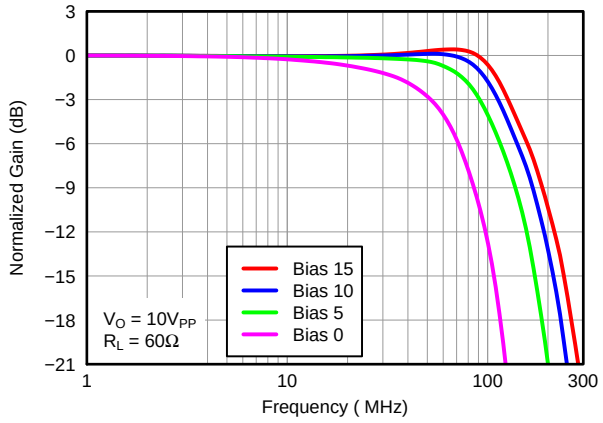


Figure 3.

OUTPUT VOLTAGE AND CURRENT LIMITATIONS

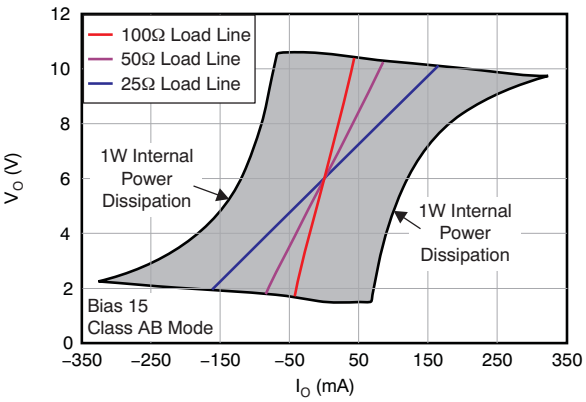


Figure 4.

POWER CONSUMPTION

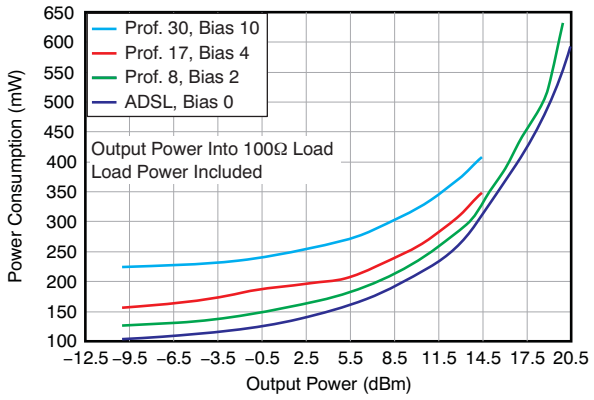


Figure 5.

CLASS AB OVERDRIVE RECOVERY

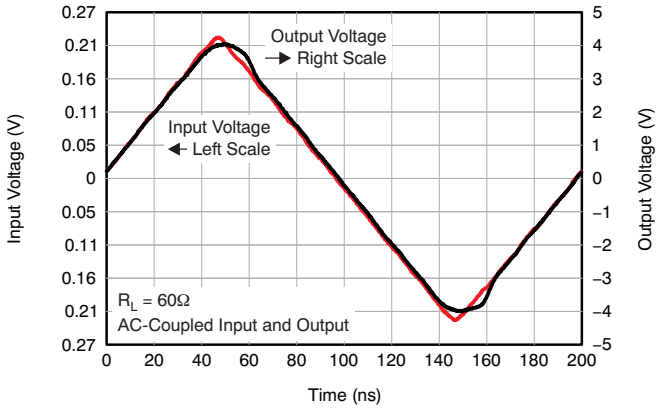


Figure 6.

OVERDRIVE RECOVERY

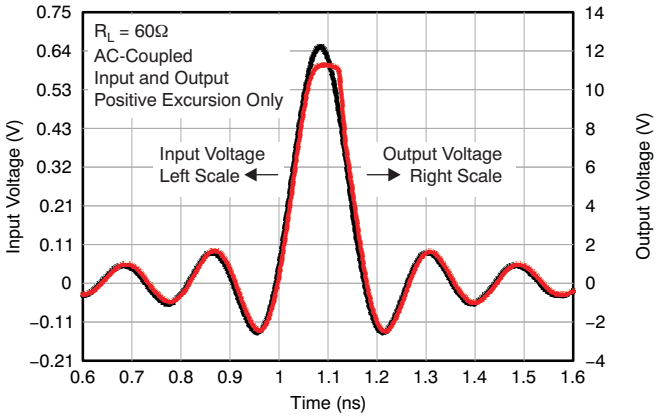


Figure 7.

