XZ3215

5A, 2.5MHz I^{2}C Controlled Output Synchronous Step-Down Converter

DESCRIPTION

The XZ3215 is a high-efficiency, DC-to-DC step-down switching regulator, capable of delivering up to 5A of pulse load. It integrates an I^{2}C interface that dynamically scales the output voltages on demand. The DCDC control block belongs to a new breed of high frequency synchronous Step-Down converter that combines the advantages of voltage mode control and Constant-On-Time control. Its adaptive Constant-On-Time control dynamically changes switch on time to achieve a constant switching frequency. It does not have the minimum on-time constrain normally a fixed-frequency current mode Step-down requires, allowing it to go down to very low duty ratio without affecting loop stability. The voltage mode nature also provides a more superior load transient response and a seamless transition from PFM to PWM modes. Cycle-by-cycle current limit provides output short-circuit protection and an input OVP function guards XZ3215 against possible input voltage surge. XZ3215 is housed in a 2mm x 1.6mm CSP-20 Package.

FEATURES

- I^{2}C Dynamic Output Control
- Synchronous High Efficiency up to 95%
- Fast load transient response
- Capable of Delivering 5A
- Input OVP at 6.2V
- No External Schottky Diode Needed
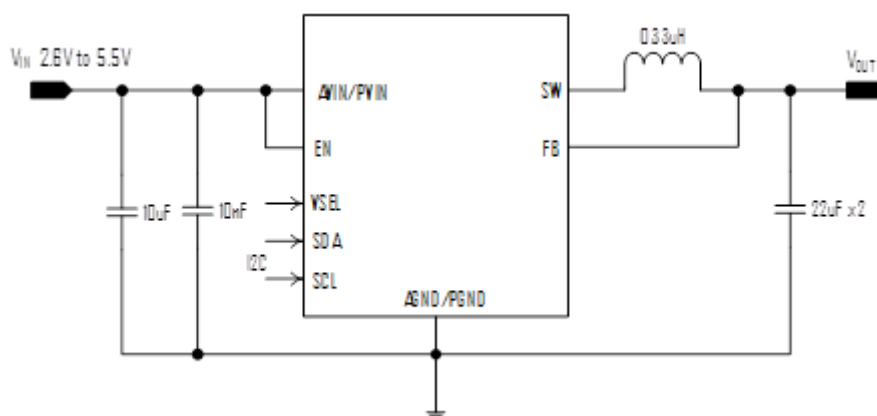- Thermal shutdown and UVLO
- CSP-20 (4x5) package

APPLICATIONS

- ARM based CPUs
- Smart Phone
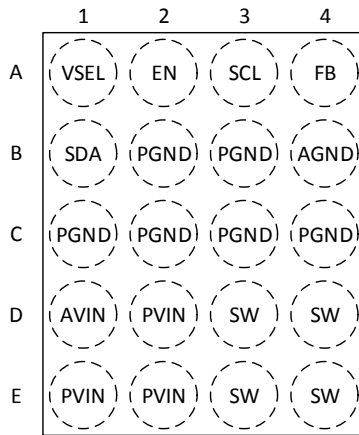- Tablet, MID
- Smart Set-Top Box, OTT

ORDERING INFORMATION

PART	PACKAGE PIN	TOP MARK
XZ3215CSU	CSP-20 (4x5)	YWWL (Date Code)

TYPICAL APPLICATION

Typical Application Circuit

XZ3215

PIN CONFIGURATION

	1	2	3	4
A	VSEL	EN	SCL	FB
B	SDA	PGND	PGND	AGND
C	PGND	PGND	PGND	PGND
D	AVIN	PVIN	SW	SW
E	PVIN	PVIN	SW	SW

Top View

ABSOLUTE MAXIMUM RATINGS

(Note: Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

VIN Voltage ....−0.3V to 6.0V
All Other Pin Voltage ....VIN−0.3V to VIN+0.3
SW to ground current..Internally limited
Operating Temperature Range ....−40ºC to 85ºC
Storage Temperature Range ....−55ºC to 150ºC
Thermal Resistance θ_{JA}
CSP-20...35 .... ºC/W

ELECTRICAL CHARACTERISTICS

(V_{IN} = 3.6V, unless otherwise specified. Typical values are at TA = 25ºC.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range		2.5		5.5	V
Input UVLO	Rising, Hysteresis=250mV		2.35		V
Input OVP	Rising, Hysteresis=200mV		6.15		V
Input Supply Current	V_{FB} =0.5V, Device Not Switching		55		µA
Input Shutdown Current	EN=GND		0.1	10	µA
Thermal Shutdown	Rising, Hysteresis =20ºC		155		ºC
DC/DC converter					
Default Output Voltage	VSEL=0, default bit 10100111	1.08	1.1	1.12	V
	VSEL=1, default bit 11100111	1.07	1.1	1.13	V
Load Regulation			0.5		%/A
Line Regulation	V_{IN} =3V to 4V		0.04		%/V
Switching Frequency			2		MHz
Maximum Duty Cycle			100		%
PMOS Switch On Resistance	I_{SW} =500mA		40		mΩ
NMOS Switch On Resistance	I_{SW} =500mA		15		mΩ
High Side PMOS Switch Current Limit	IPEAK Bit = 00		4		A
	IPEAK Bit = 01		6.5		A
	IPEAK Bit = 10		8		A
	IPEAK Bit = 11		10		A
Maximum Output Current Limit	IPEAK Bit = 01		6		A
Short Circuit Hiccup mode off time	EN=5V		20		ms

