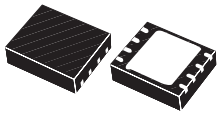
ST8R00

Micropower 1 A synchronous step-up DC-DC converter

Features

- Output voltage adjustable from 6 V to 12 V
- Output voltage accuracy: ± 2%
- Output current up to 1 A
- Low ripple voltage: 5 mV (typ.)
- Synchronous rectification
- High 90% efficiency: V_O = 9 V (typ.)
- Few external components
- Thermal shutdown protection
- Very small DFN8 (4 x 4 mm) package



DFN8 4 x 4 mm

Description

The ST8R00 is a synchronous PWM step-up DC-DC converter. The device is able to provide an output voltage in the range of 6 to 12 V with an input voltage from 4 to 6 V. The high switching frequency (1.7 MHz) permits the use of tiny surface-mount components. In addition to the resistor divider to set the output voltage value, only an inductor and two capacitors are required. Moreover, a low output ripple is guaranteed by the current mode PWM topology and by the use of low ESR SMD ceramic capacitors. The device is available in a very small DFN8 (4 x 4 mm) package.

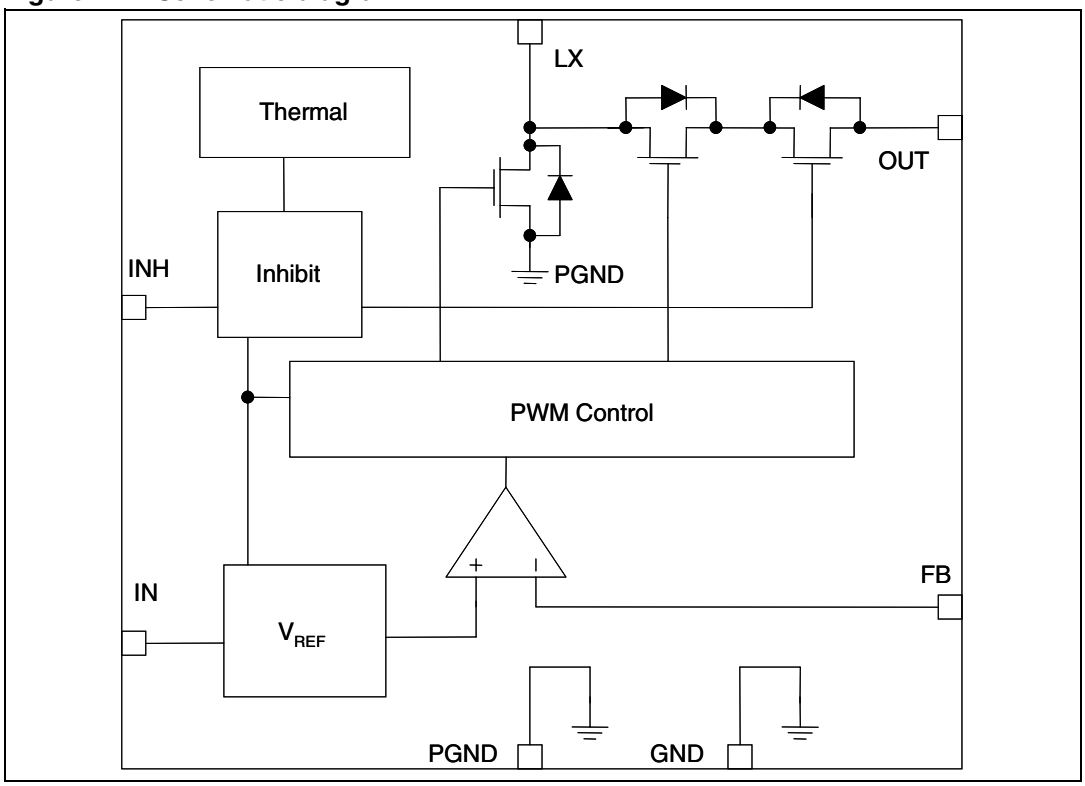
Table 1. Device summary

Part number	Order code	Output voltage
ST8R00	ST8R00WPUR	ADJ

Contents

1 Block diagram

Figure 1. Schematic diagram



2 Pin configuration

Figure 2. Pin connections (top view)

