

DESCRIPTION

The XR5250S is a current mode monolithic buck switching regulator. Operating with an input range of 2.5V-6.0V, the XR5250S delivers 1A of continuous output current with integrated P-Channel and N-Channel MOSFETs. The internal synchronous power switches provide high efficiency. At light loads, the regulator operate in low frequency to maintain high efficiency and low output ripples.

The XR5250S guarantees robustness with hiccup output short-circuit protection, FB short-circuit protection, start-up current run-away protection, input under voltage lockout and hot-plug in, and thermal protection.

The XR5250S is available in 5-pin SOT23-5 and SOT563 package, which provides a compact solution with minimal external components.

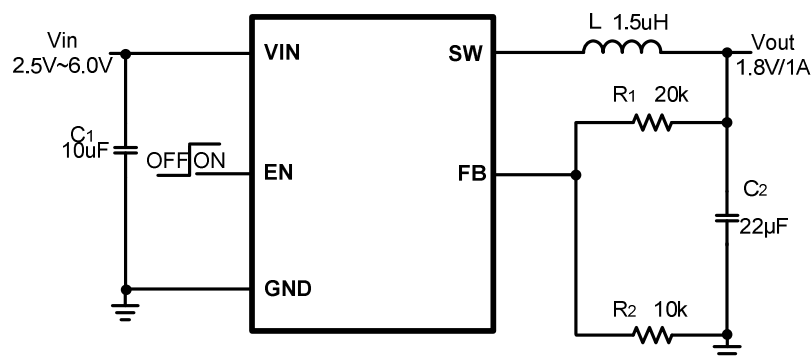
FEATURES

- 2.5V to 6.0V operating input range
- Up to 1A output current
- Up to 94% peak efficiency
- Internal Soft-Start
- 1.5MHz switching frequency
- Input under voltage lockout
- Hot-plug in protection
- Short circuit protection
- Thermal protection
- Available in SOT23-5/SOT563 package

APPLICATIONS

- 5V or 3.3V Point of Load Conversion
- Set Top Boxes
- Telecom/Networking Systems
- Storage Equipment
- GPU/DDR Power Supply

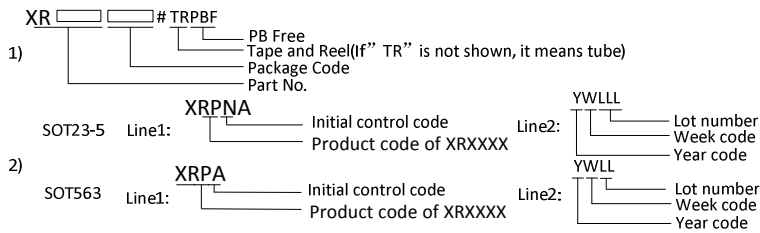
TYPICAL APPLICATION



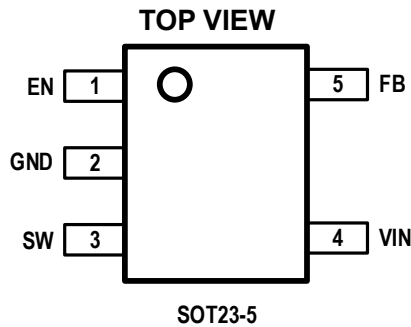
ORDER INFORMATION

DEVICE ¹⁾	PACKAGE	TOP MARKING ²⁾
XR5250SSOTI#TRPBF	SOT563	XRDX YWLL
XR5250SSOTA#TRPBF	SOT23-5	XRK8X YWLLL

Note: : :



PIN CONFIGURATION



ABSOLUTE MAXIMUM RATING^{1)1)))}

EN, FB Pins	-0.3V to 7.0 V
Vin, SW Pins	-0.3V(-1.7V for 20ns) to 7.0V(7.1V for 70ns)
Junction Temperature. ^{2) 3)}	150°C
Lead Temperature	260°C
Storage Temperature	-65°C to +150°C
ESD Susceptibility (Human Body Model)	3.5kV

RECOMMENDED OPERATING CONDITIONS

Input Voltage VIN	2.5V to 6.0V
Output Voltage Vout.	0.6V to VIN
Operating Junction Temperature	-40°C to 125°C

THERMAL PERFORMANCE

AAA *...000*

SOT23-5	220.....130°C/W
SOT563	130.....60°C/W

Note: : :

- 1) Exceeding these ratings may damage the device.
- 2) The XR5250S guarantees robust performance from -40°C to 150°C junction temperature. The junction temperature range specification is assured by design, characterization and correlation with statistical process controls.
- 3) The XR5250S includes thermal protection that is intended to protect the device in overload conditions. Thermal protection is active when junction temperature exceeds the maximum operating junction temperature. Continuous operation over the specified absolute maximum operating junction temperature may damage the device.
- 4) Measured on JESD51-7, 4-layer PCB.

