

Features

- Low start-up voltage: 0.7V (Typ.), 0.9V (Max.)
- High efficiency: 85% (Typ.), V_{OUT}≥2.7V
- High output voltage accuracy: ±2.5%
- Output voltage: 1.8V, 2.7V, 3.0V, 3.3V, 3.7V, 5.0V

Applications

- Palmtops/PDAs
- Portable communicators/Smartphones

- Ultra low supply current I_{DD2}: 4µA (Typ.)
- Low ripple and low noise
- Low shutdown current: 0.5μA (Typ.)
- TO-92, SOT-89, SOT-23 and SOT-25 package
- Cameras/Camcorders
- Battery-powered equipment

General Description

The HT77XX series is a set of PFM step-up DC/DC converter with high efficiency and low ripple. The series features extremely low start-up voltage and high output voltage accuracy. They require only three external components to provide a fixed output voltage of 1.8V, 2.7V, 3.0V, 3.3V, 3.7V or 5.0V. CMOS technology ensures ultra low supply current and makes them ideal for battery-operated applications powered from one or more cells.

The HT77XX consists of an oscillator, a PFM control cir-
cuit, a driver transistor, a reference voltage unit, and a
high speed comparator. They employ pulse frequency
modulation (PFM) for minimum supply current and rip-
ple at light output loading. These devices are available
in space saving TO-92, SOT-89, SOT-23 and SOT-25
packages. For SOT-25 package, it also build-in a chip
enable function to reduce power consumption during
shutdown mode.

Selection Table

Part No.	Output Voltage	Package	Marking
HT7718	1.8V		
HT7727	2.7V		HT77XX (for TO 02)
HT7730	3.0V	SOT-89 SOT-23 SOT-25	HT77XX# (for SOT-89) 77XX# (for SOT-23)
HT7733	3.3V		
HT7737	3.7V		//XX# (tor SOT-25)
HT7750	5.0V		

Note: "XX" stands for output voltages.

Only lead free devices are available. "#" stands for lead free devices. For the TO-92 package, there will be a "#" mark at the end of the date code.

Block Diagram



Rev 1.60



Pin Assignment



Pin Description

	Pin No.		Din Nomo	Description	
TO-92	SOT-89	SOT-23	SOT-25	r in Name	Description
			1	CE	Chip enable pin, high active
2	2	3	2	VOUT	DC/DC converter output monitoring pin
			3	NC	No connection
1	1	1	4	GND	Ground pin
3	3	2	5	LX	Switching pin

Absolute Maximum Ratings

Supply Voltage	V _{SS} –0.3V to V _{SS} +7V	Storage Temperature	–50°C to 125°C
Operating Temperature	–40°C to 85°C		

Note: These are stress ratings only. Stresses exceeding the range specified under "Absolute Maximum Ratings" may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

Thermal Information

Symbol	Parameter	Package	Max.	Unit
		SOT-89	300	°C/W
0	(Junction to Ambient)	TO-92	300	°C/W
Ala	⁰ JA (Assume no ambient airflow, no heat sink)	SOT-23	330	°C/W
		SOT-25	320	°C/W
	P _D Power Dissipation	SOT-89	0.33	W
D-		TO-92	0.33	W
۳D		SOT-23	0.3	W
		SOT-25	0.31	W

Note: P_D is measured at Ta= $25^\circ C$



Electrical Characteristics

 $V_{IN}{=}V_{OUT}{\times}0.6;~I_{OUT}{=}10mA;~Ta{=}25^{\circ}C$ (Unless otherwise specified)

Symbol	Parameter	Test Conditio	ons	Min.	Тур.	Max.	Unit
V _{IN}	Input Voltage			_	_	6	V
ΔV _{OUT}	Output Voltage Tolerance			-2.5	_	2.5	%
V _{START}	Start-up Voltage (Fig. 1)	V _{IN} : 0→2V; I _{OUT} =1mA		_	0.7	0.9	V
V _{HOLD}	Minimum Hold-on Voltage (Fig. 1)	V _{IN} : 2→0V; I _{OUT} =1mA		_	_	0.7	V
I _{IN}	No-load Input Current (Fig. 1)	I _{OUT} =0mA		_	10	20	μA
			V _{OUT} =1.8V	_	35	50	
			V _{OUT} =2.7V	_	40	60	
		V _S =V _{OUT} ×0.95	V _{OUT} =3.0V		45	68	
IDD1	I _{DD1} Supply Current 1 (Fig. 2)	Measured at V _{OUT} pin	V _{OUT} =3.3V		55	81	μΑ
			V _{OUT} =3.7V		64	85	
			V _{OUT} =5.0V		85	134	
I _{DD2}	Supply Current 2 (Fig. 2)	V _S =V _{OUT} +0.5V Measured at V _{OUT} pin			4	7	μA
I _{SHDN}	Shutdown Current	CE=GND		_	0.5	1	μA
VIH	CE High Threshold	_		2	_	_	V
V _{IL}	CE Low Threshold			_	_	0.4	V
I _{LEAK}	LX Leakage Current (Fig. 3)	$V_S=V_{OUT}$ +0.5V, V_X =6V Measured at the LX pin		_	_	0.9	μA
f _{OSC}	Maximum Oscillator Frequency (Fig. 3)	V _S =V _{OUT} ×0.95 Measured at LX pin		_	115	_	kHz
D _{OSC}	Oscillator Duty Cycle (Fig. 3)	V _S =V _{OUT} ×0.95 Measured at LX pin		65	75	85	%
	Efficiency	V _{OUT} ≤1.8V			80	_	0/
η Efficiency		V _{OUT} ≥2.7V			85	_	%