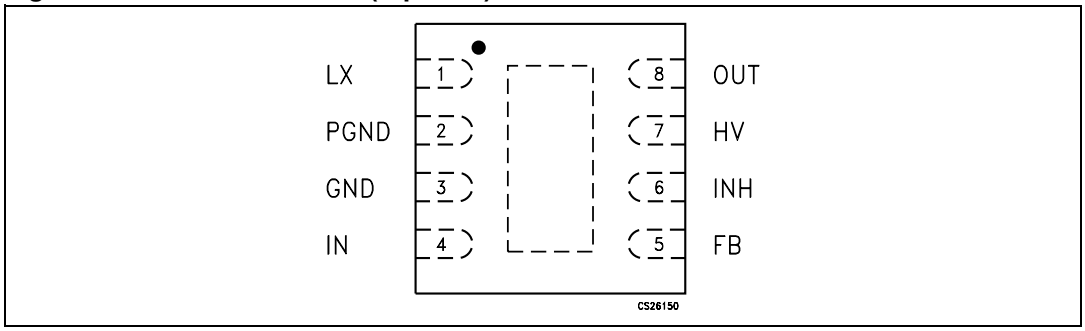
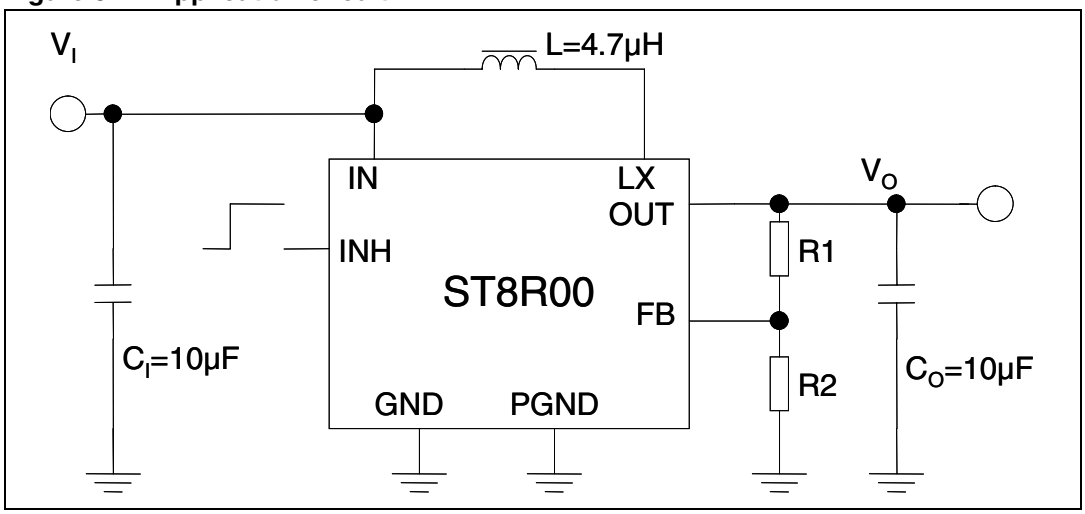


Table 2. Pin description

Pin n°	Symbol	Name and function
1	LX	Switching output
2	PGND	Power ground
3	GND	Analog ground
4	IN	Power input for analog circuit
5	FB	Feedback
6	INH	Inhibit. Connecting the pin to a voltage higher than 2 V = device ON. Connecting the pin to a voltage lower than 0.8 V = device OFF, resulting in no current flow to the load
7	HV	Trimming (floating or connected to GND)
8	OUT	Output voltage
EXP pad	GND	Exposed pad. Must be connected to GND

3 Typical application circuit

Figure 3. Application circuit



4 Maximum ratings

Table 3. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_O	Output voltage	16	V
V_I	Input voltage	6	V
V_{INH}	Inhibit voltage	6	V
V_{LX}	LX pin voltage	16	V
I_{LX}	LX pin output current	Internally limited	
T_{STG}	Storage temperature range	-50 to 150	°C
T_{OP}	Operating junction temperature range	-25 to 125	°C

Table 4. Thermal Data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case	10	°C/W
R_{thJA}	Thermal resistance junction-ambient	50	°C/W

Table 5. ESD Performance

Symbol	Parameter	Test conditions	Value	Unit
ESD	ESD protection voltage	HBM	4	KV
ESD	ESD protection voltage	MM	500	V

5 Electrical characteristics

V_I = 5 V, V_{INH} = 2 V, I_O = 100 mA, T_J = - 25 °C to 125 °C, C_I = C_O = 10 µF(X7R), L = 4.7 µH unless otherwise specified.

Table 6. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	(1)	6		12	V
$V_{START-UP}$	Start-up voltage	I_O = 400mA, V_I rising		3	3.5	V
V_I	Input voltage range		4		6	V
V_{FB}	Feedback voltage	I_O = 50mA	1.195	1.22	1.245	V
V_{FB_OFF}	Feedback voltage	I_O = 0, V_{INH} = 0		0		V
I_{FB}	Feedback current	V_{FB} = 0, V_{INH} = 2V		600		nA
I_{SUPPLY}	Supply current	To be measured at V_I, V_O = 7V, no load		10		mA
R_{DSON_N}	Internal N channel R_{DSON}	I_{LX} = 400mA		300		mΩ
R_{DSON_P}	Internal P channel R_{DSON}	I_{LX} = 400mA		300		
$I_{LX(leak)}$	Internal leakage current	V_{LX} = 4V, V_{FB} = 2V, V_{INH} = 0			0.5	µA
$I_{LX(LIM)}$	LX current limitation	V_{LX} = 4V		3		A
f_{OSC}	Oscillator frequency	To be measured on LX pin	0.8	1.2	1.4	MHz
D_{TY}	Max. oscillator duty cycle	To be measured on LX pin		90		%
Eff	Efficiency	I_O = 50mA, V_O = 7V		85		%
		I_O = 500mA, V_O = 9V		90		
		I_O = 1A, V_O = 9V		90		
V_{INH_H}	Inhibit threshold high		2			V
V_{INH_L}	Inhibit threshold low	V_I = 4 to 6V, I_O = 50mA			0.8	
I_{INH}	Inhibit pin current	V_{INH} = V_I = 5V			2	µA
T_{SHDN}	Thermal shut down (2)		130	150		°C
T_{HYS}	Thermal shut down hysteresis (2)			15		°C
$\Delta V_O/\Delta V_I$	Line transient response	V_I from 4 to 5.5V, I_O= 500mA (2)	-5		5	$\%V_O$
$\Delta V_O/\Delta I_O$	Load transient response	V_I = 5V, I_O from 10mA to 500mA, V_O = 7V (2)	-5		5	$\%V_O$
$\Delta V_O/\Delta V_I$	Start-up transient	V_I from 0 to 5V, I_O = 500mA	-10		10	$\%V_O$
T_{START}	Start-up time	V_{INH} from 0 to 5V, I_O = 100mA		500		µs

1. For V_O higher than 9 V the maximum output current capability is reduced according to LX current limitation
2. Guaranteed by design

6 Typical characteristics

L = 4.7 µH, $C_I = C_O = 10$ µF.