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TYPICAL CHARACTERISTICS: V_S = +12V (continued)

At T_A = +25°C and Full Bias Mode, unless otherwise noted

INPUT NOISE DENSITY

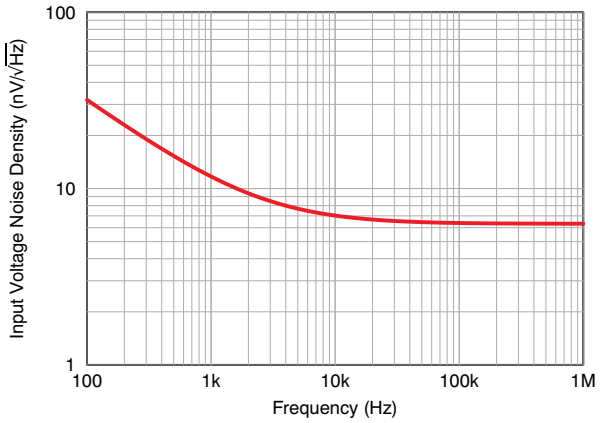


Figure 8.

HARMONIC DISTORTION vs FREQUENCY

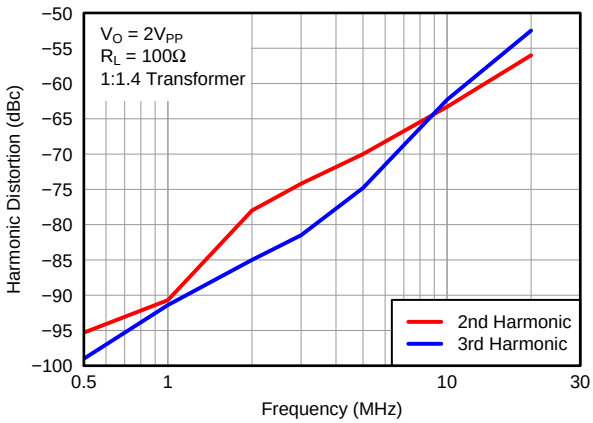


Figure 9.

HARMONIC DISTORTION vs LOAD

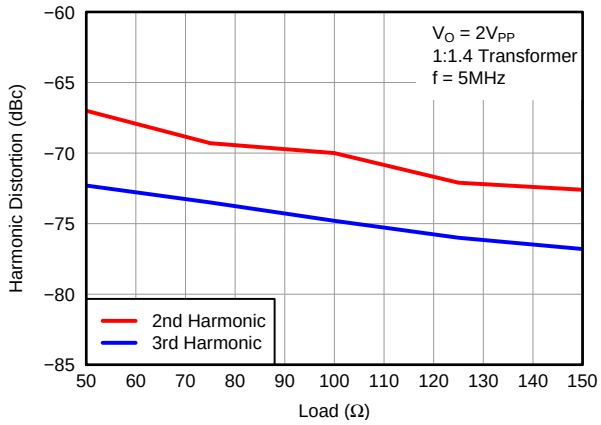


Figure 10.

TWO-TONE, THIRD-ORDER INTERMODULATION SPURIOUS

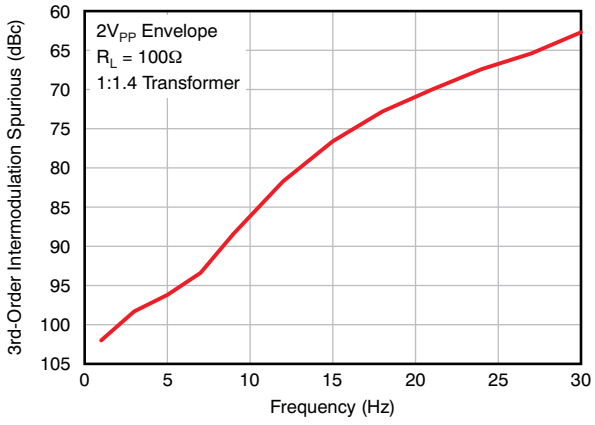


Figure 11.

HARMONIC DISTORTION vs OUTPUT VOLTAGE

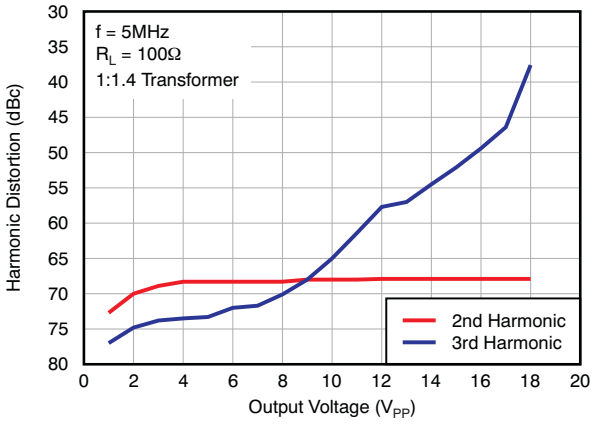


Figure 12.

HARMONIC DISTORTION vs BIAS CURRENT

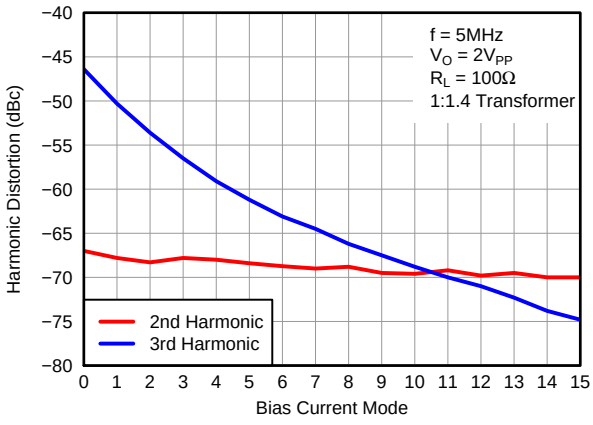


Figure 13.