ELECTRICAL CHARACTERISTICS

<i>V_{IN}=5V, T_A=25 °C, unless otherwise stated.</i>						
Item	Symbol	Condition	Min.	Typ.	Max.	Units
V _{IN} Under Voltage Lockout Threshold	V _{IN_UVLO}	V _{IN} rising	2.3	2.4	2.5	V
V _{IN} Under Voltage Lockout Hysteresis	V _{IN_UVLO_HYST}	V _{IN} falling		200		mV
V _{IN} Hot-plug in Protection Threshold	V _{IN_OVP}	V _{IN} rising	6.6	6.8	7.0	V
V _{IN} Hot-plug in Protection Hysteresis	V _{IN_OVP_HYST}	V _{IN} falling		400		mV
Shutdown Current	I _{SHDN}	V _{IN} =6.0V, V _{EN} =0V		0.1	1	μA
Quiescent Current	I _Q	V _{EN} =5V, I _{OUT} =0A, V _{FB} =V _{REF} *105%		50		μA
Regulated Feedback Voltage	V _{FB}	2.5V<V _{IN} <6.0V	0.591	0.6	0.609	V
PFET On Resistance ⁵⁾	R _{DS_ON_P}	V _{IN} =3.6V, I _{SW} =200mA		250		mΩ
NFET On Resistance ⁵⁾	R _{DS_ON_N}	V _{IN} =3.6V, I _{SW} =-200mA		160		mΩ
PFET Leakage Current	I _{LEAK_P}	V _{IN} =6.0V, V _{EN} =0V, V _{SW} =0V			1	uA
NFET Leakage Current	I _{LEAK_N}	V _{IN} =6.0V, V _{EN} =0V, V _{SW} =6.0V			1	uA
PFET Current Limit ⁵⁾	I _{LIM_TOP}			2.0		A
NFET Current Limit ⁵⁾	I _{LIM_BOT}			1.5		A
Switch Frequency	F _{SW}	I _{OUT} =1A		1.5		MHz
Minimum On Time ⁵⁾	T _{ON_MIN}			100		ns
Maximum Duty Cycle ⁵⁾	D _{MAX}			100		%
EN Rising Threshold	V _{EN_TH}	V _{EN} rising, FB=0.3V	1.5			V
EN Falling Threshold	V _{EN_HYST}	V _{EN} falling, FB=0.3V			0.4	V
Thermal Shutdown Threshold ⁵⁾	T _{SHDN}			150		°C
Thermal Shutdown Hysteresis	T _{HYST}			20		°C