Figure 4. Voltage feedback vs. temperature

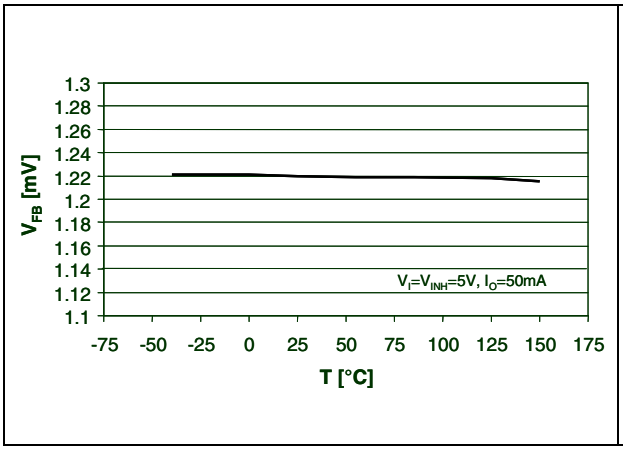


Figure 5. Feedback current vs. temperature

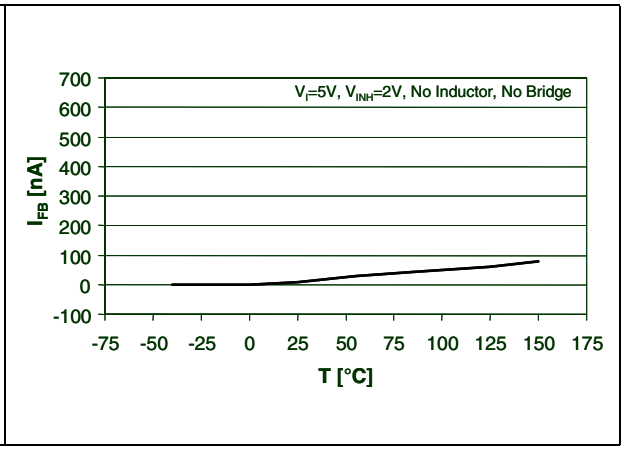


Figure 6. Supply current vs. temperature ($V_I = V_{INH} = 5$ V)

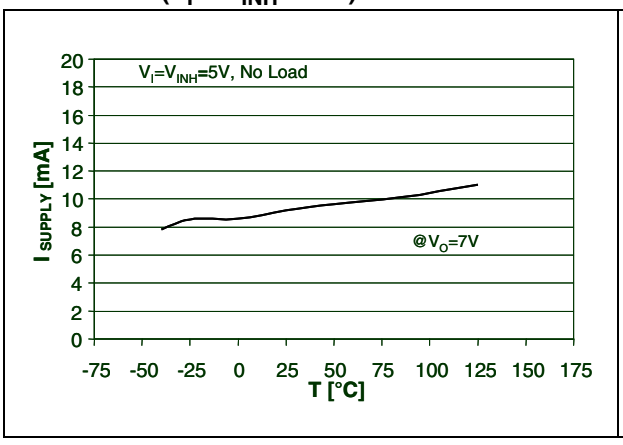


Figure 7. Supply current vs. temperature ($V_{INH} = 2$ V)

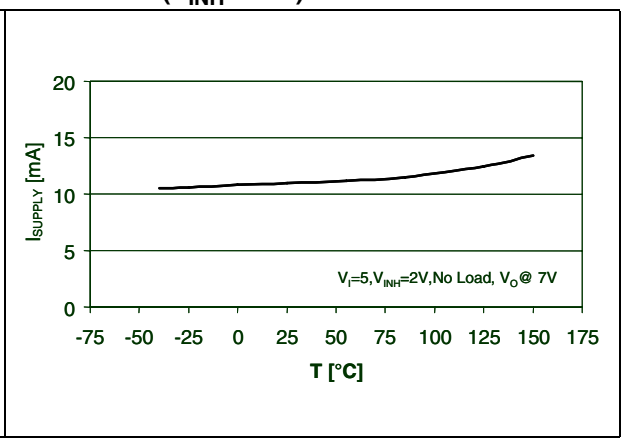


Figure 8. Supply current vs. temperature ($V_{FB} = 2$ V)

