High efficiency bidirectional DC/DC converter

TEA1204T

FEATURES

- Fully integrated DC/DC converter circuit
- Up or downconversion, each in 2 different modes
- High efficiency up to 96% at high loads
- High output power up to 3 W continuous, 8 W in burst mode
- Burst mode input for optimal dynamic response to switching loads
- Low quiescent power consumption
- Shutdown mode
- Fabricated in advanced 0.8 μm CMOS process
- 8-pin SO package.

GENERAL DESCRIPTION

The TEA1204T is a fully integrated DC/DC converter circuit using the minimum amount of external components. It is intended to be used to supply electronic circuits with supply voltages of 3.3, 3.6 or 5.0 V from 2, 3 or 4 NiCd cell batteries or one LiIon battery at an output power level up to 3 W continuously, or 8 W in GSM TDMA (1 : 8) burst mode. Efficient (up to 96%) compact and dynamic power conversion is achieved using a novel, digitally controlled Pulse Width and Frequency Modulation (PWFM) control concept, integrated low R_{dson} CMOS power switches with low parasitic capacitances, and synchronous rectification.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TEA1204T	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1

BLOCK DIAGRAM

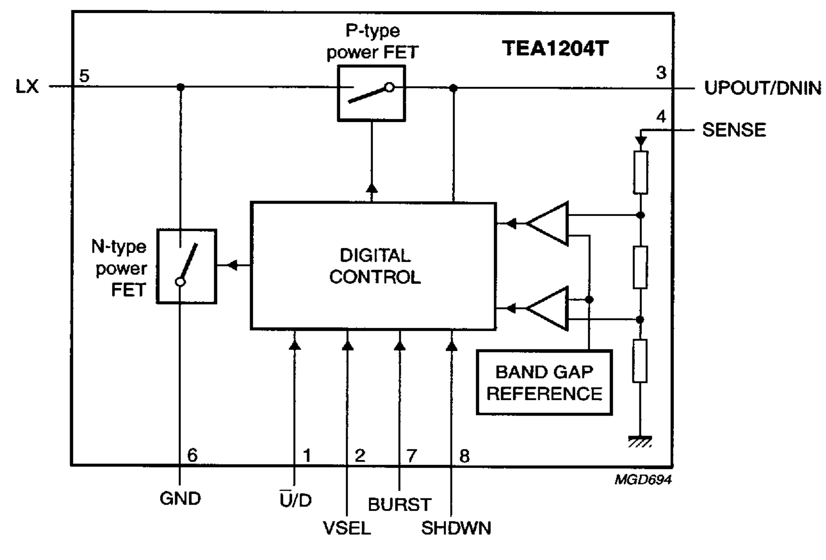


Fig.1 Block diagram.

PINNING

SYMBOL	PIN	DESCRIPTION
$\overline{U}$/D	1	conversion mode selection input
VSEL	2	output voltage selection input
UPOUT/DNIN	3	up mode: output voltage down mode: input voltage
SENSE	4	output voltage sense input
LX	5	inductor connection
GND	6	ground
BURST	7	power burst trigger input
SHDWN	8	shutdown input

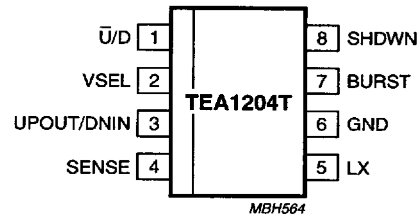


Fig.2 Pin configuration.

FUNCTIONAL DESCRIPTION

The TEA1204 can be configured as an upconverter, with selectable output voltage of 3.3 V or 5.0 V, or as a downconverter, generating 3.3 V or 3.6 V output voltage from max. 5.5 V input. Two pins are reserved to set the operational mode; see Table 1.

Table 1 Conversion mode and V_O selection

PIN $\overline{U}$/D	PIN VSEL	MODE	V_I (V)	V_O (V)
LOW	LOW	UP	1.6 to 4.3	5.0
LOW	HIGH	UP	1.6 to 3.0	3.3
HIGH	LOW	DOWN	3.6 to 5.0	3.6
HIGH	HIGH	DOWN	3.3 to 5.0	3.3

APPLICATION INFORMATION

Upconversion

A typical component choice for an upconverter (see Fig.3) from 3 NiCd cells to 5.0 V in a GSM handset (peak power 7.5 W, peak current 2.7 A) is:

- L1: L = 10 μH, I_{sat} = 3.5 A, R_{dc} = 50 mΩ, e.g. Coilcraft DO3316-103
- C1: C = 100 μF, low ESR capacitor; necessity depends on type of input voltage source
- C2: C = 330 μF, ESR = 0.1 Ω, e.g. Sprague 595D series
- D1: Medium-power schottky diode, e.g. Philips PRLL5819 (SMD).