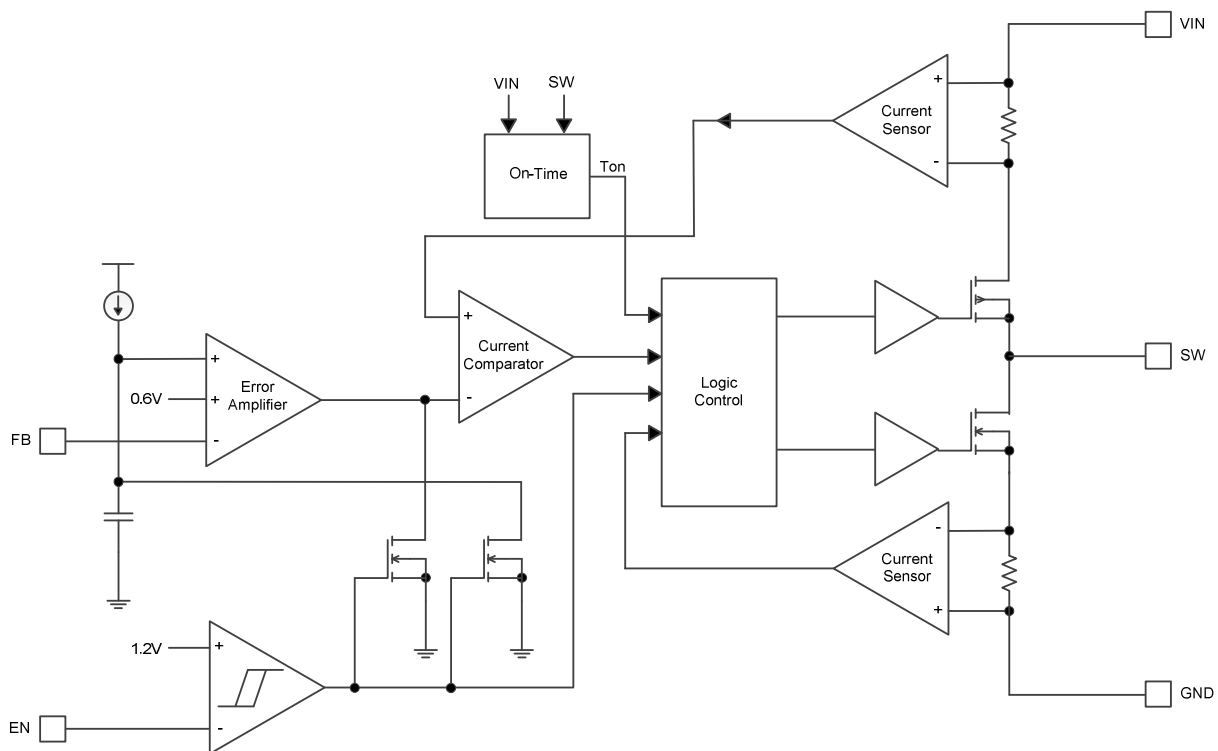
Note:

5) Guaranteed by design

PIN DESCRIPTION

Pin	Name	Description
1	EN	Drive EN pin high to turn on the regulator and low to turn off the regulator.
2	GND	Ground pin.
3	SW	SW is the switching node that supplies power to the output. Connect the output LC filter from SW to the output load.
4	VIN	Input voltage pin. VIN supplies power to the IC. Connect a 2.5V to 6.0V supply to VIN and bypass VIN to GND with a suitably large capacitor to eliminate noise on the input to the IC.
5	FB	Output feedback pin. FB senses the output voltage and is regulated by the control loop to 0.6V. Connect a resistive divider at FB.

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

The XR5250S is a constant on-time control, synchronous, step-down regulator. It regulates input voltages from 2.5V~6.0V down to an output voltage as low as 0.6V, and is capable of supplying up to 1A of load current.

Constant On-time Control

The XR5250S utilizes constant on-time control to regulate the output voltage. The output voltage is measured at the FB pin through a resistive voltage divider and the error is amplified by the internal transconductance error amplifier.

Output of the internal error amplifier is compared with the switch current measured internally to control the output current limit.

PFM Mode

The XR5250S operates in PFM mode at light load. In PFM mode, switch frequency is continuously controlled in proportion to the load current, i.e. switch frequency decreases when load current drops to boost power efficiency at light load by reducing switch-loss, while switch frequency increases when load current rises, minimizing output voltage ripples.

Shut-Down Mode

The XR5250S operates in shut-down mode when voltage at EN pin is driven below 0.4V. In shut-down mode, the entire regulator is off and the supply current consumed by the XR5250S drops below 1 μ A.

Power Switches

P-channel and N-channel MOSFET switches are integrated on the XR5250S to down convert the input voltage to the regulated output voltage.

Short Circuit Protection

When output is shorted to ground, the switching frequency is reduced to prevent the inductor current from increasing beyond PFET current limit. If short circuit condition holds for more than 1024 cycles, both PFET and NFET are forced off and can be enabled again after 8ms. This procedure is repeated as long as short circuit condition is not removed.

FB Short Circuit Protection

When FB is shorted to ground and holds for more 16 cycles, NFET will be turned off after inductor current drops to zero, and then both PFET and NFET are latched off. When short circuit condition is removed, it can be recovery.