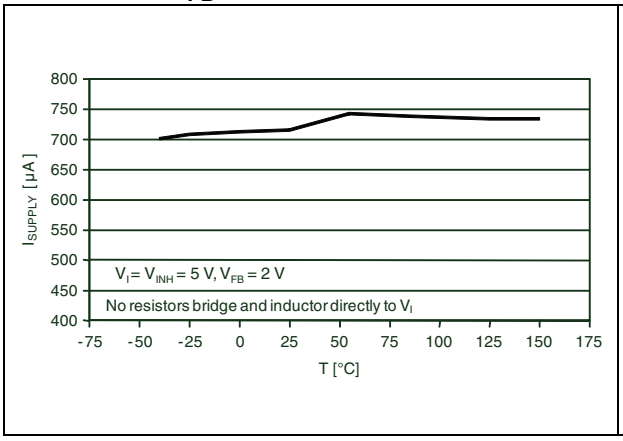


Figure 9. LX current limitation vs. temperature

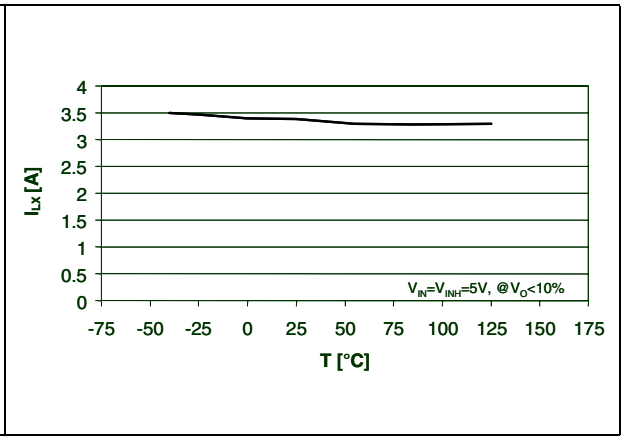


Figure 10. Inhibit voltage vs. temperature (V_I = 4 V)

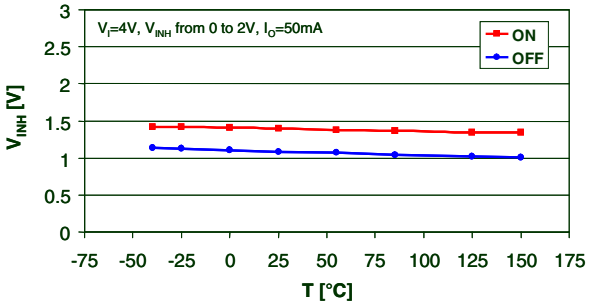


Figure 11. Inhibit voltage vs. temperature (V_I = 6 V)

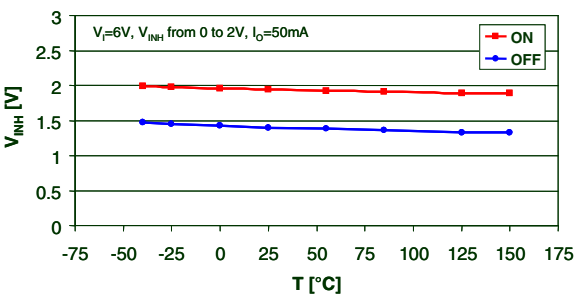


Figure 12. Line regulation vs. temperature

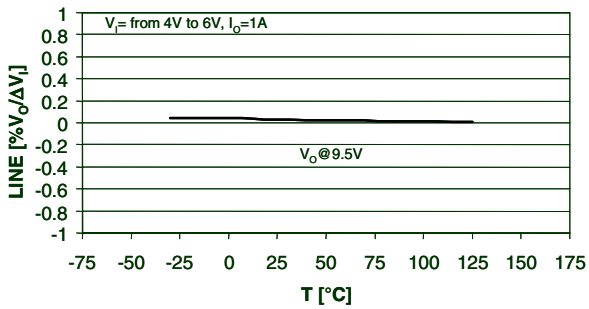


Figure 13. Load regulation vs. temperature

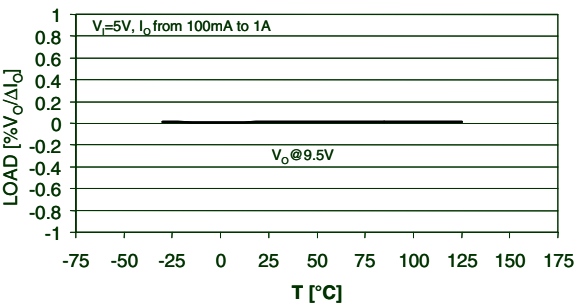


Figure 14. Oscillator frequency vs. temperature

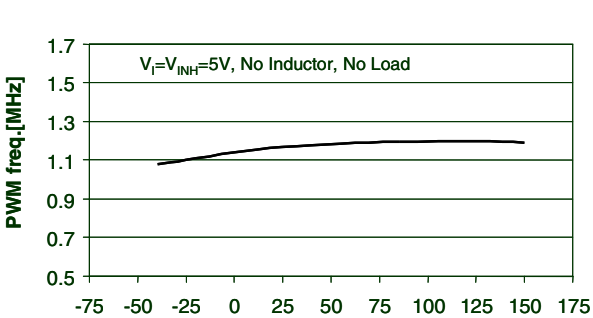


Figure 15. Max oscillator duty cycle vs. temperature

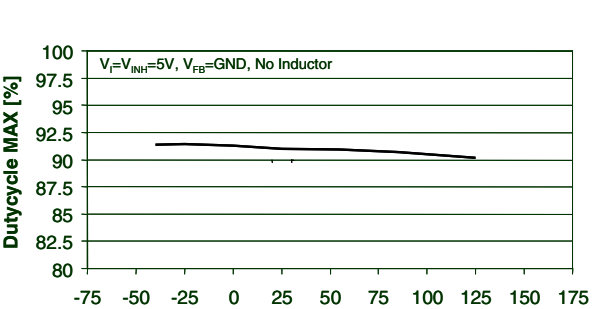


Figure 16. Internal leakage current vs. temperature (V_I = V_{INH} = 5 V)