Downconversion

A downconverter (see Fig.4) for the same power level can be realised using the same components.

For lower power applications, the I_{sat} and R_{dc} values of the inductor can be scaled by the scaling factor of the output current from the values above. The same holds for the ESR value of the output capacitor. A further improvement is increase of inductance and decrease of output capacitance.

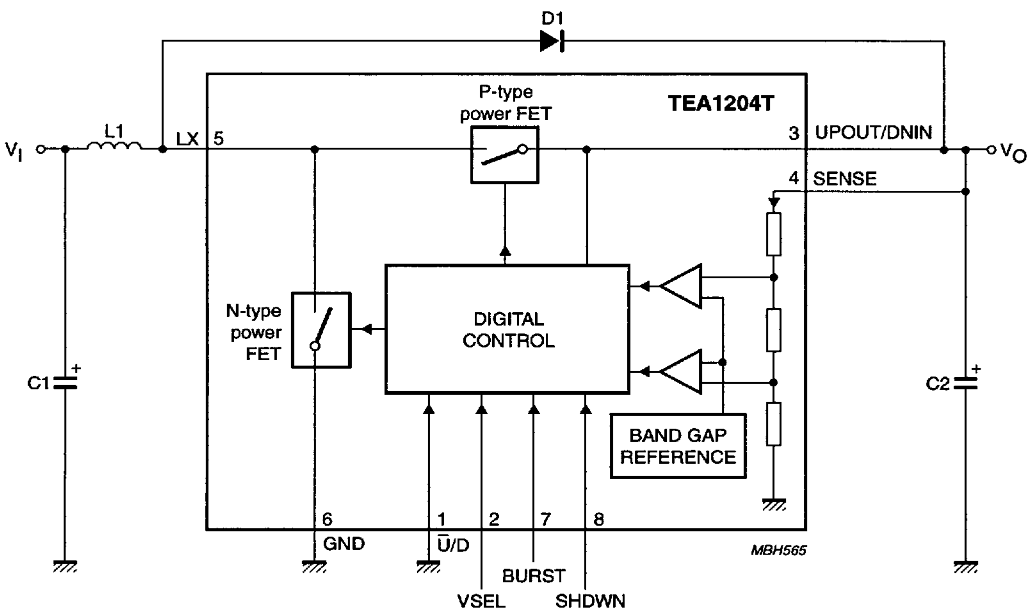


Fig.3 Application diagram (upconversion).