Hot Plug-in Protection

When input voltage is greater than hot plug-in protection threshold, typical 6.8V, it will disable XR5250S. When input voltage decrease below 6.4V, it will be enabled again.

Thermal Protection

When the temperature of the XR5250S rises above 150°C, it is forced into thermal shut-down. Only when core temperature drops below 130°C can the regulator becomes active again.

XR5250S

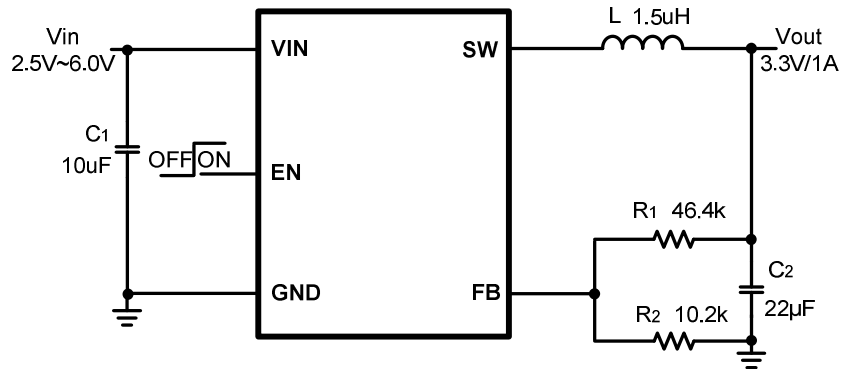
REFERENCE DESIGN

Reference 1:

V_{IN} : 2.5V ~ 6.0 V

V_{OUT} : 3.3V

I_{OUT} : 0~1A

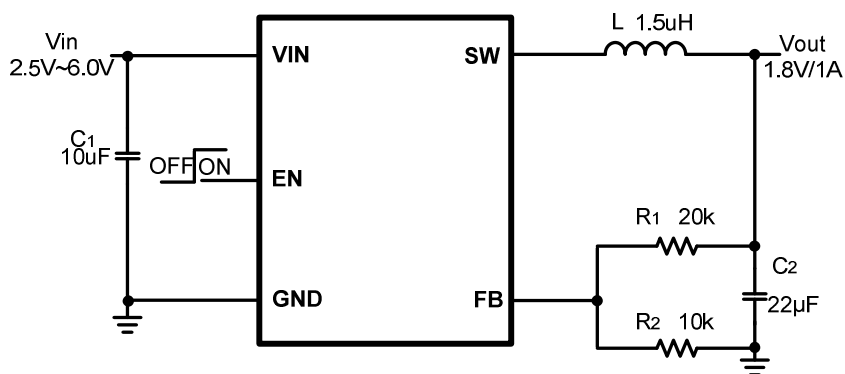


Reference 2:

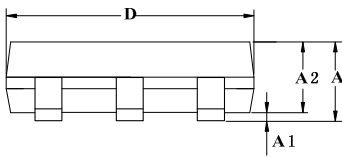
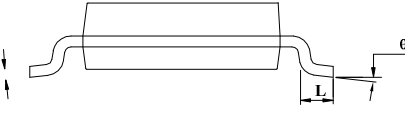
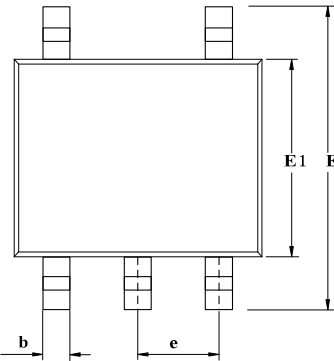
V_{IN} : 2.5V ~ 6.0 V