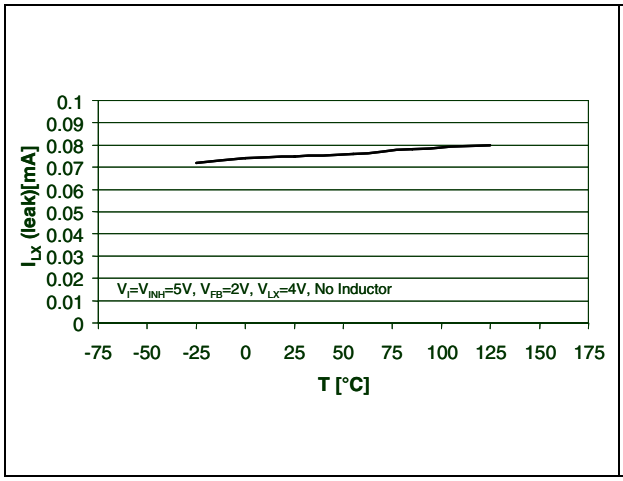


Figure 17. Internal leakage current vs. temperature (V_I = 5 V)

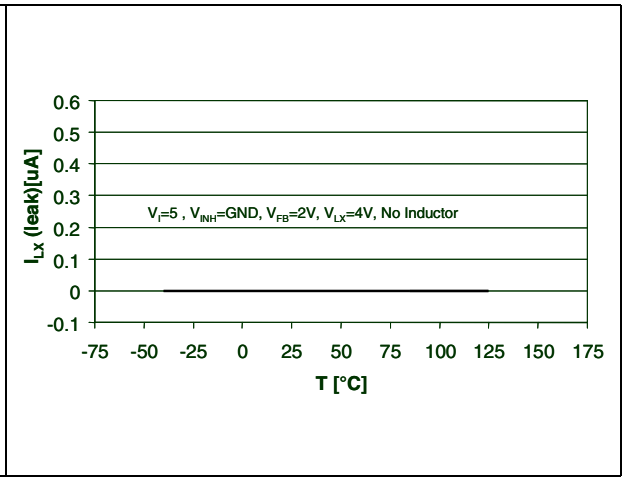


Figure 18. NMOS switch on resistance vs. temperature

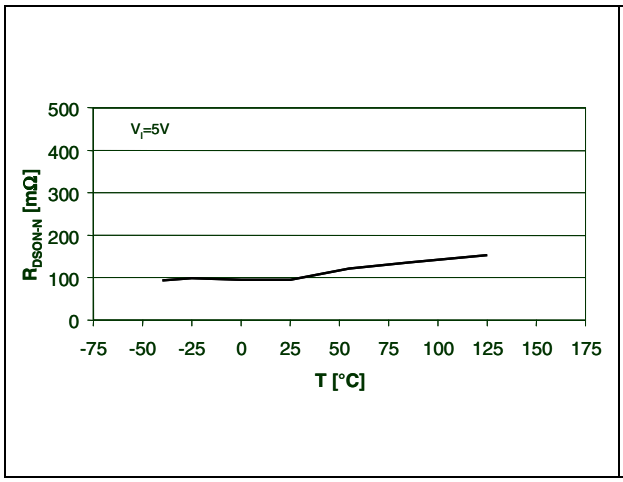


Figure 19. PMOS switch on resistance vs. temperature

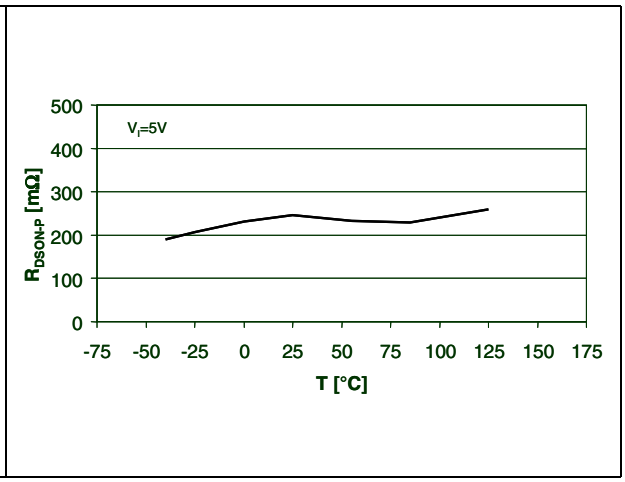


Figure 20. Efficiency vs. output current (L = 10 µH)