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TYPICAL CHARACTERISTICS: V_S = +12V (continued)

At T_A = +25°C and Full Bias Mode, unless otherwise noted

LARGE-SIGNAL ENABLE/DISABLE RESPONSE

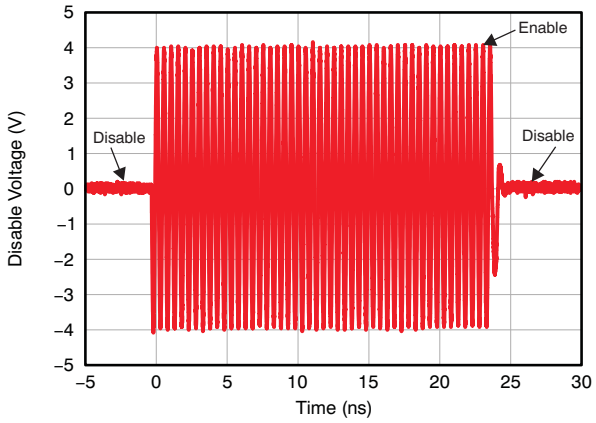


Figure 14.

DISABLE FEEDTHROUGH vs FREQUENCY

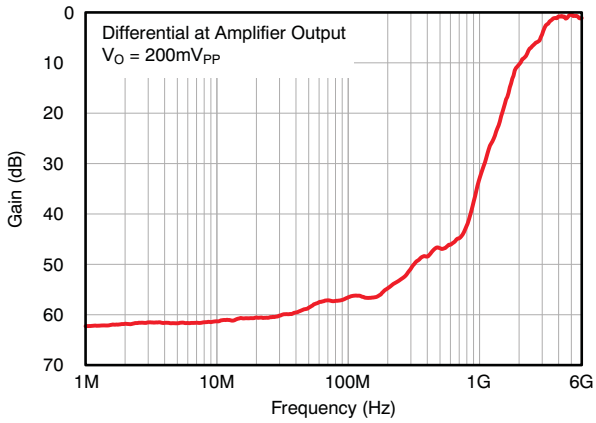


Figure 15.

PSRR AND CMRR vs FREQUENCY

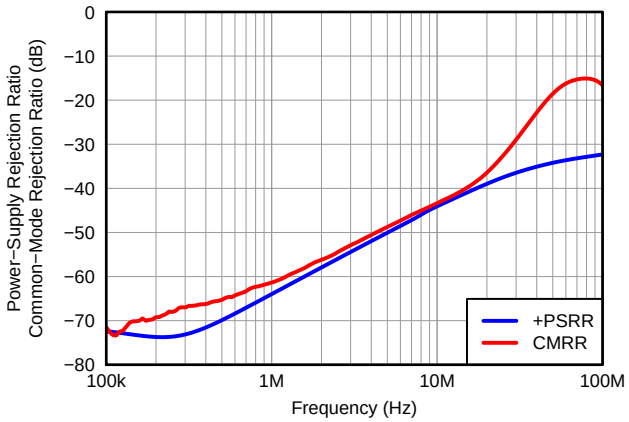


Figure 16.

QUIESCENT CURRENT AND OUTPUT vs TEMPERATURE

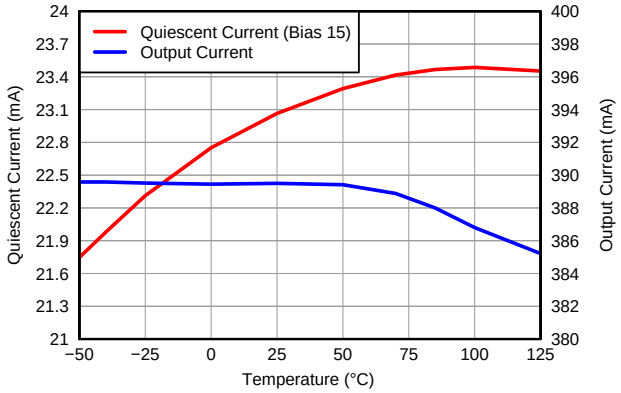


Figure 17.

INPUT OFFSET VOLTAGE vs TEMPERATURE

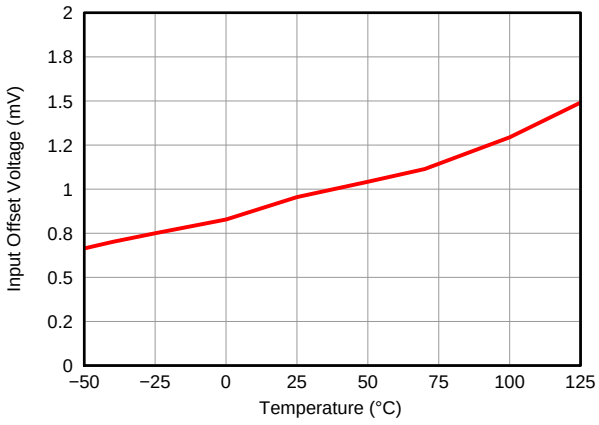


Figure 18.