XZ3215

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Output Discharge Pull-down			1000		Ω
EN, VSEL					
Input Low Voltage			0.4		V
Input High Voltage			1.15		V
Input Current				1	µA
I^{2}C Control					
SCL Clock Frequency			400		KHz
SDA Setup Time			100		ns
SDA hold time			50		ns
Input Low Voltage			0.4		V
Input High Voltage				1.5	V

PIN DESCRIPTION

PIN #	NAME	DESCRIPTION
A1	VSEL	Output voltage and mode selection pin
A2	EN	Chip enable control pin, pull high to turn the chip on
A3	SCL	Clock pin for I^{2}C interface
A4	FB	Feedback Input pin, connect to the output capacitor thru a trace.
B1	SDA	Data IO pin for I^{2}C interface
B2, B3, C1, C2, C3, C4	PGND	Power ground for large switching current
B4	AGND	Analog ground, for internal control circuit
D1	AVIN	Analog supply for internal control circuit
D2, E1, E2	PVIN	Power supply for large switching current
D3, D4, E3, E4	SW	Switching node, to connect a 0.33-0.47uH inductor

---

TYPICAL CHARACTERISTICS
(Typical values are at T$_A$ = 25°C unless otherwise specified.)

Efficiency Vs Iout, Vout=1.15V

Output Voltage Vs Iout, Vout=1.15V

Vout Vs Vin, Iout=0.1A

Vin Stanby Current at Iout=0A

Switching Waveform: V_{IN}=3.6V, Vout=1.15V, I_{OUT}=100mA

Switching Waveform: V_{IN}=3.6V, Vout=1.15V, I_{OUT}= 3A

Load Transient Respond: Vin=3.6V, Vout=1.15V, I_{OUT}=0.3 – 3A
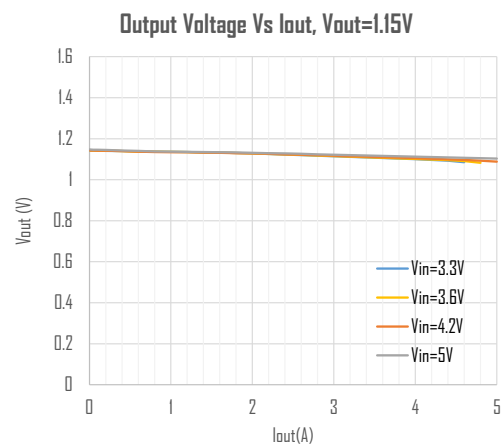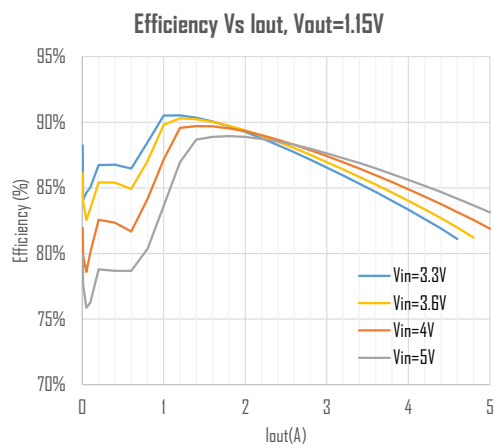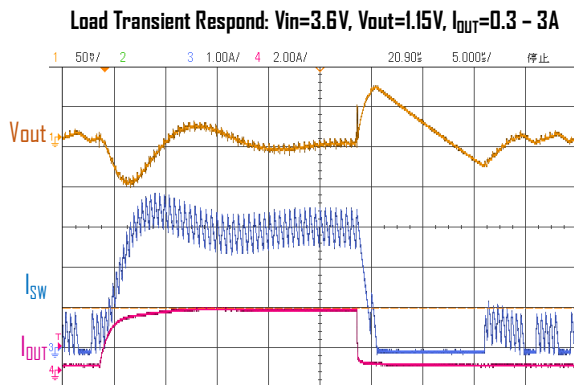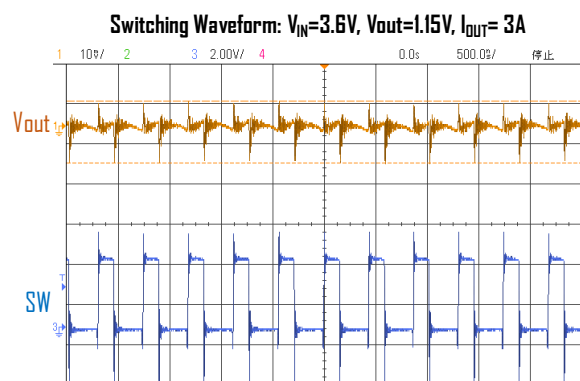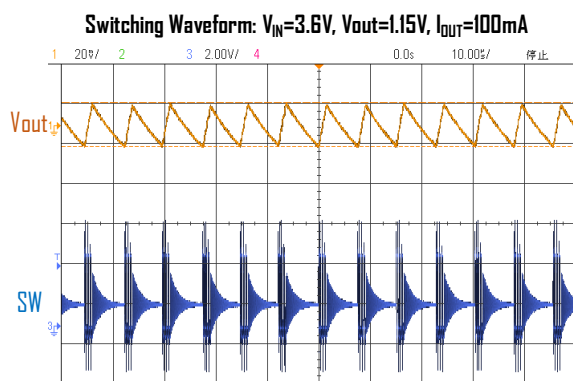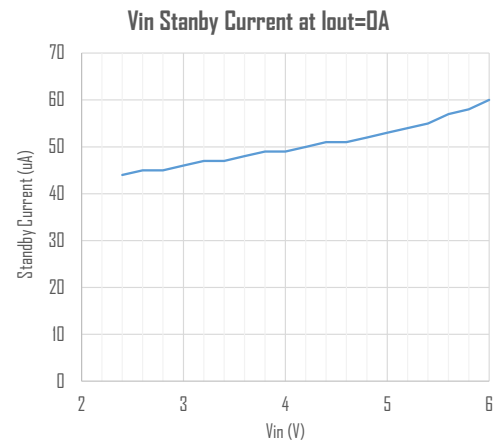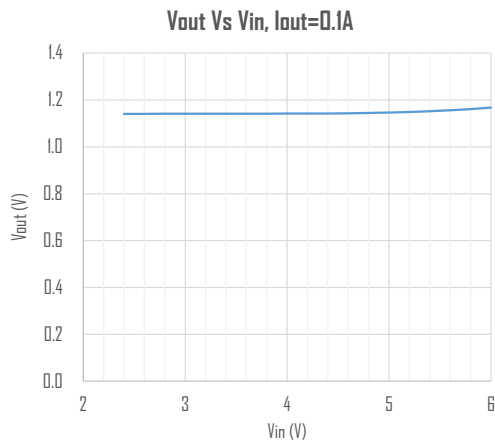
FUNCTIONAL DECRIPTIONS