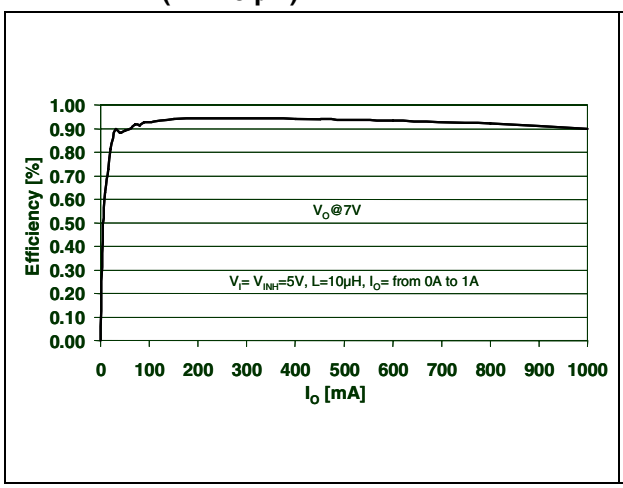


Figure 21. Efficiency vs. output current

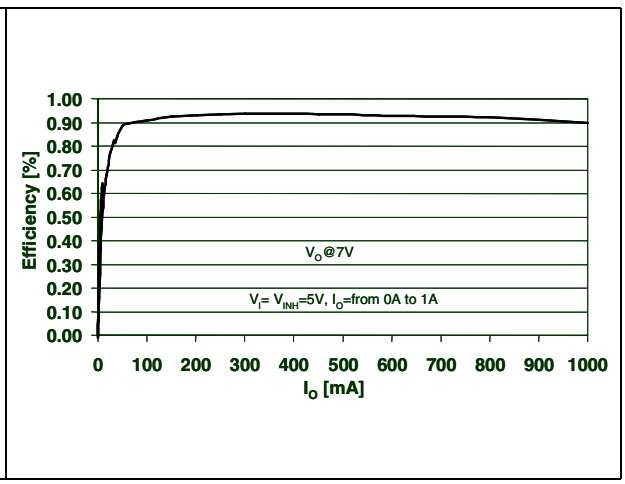


Figure 22. Output voltage vs. input voltage

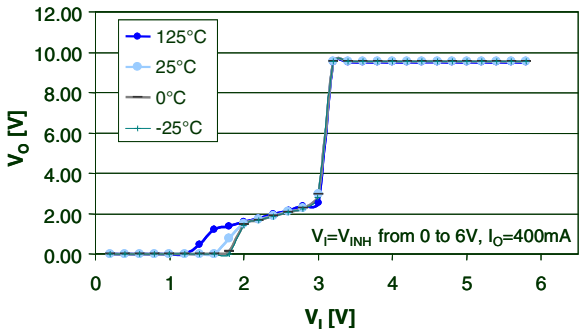


Figure 23. Maximum output current vs. output voltage

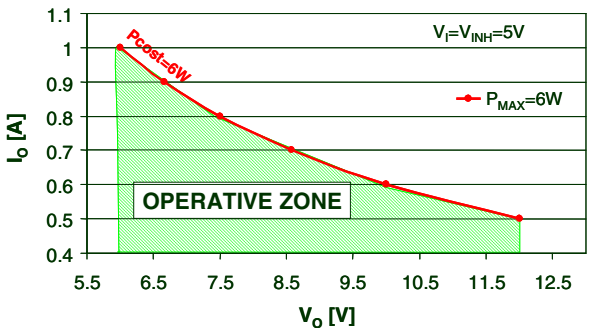
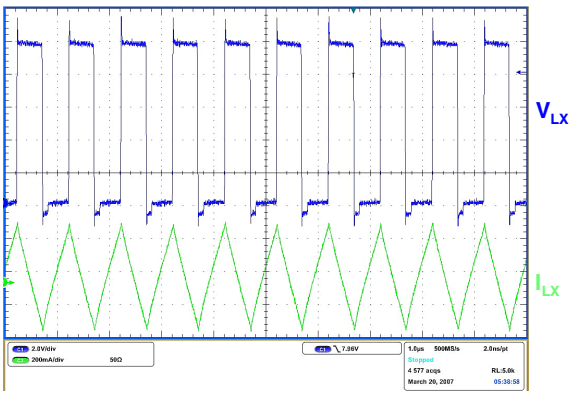
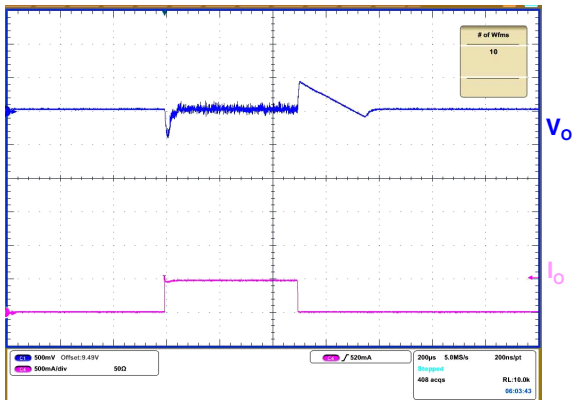


Figure 24. Inductor current



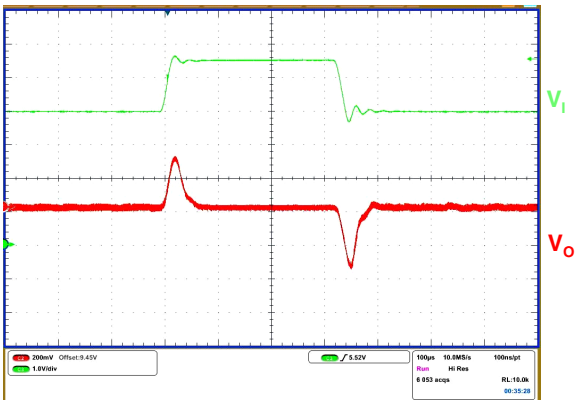
V_I=5V,V_{INH}= 2V, L=4.7µH, C_I=C_O=10µF, No Load, T=25°C