Note: Absolute maximum ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but do not guarantee specific performance limits. The guaranteed specifications apply only for the test conditions listed.

Test Circuit



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Typical Performance Characteristics







HT7727 Output Voltage v.s Output Current

/IN=2.0V

=1.6V

VIN=1.8V

90

85

80

75

70

65

60 55 0



HT7718 Efficiency v.s Output Current

Hold-on

10 12

Output Current (mA)

HT7718 Start-Up& Hold-On Voltage



60

80

100

120

140

40

. Vin=1.2V



HT7727 Start-Up& Hold-On Voltage

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Efficiency (%)

1.0

0.9

0.8

0.7

0.6

0.5

0.4

0.3

0.2

0.1

2 4 6 8

Input Voltage (V)

Start-up

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18

20

16

14



85

80

75

70





HT7730 Output Voltage v.s Output Current

VIN=2.0V

VIN=1.8V

VIN=1.5V



HT7733 Output Voltage v.s Output Current



HT7733 Efficiency v.s Output Current



HT7733 Start-Up& Hold-On Voltage

Efficiency (%) 65 VIN=1.2V 60 55 50 L 0 120 140 20 40 80 100 60 Output Current (mA) HT7730 Efficiency v.s Output Current 1.1 1.0



HT7730 Start-Up& Hold-On Voltage

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90

85

80

75

65

60

55

50

45

40 0

Efficiency (%) 70



HT7737 Output Voltage v.s Output Current



HT7750 Output Voltage v.s Output Current



HT7737 Efficiency v.s Output Current

60

40



HT7737 Start-Up& Hold-On Voltage



HT7750 Efficiency v.s Output Current



HT7750 Start-Up& Hold-On Voltage





HT7718 Load Transient Response (L=100 μ H, C_{OUT}=100 μ F, V_{IN}=1.08V)



HT7727 Load Transient Response (L=100 μ H, C_{OUT}=100 μ F, V_{IN}=1.62V)



HT7730 Load Transient Response (L=100μH, C_{OUT}=100μF, V_{IN}=1.8V)

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HT7733 Load Transient Response (L=100 μ H, C_{OUT}=100 μ F, V_{IN}=1.98V)



HT7737 Load Transient Response (L=100μH, C_{OUT}=100μF, V_{IN}=2.22V)



HT7750 Load Transient Response (L=100μH, C_{OUT}=100μF, V_{IN}=3V)





HT7733 Line Transient Response (L=100μH, C_{OUT}=100μF)



HT7750 Line Transient Response (L=100 μ H, C_{OUT}=100 μ F)



Application Circuits

Without CE Pin





Note: For the SOT-25 package, when CE is pulled low, the internal blocks of the device, such as the reference band gap, gain block, and all feedback and control circuitry will be switched off. The boost converter's output, V_{OUT}, will be at a value one Schottky diode voltage drop below the input voltage and the LX pin remains in a high impedance condition. The output capacitor and load at V_{OUT} determine the rate at which V_{OUT} decays.



Package Information

3-pin TO-92 Outline Dimensions



Symbol	Dimensions in mil			
Symbol	Min.	Nom.	Max.	
A	170	_	200	
В	170	_	200	
С	500	_	_	
D	11	_	20	
E	90	_	110	
F	45	_	55	
G	45	_	65	
Н	130	_	160	
I	8	_	18	
α	4 °		6°	



3-pin SOT-89 Outline Dimensions



Symbol	Dimensions in mil			
Symbol	Min.	Nom.	Max.	
A	173		181	
В	64		72	
С	90		102	
D	35		47	
E	155		167	
F	14	_	19	
G	17		22	
Н		59	_	
I	55		63	
J	14	_	17	



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3-pin SOT-23 Outline Dimensions





Symbol	Dimensions in mm			
Symbol	Min.	Nom.	Max.	
А	1	_	1.3	
A1		_	0.1	
A2	0.7	_	0.9	
b	0.35	_	0.5	
С	0.1	_	0.25	
D	2.7	_	3.1	
E	1.4	_	1.8	
е		1.9	_	
Н	2.6	—	3	
L	0.37		_	
θ	1°	_	9°	