INPUT OFFSET VOLTAGE HISTOGRAM

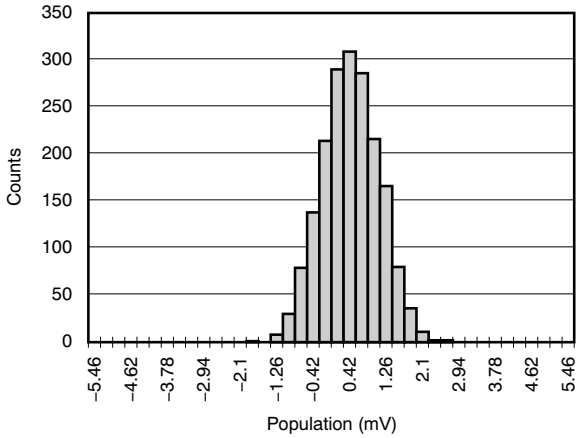


Figure 19.

APPLICATION INFORMATION

The THS6226 class H line driver provides exceptional ac performance in conjunction with wide output voltage swing. The class H operation allows voltage swings to exceed the power supply for short intervals limited only by the charge in the capacitor. In class AB mode, the THS6226 is capable of driving a 60Ω load from +1.9V to +10.1V. In class H mode, under the same conditions, the output voltage range becomes an impressive –5.5V to +17.5V, or 46V_{PP} differentially with the capacitor fully charged.

Figure 20 shows a fully-differential, noninverting amplifier configuration with active impedance. In this configuration, the 10.2Ω matching resistance appears through the transformer as 100Ω, minimizing reflection on the line, while also minimizing transmission losses. The THS6226 gain is fixed and equal to 19V/V from input of the amplifier to the output of the amplifier (IN_{CD} to OUT_{CD}), not including the transformer-turn ratio.

To simplify the implementation as well as provide design flexibility, the THS6226 contains an integrated mid-supply buffer that provides the correct biasing to the amplifier core without requiring any external components. Also present is a two-pin serial interface that provides exceptional design flexibility and allows minimal power consumption for each xDSL profile.