Figure 25. Load transient



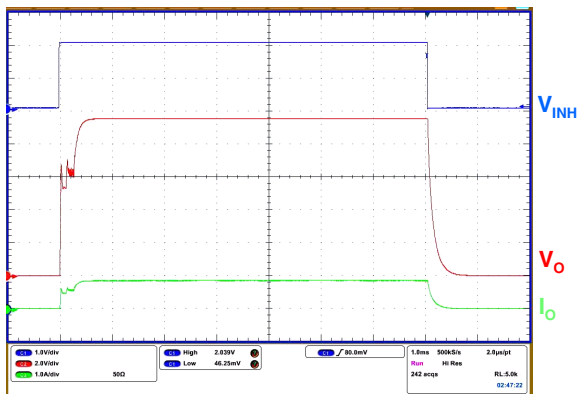
V_I=V_{INH}=5V, I_O=from 10mA to 500mA

Figure 26. Line transient



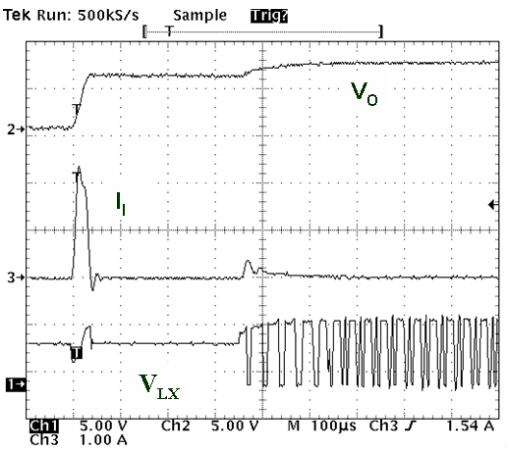
V_I=V_{INH} from 4V to 5.5V, I_O=500mA, 20µs

Figure 27. INH transient



V_I=6, V_{INH} from 0V to 2V, I_O=1A

Figure 28. Inrush current



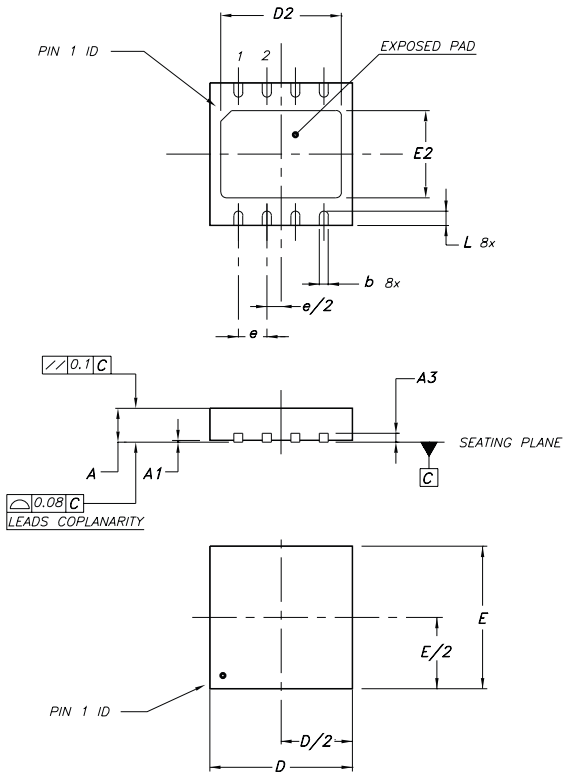
V_I=4.5, V_O=7V, V_{INH} from 0V to 3V, I_O=0, L=10µH

7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

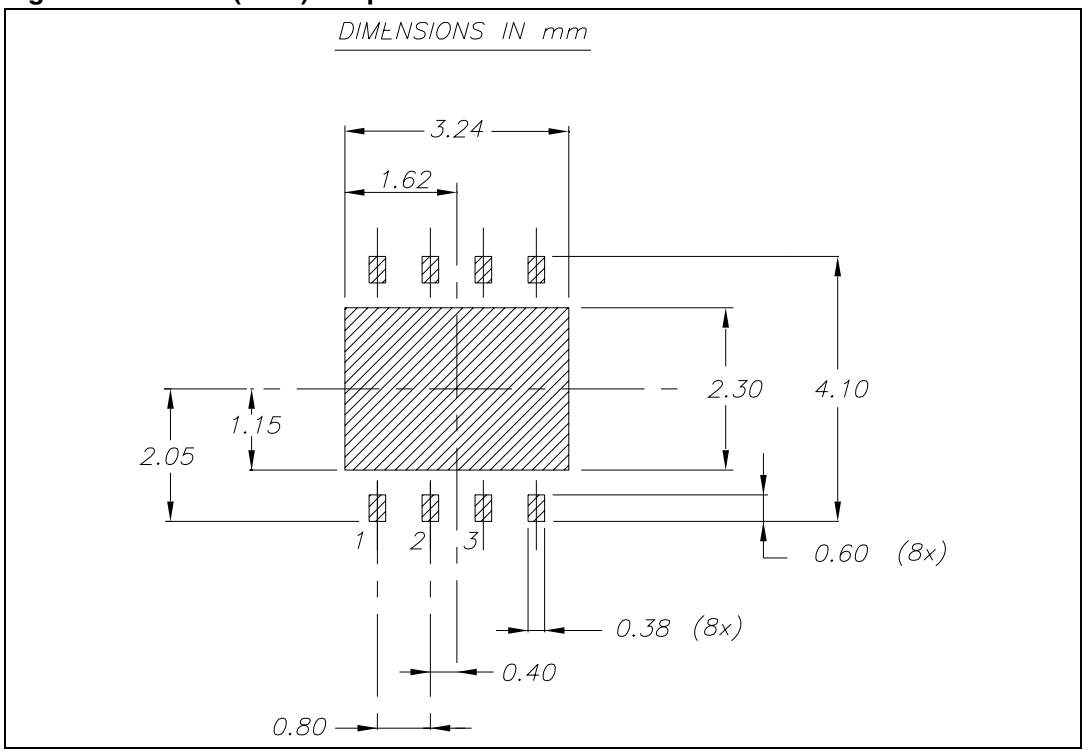
DFN8 (4x4) Mechanical Data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.80	0.90	1.00	0.031	0.035	0.039
A1	0	0.02	0.05	0	0.001	0.002
A3		0.20			0.008	
b	0.23	0.30	0.38	0.009	0.012	0.015
D	3.90	4.00	4.10	0.154	0.157	0.161
D2	2.82	3.00	3.23	0.111	0.118	0.127
E	3.90	4.00	4.10	0.154	0.157	0.161
E2	2.05	2.20	2.30	0.081	0.087	0.091
e		0.80			0.031	
L	0.40	0.50	0.60	0.016	0.020	0.024