5-pin SOT-25 Outline Dimensions





Symbol		Dimensions in mm	
Symbol	Min.	Nom.	Max.
A	1.00	_	1.30
A1	_	_	0.10
A2	0.70	—	0.90
b	0.35	_	0.50
С	0.10	_	0.25
D	2.70	_	3.10
E	1.40	_	1.80
е	_	1.90	—
Н	2.60	—	3
L	0.37	_	_
θ	1°		9°



Product Tape and Reel Specifications

TO-92 Reel Dimensions (Unit: mm)





Package Up, Flat Side Up



Package Up, Flat Side Down



SOT-89, SOT-23 & SOT-25 Reel Dimensions



SOT-89

Symbol	Description	Dimensions in mm
A	Reel Outer Diameter	180±1.0
В	Reel Inner Diameter	62±1.5
С	Spindle Hole Diameter	12.75+0.15
D	Key Slit Width	1.9±0.15
T1	Space Between Flange	12.4+0.2
T2	Reel Thickness	17–0.4

SOT-23

Symbol	Description	Dimensions in mm
А	Reel Outer Diameter	178±1
В	Reel Inner Diameter	62±1
С	Spindle Hole Diameter	13±0.2
D	Key Slit Width	2.5±0.25
T1	Space Between Flange	8.4+1.5
T2	Reel Thickness	11.4+1.5

SOT-25

Symbol	Description	Dimensions in mm
А	Reel Outer Diameter	178±1.0
В	Reel Inner Diameter	62±1.0
С	Spindle Hole Diameter	13.0±0.2
D	Key Slit Width	2.5±0.25
T1	Space Between Flange	8.4+1.5 0.0
T2	Reel Thickness	11.4+1.5



TO-92 Carrier Tape Dimensions



TO-92

Symbol	Description	Dimensions in mm
11	Taped Lead Length	(2.5)
Р	Component Pitch	12.7±1.0
P ₀	Perforation Pitch	12.7±0.3
P ₂	Component to Perforation (Length Direction)	6.35±0.4
F ₁	Lead Spread	2.5+0.4 _0.1
F ₂	Lead Spread	2.5+0.4 _0.1
Δh	Component Alignment	0±0.1
W	Carrier Tape Width	18.0+1.0 _0.5
W ₀	Hold-down Tape Width	6.0±0.5
W ₁	Perforation Position	9.0±0.5
W ₂	Hold-down Tape Position	(0.5)
H ₀	Lead Clinch Height	16.0±0.5
H ₁	Component Height	Less than 24.7
D ₀	Perforation Diameter	4.0±0.2
t	Taped Lead Thickness	0.7±0.2
Н	Component Base Height	19.0±0.5

Note: Thickness less than 0.38±0.05mm~0.5mm

P0 Accumulated pitch tolerance: ±1mm/20pitches.

() Bracketed figures are for reference only.



SOT-89, SOT-23 & SOT-25 Carrier Tape Dimensions



SOT-89

Symbol	Description	Dimensions in mm
W	Carrier Tape Width	12.0+0.3
Р	Cavity Pitch	8.0±0.1
E	Perforation Position	1.75±0.1
F	Cavity to Perforation (Width Direction)	5.5±0.05
D	Perforation Diameter	1.5+0.1
D1	Cavity Hole Diameter	1.5+0.1
P0	Perforation Pitch	4.0±0.1
P1	Cavity to Perforation (Length Direction)	2.0±0.10
A0	Cavity Length	4.8±0.1
B0	Cavity Width	4.5±0.1
K0	Cavity Depth	1.8±0.1
t	Carrier Tape Thickness	0.30±0.013
С	Cover Tape Width	9.3

SOT-23

Symbol	Description	Dimensions in mm
W	Carrier Tape Width	8±0.3
Р	Cavity Pitch	4
E	Perforation Position	1.75
F	Cavity to Perforation (Width Direction)	3.5±0.05
D	Perforation Diameter	1.5+0.1
D1	Cavity Hole Diameter	1.5+0.1
P0	Perforation Pitch	4
P1	Cavity to Perforation (Length Direction)	2
A0	Cavity Length	3.15
B0	Cavity Width	3.2
К0	Cavity Depth	1.4
t	Carrier Tape Thickness	0.2±0.03
С	Cover Tape Width	5.3



SOT-25

Symbol	Description	Dimensions in mm
W	Carrier Tape Width	8.0±0.3
Р	Cavity Pitch	4.0
E	Perforation Position	1.75
F	Cavity to Perforation (Width Direction)	3.5±0.05
D	Perforation Diameter	1.5+0.1
D1	Cavity Hole Diameter	1.5+0.1
P0	Perforation Pitch	4.0
P1	Cavity to Perforation (Length Direction)	2.0
A0	Cavity Length	3.15
B0	Cavity Width	3.2
K0	Cavity Depth	1.4
t	Carrier Tape Thickness	0.20±0.03
С	Cover Tape Width	5.3



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