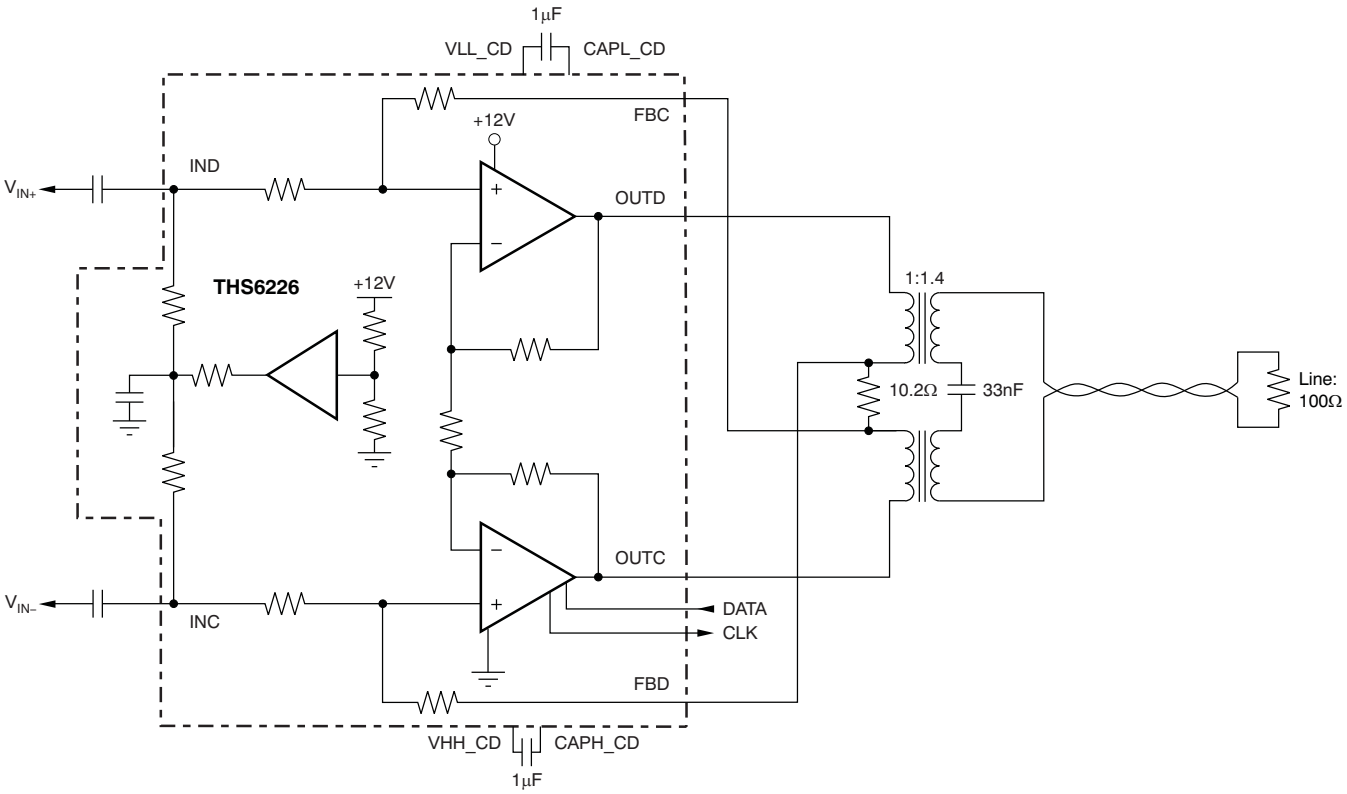


Figure 20. Multi-Tone Power Ratio (MTPR) Test Circuit

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PROGRAMMING THE THS6226

Programming of the THS6226 is realized through a serial interface (pins 4 and 5) and proceeds in the following sequence.

Two start bits are required B0 = 0 followed by B1 = 1.

B2 through B9 are used to program the THS6226.

Refer to Table 1 for the bit descriptions.

B10 (refer to Table 2) is the parity bit that controls if the word is or is not loaded.

B11 is the stop bit and should be set to B11 = 1. Figure 21 shows the sequence to be adopted.

Table 1. SDATA

PARAMETER	DESCRIPTION
B0, B1	Start bit
B2, B3	Channel select
B4, B5	Power-down features
B6-B9	Quiescent current setting
B10	Parity bit
B11	Stop bit

Table 2. Parity Bit

B10	ODD PARITY BIT
0	If odd, number of high bits in B2 to B9
1	If even, number of high bits in B2 to B9

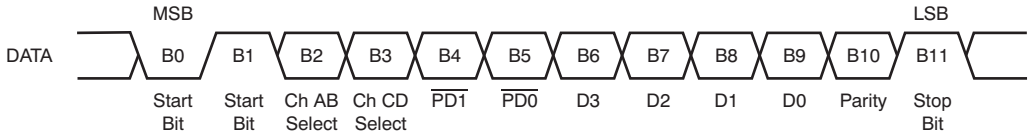


Figure 21. DATA Description

QUIESCENT CURRENT

The quiescent current of the THS6226 is dissipated in two main modules of the THS6226: the class AB and the charge pump. B4 and B5 select the mode of operation, class AB operating with or without the charge pump enabled, powering down the entire port, or operating in a line termination mode. Table 4 lists the details on each bit functionality and the approximate quiescent current.

The class AB quiescent current is set by bits B6 to B9, using B4 and B5 for the power-down function, and B2 and B3 for channel select. The approximate quiescent current for the amplifier core is shown in Table 3.

Table 3. Class AB Quiescent Current

B6 (D3)	B7 (D2)	B8 (D1)	B9 (D0)	QUIESCENT CURRENT SETTING	APPROXIMATE I_Q (mA/Port)
0	0	0	0	ADSL2+ mode	7.6
0	0	0	1		8.7
0	0	1	0	Profile 8b mode	9.8
0	0	1	1		10.9
0	1	0	0	Profile 17a mode	12
0	1	0	1		13
0	1	1	0		14
0	1	1	1		15
1	0	0	0		16
1	0	0	1		17
1	0	1	0	Profile 30a mode	18
1	0	1	1		19
1	1	0	0		20
1	1	0	1		21
1	1	1	0		22
1	1	1	1		23

The various power modes are shown in Table 4. For all modes, when B6 through B9 are not defined, set B9 = B8 = B7 = B6 = 0 to achieve the lowest power dissipation possible.

Table 4. Power Modes

B4 (PD1)	B5 (PD0)	POWER-DOWN MODE	APPROXIMATE I_Q (mA/Port)
0	0	Power-down (B9, B8, B7, B6 = 0)	0.85
0	1	Line termination mode (B9, B8, B7, B6 = 0)	4.4
1	0	Class AB driver I_Q set by B6 to B9, class H disabled	—
1	1	Class AB driver I_Q set by B6 to B9, class H enabled	—

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Channel selection is shown in Table 5. Each channel can be programmed independently, or together if both B2 and B3 are set to '1'.

Table 5. Channel Selection

B2 (Channel AB)	B3 (Channel CD)	CHANNEL SELECT
0	0	Bits B4 to B9 are ignored
0	1	Channel B programmed with B4 to B9
1	0	Channel A programmed with B4 to B9
1	1	Channels A and B programmed with B4 to B9

At startup, the internal register is set as shown in Table 6.

Table 6. Internal Register

B2 (Channel AB)	B3 (Channel CD)	B4 (PD1)	B5 (PD0)	B6 (D3)	B7 (D2)	B8 (D1)	B9 (D0)
0	0	0	0	0	0	0	0

In this condition, the total quiescent power dissipation is 10.2mW/port on a +12V supply.