V_{OUT} : 1.8V

I_{OUT} : 0~1A

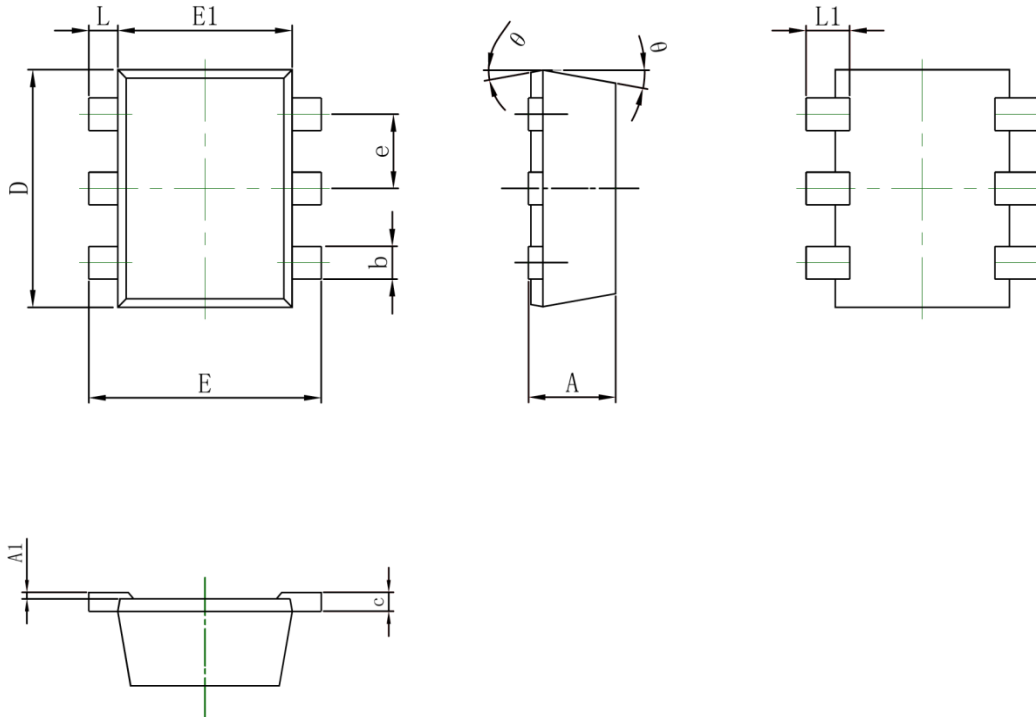


PACKAGE OUTLINE

SOT23-5	UNIT: mm																																																			
<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div> <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="text-align: center;">  </div> <div style="margin-left: 20px;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">SYMBOL</th> <th colspan="3">MILLIMETER</th> </tr> <tr> <th>MIN</th> <th>NOM</th> <th>MAX</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>1.05</td> <td>1.15</td> <td>1.25</td> </tr> <tr> <td>A1</td> <td>0</td> <td>0.05</td> <td>0.15</td> </tr> <tr> <td>A2</td> <td>0.95</td> <td>1.05</td> <td>1.20</td> </tr> <tr> <td>b</td> <td>0.20</td> <td>0.40</td> <td>0.60</td> </tr> <tr> <td>c</td> <td>0.05</td> <td>—</td> <td>0.21</td> </tr> <tr> <td>D</td> <td>2.72</td> <td>2.92</td> <td>3.12</td> </tr> <tr> <td>E</td> <td>2.60</td> <td>2.80</td> <td>3.00</td> </tr> <tr> <td>E1</td> <td>1.40</td> <td>1.60</td> <td>1.80</td> </tr> <tr> <td>e</td> <td colspan="3">0.95 (BSC)</td> </tr> <tr> <td>L</td> <td>0.30</td> <td>0.45</td> <td>0.60</td> </tr> <tr> <td>θ</td> <td>0°</td> <td>—</td> <td>8°</td> </tr> </tbody> </table> </div> </div>		SYMBOL	MILLIMETER			MIN	NOM	MAX	A	1.05	1.15	1.25	A1	0	0.05	0.15	A2	0.95	1.05	1.20	b	0.20	0.40	0.60	c	0.05	—	0.21	D	2.72	2.92	3.12	E	2.60	2.80	3.00	E1	1.40	1.60	1.80	e	0.95 (BSC)			L	0.30	0.45	0.60	θ	0°	—	8°
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SOT563

UNIT: mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.525	0.600	0.021	0.024
A1	0.000	0.050	0.000	0.002
e	0.450	0.550	0.018	0.022
c	0.090	0.180	0.004	0.007
D	1.500	1.700	0.059	0.067
b	0.170	0.270	0.007	0.011
E1	1.100	1.300	0.043	0.051
E	1.500	1.700	0.059	0.067
L	0.100	0.300	0.004	0.012
L1	0.200	0.400	0.008	0.016
θ	9° REF.		9° REF.	