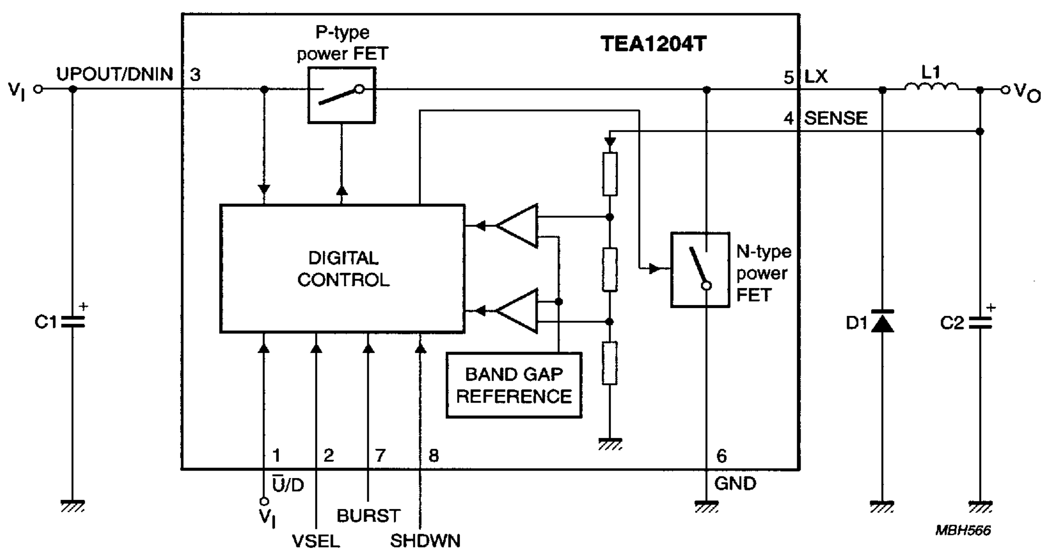
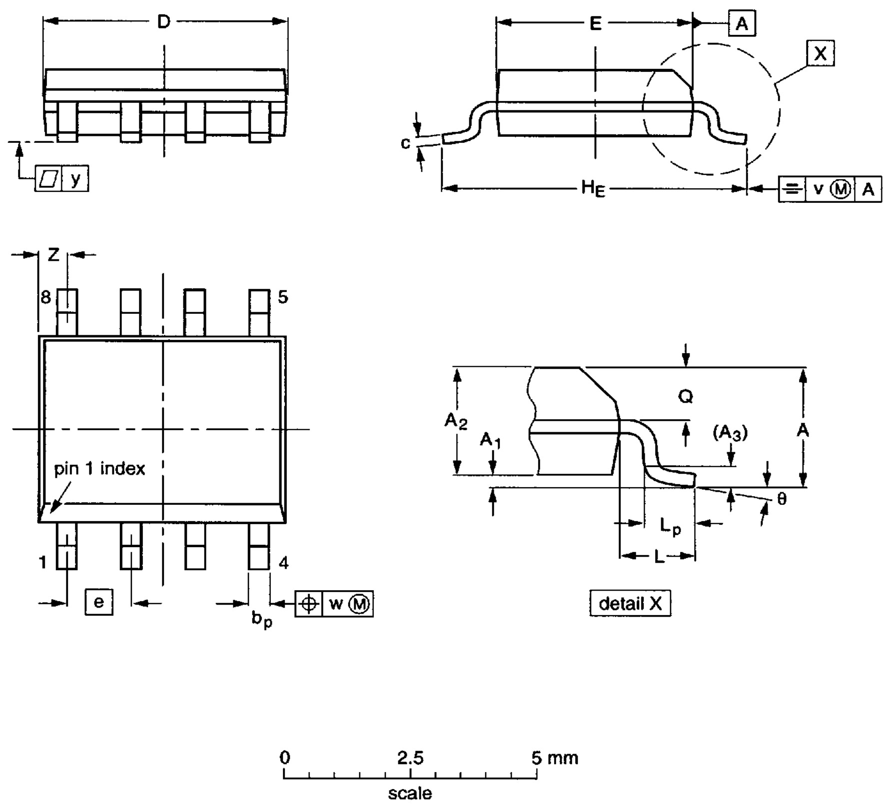


Fig.4 Application diagram (downconversion).

PACKAGE OUTLINE

SO8: plastic small outline package; 8 leads; body width 3.9 mm **SOT96-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(2)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	5.0 4.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.0098 0.0039	0.057 0.049	0.01	0.019 0.014	0.0098 0.0075	0.20 0.19	0.16 0.15	0.050	0.24 0.23	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT96-1	076E03S	MS-012AA				~~92-11-17~~ 95-02-04

7110826 0108129 9T3

SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"IC Package Databook"* (order code 9398 652 90011).

Reflow soldering

Reflow soldering techniques are suitable for all SO packages.

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt. Dwell times vary between 50 and 300 seconds depending on heating method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 minutes at 45 °C.

Wave soldering

Wave soldering techniques can be used for all SO packages if the following conditions are observed:

- A double-wave (a turbulent wave with high upward pressure followed by a smooth laminar wave) soldering technique should be used.
- The longitudinal axis of the package footprint must be parallel to the solder flow.
- The package footprint must incorporate solder thieves at the downstream end.

During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder is 10 seconds, if cooled to less than 150 °C within 6 seconds. Typical dwell time is 4 seconds at 250 °C.

A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

Repairing soldered joints

Fix the component by first soldering two diagonally-opposite end leads. Use only a low voltage soldering iron (less than 24 V) applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C. When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.

7110826 0108130 615