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REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision B (February 2011) to Revision C	Page
• Changed LOGIC, *Logic pin input impedance* typical specification and unit in Electrical Characteristics table	4
• Changed Timing Characteristics section	6

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
THS6226IRHBR	ACTIVE	VQFN	RHB	32	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	-40 to 85	THS6226 IRHB	Samples
THS6226IRHBT	ACTIVE	VQFN	RHB	32	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	-40 to 85	THS6226 IRHB	Samples

(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.

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

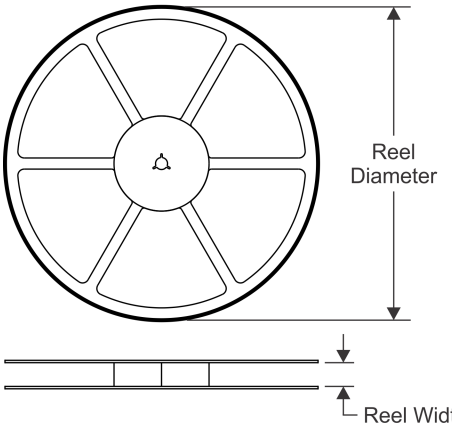
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

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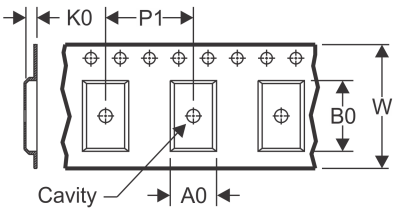
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TAPE AND REEL INFORMATION

REEL DIMENSIONS

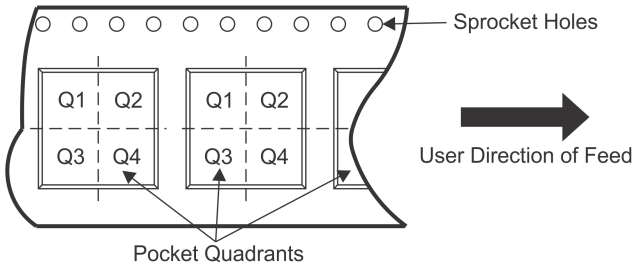


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

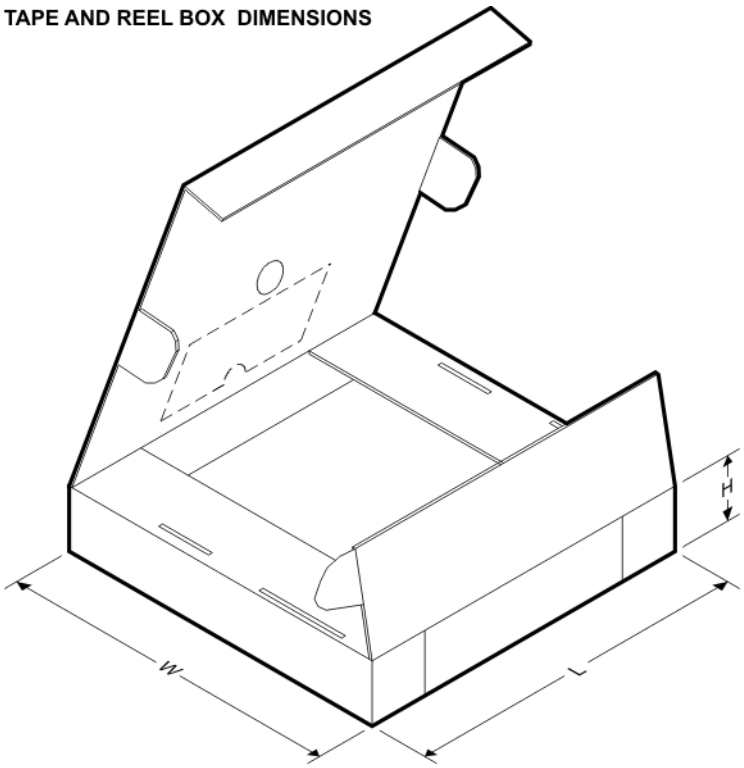
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
THS6226IRHBR	VQFN	RHB	32	3000	330.0	12.4	5.3	5.3	1.1	8.0	12.0	Q2
THS6226IRHBT	VQFN	RHB	32	250	180.0	12.4	5.3	5.3	1.1	8.0	12.0	Q2