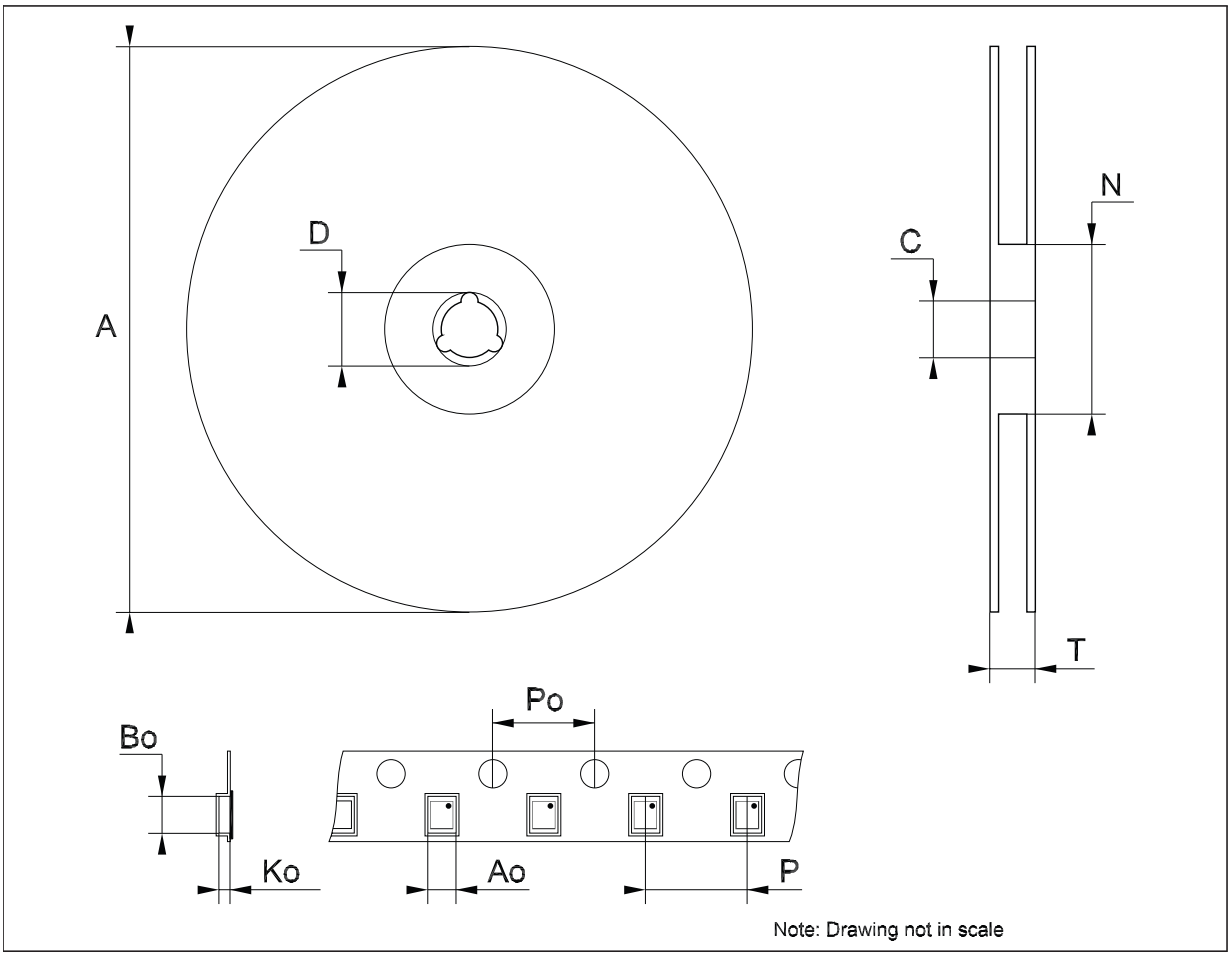
7869653B

Figure 29. DFN8 (4 x 4) footprint recommended data



Tape & Reel QFNxx/DFNxx (4x4) Mechanical Data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	99		101	3.898		3.976
T			14.4			0.567
Ao		4.35			0.171	
Bo		4.35			0.171	
Ko		1.1			0.043	
Po		4			0.157	
P		8			0.315	



8 Revision history

Table 7. Document revision history

Date	Revision	Changes
24-May-2007	1	Initial release.
01-Feb-2012	2	Modified: *Figure 8 on page 8*. Removed: Table 6, Figures 24, 25 and 26.