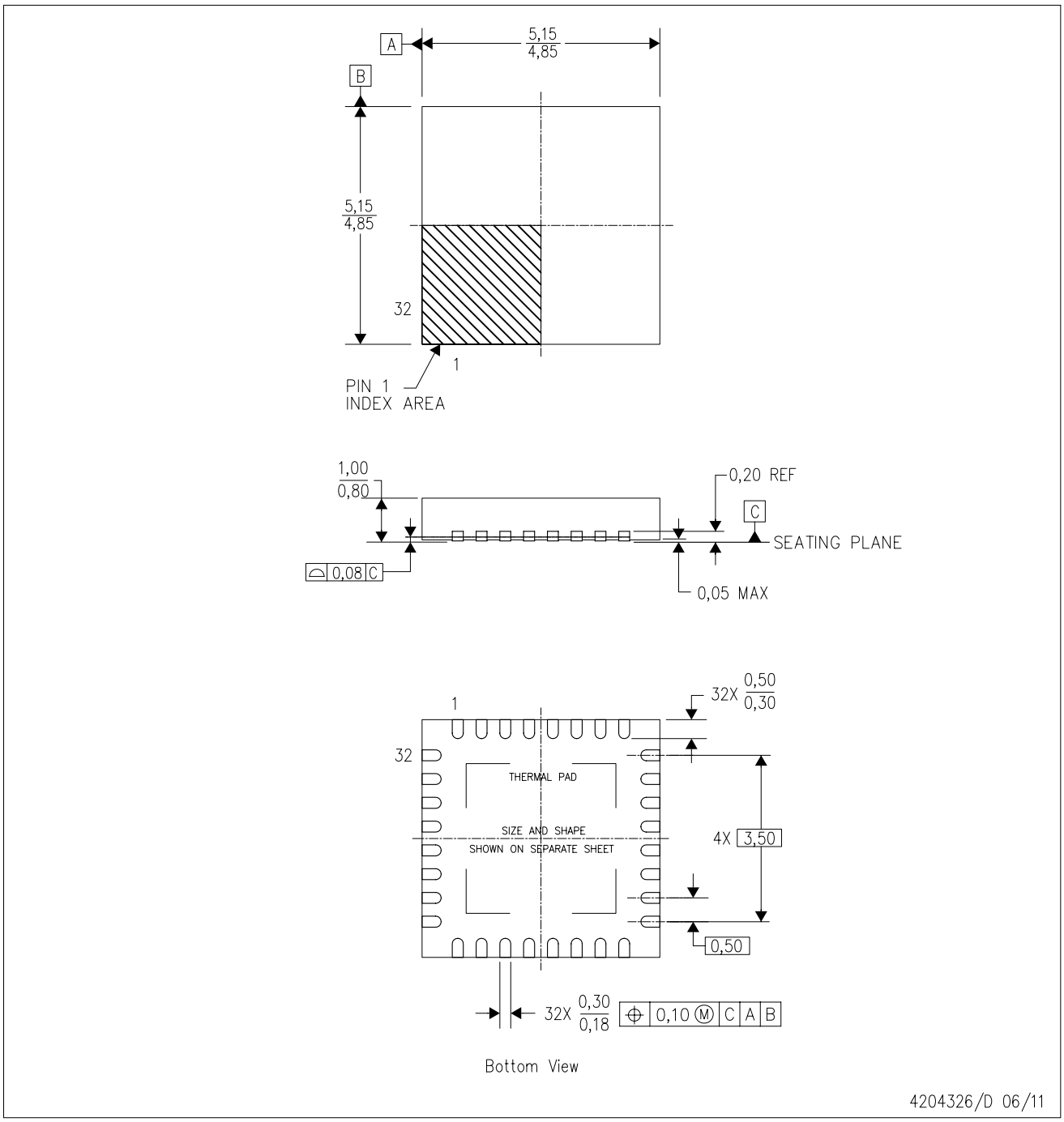
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
THS6226IRHBR	VQFN	RHB	32	3000	367.0	367.0	35.0
THS6226IRHBT	VQFN	RHB	32	250	210.0	185.0	35.0

RHB (S–PVQFN–N32) PLASTIC QUAD FLATPACK NO–LEAD



NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. QFN (Quad Flatpack No–Lead) Package configuration.
D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
F. Falls within JEDEC MO–220.

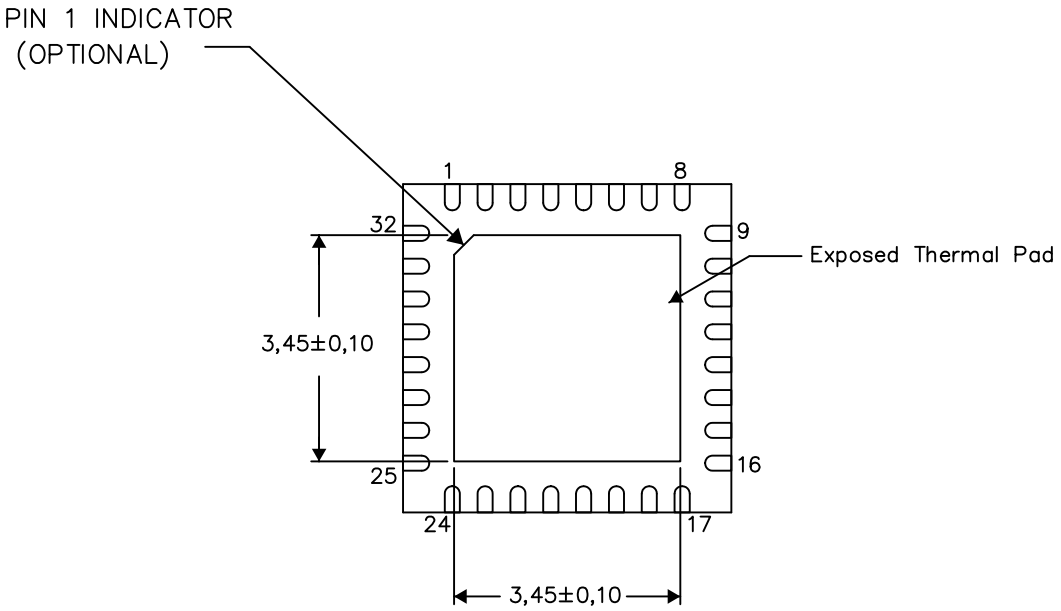
RHB (S–PVQFN–N32) PLASTIC QUAD FLATPACK NO–LEAD

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No–Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



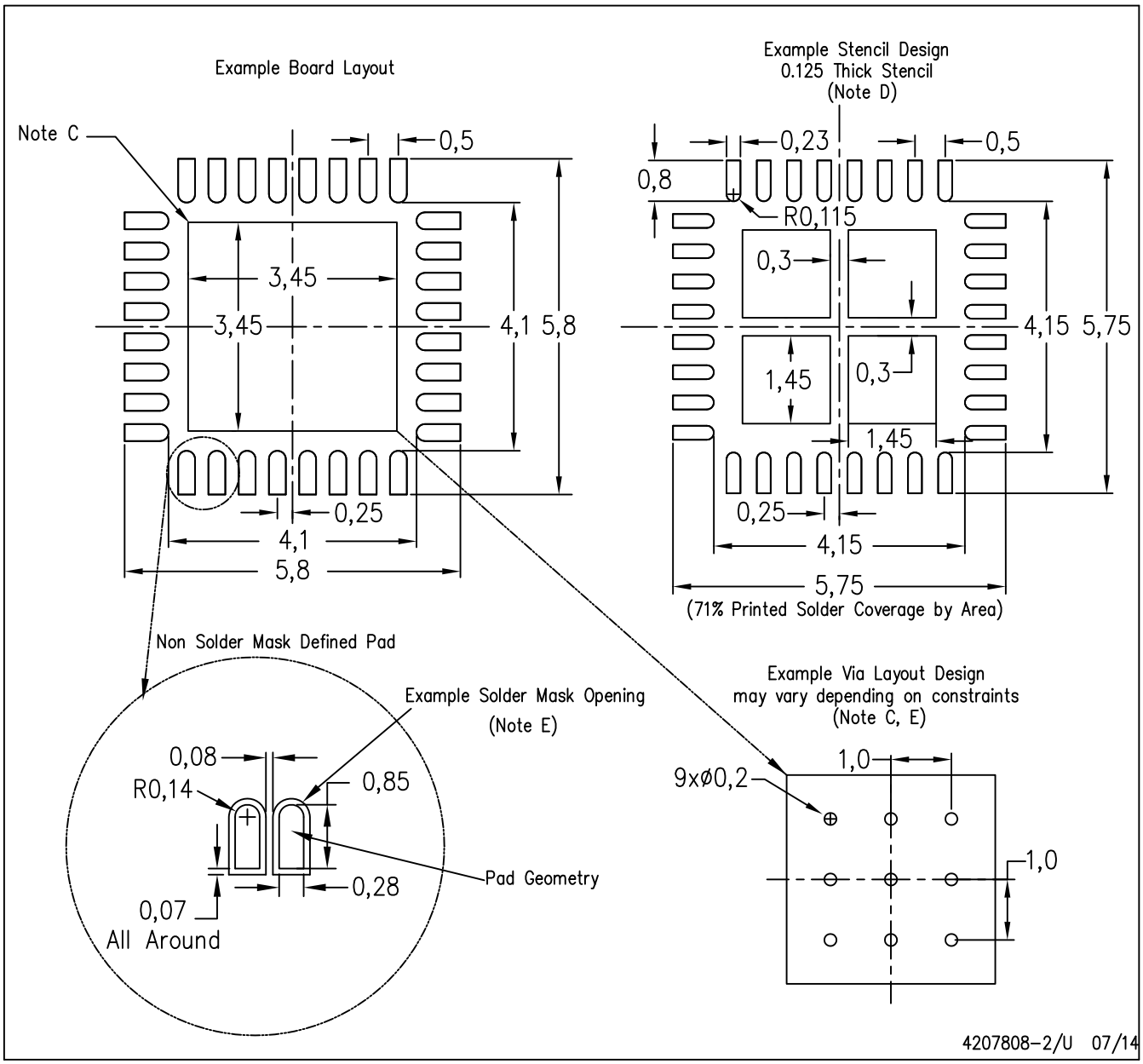
Bottom View

Exposed Thermal Pad Dimensions

4206356–2/AB 07/14

NOTE: A. All linear dimensions are in millimeters

RHB (S–PVQFN–N32) PLASTIC QUAD FLATPACK NO–LEAD



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat–Pack Packages, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <http: //www.ti.com>.
D. 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. Refer to IPC 7525 for stencil design considerations.
E. Customers should contact their board fabrication site for recommended solder mask tolerances and via tenting recommendations for any larger diameter vias placed in the thermal pad.

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