The XZ3215 is a high-efficiency, DC-to-DC step-down switching regulator, capable of delivering up to 5A of pulse load. It integrates an I^2C interface that dynamically scales the output voltages on demand. The I^2C interface can also program the ramp rate output voltage changes and enable or disable the regulator.

DCDC Control scheme

XZ3215 uses an adaptive Constant-On-Time control scheme that the ON time is dynamically adjusted according to VIN and VOUT so to achieve a nearly constant switching frequency. This control scheme provides simpler compensation and superior transient response

XZ3215

over traditional constant frequency current mode control, while still maintaining the advantage of switching at a constant frequency at about 2MHz. It also provides a seamless transition from PFM to PWM that normally a constant frequency current mode control scheme is hard to achieve. Further mode, because it is a COT control scheme, the system can achieve high step-down ratio at ease, because lower constrain on the minimum on- time requirement existing in constant frequency scheme.

Current Limit and Short-Circuit protection

XZ3215 employs a cycle-by-cycle peak current limit and it also has a hiccup mode that protects the circuit during dead-short condition. When the dead-short condition is removed, the IC goes back to normal operation.

Soft-start

XZ3215 has an internal soft-start circuitry to reduce supply inrush current during startup conditions. When the device exits under-voltage lockout (UVLO), shutdown mode, or restarts following a thermal-overload event, the l soft-start circuitry slowly ramps up current available at SW.

UVLO and Thermal Shutdown

If IN drops below UVLO threshold, the UVLO circuit inhibits switching. Once IN rises above ULVO threshold, the UVLO clears, and the soft-start sequence activates. Thermal-overload protection limits total power dissipation in the device. When the junction temperature exceeds T_J= +155ºC, a thermal sensor forces the device into shutdown, allowing the die to cool. The thermal sensor turns the device on again after the junction temperature cools by 20ºC, resulting in a pulsed output during continuous overload conditions. Following a thermal-shutdown condition, the soft-start sequence begins.

Register Description

**XZ**3215 **DEVICE ADDRESS: 80**

XZ 3215 REGISTER TABLE

Address		B7	B6	B5	B4	B3	B2	B1	B0
00h	Name	BUCK_EN0	MODE0	VSEL0<5>	VSEL0<4>	VSEL0<3>	VSEL0<2>	VSEL0<l>	VSEL0<0>
	Default	1	0	1	0	0	1	1	1
	Access	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
01h	Name	BUCK_EN1	MODE1	VSEL1<5>	VSEL1<4>	VSEL1<3>	VSEL1<2>	VSEL1<l>	VSEL1<0>
	Default	1	1	1	0	0	1	1	1
	Access	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
02h	Name	Out_dis	SLEW<2>	SLEW<l>	SLEW<0>	DVSMODE	SWRST	IPEAK_1	IPEAK_0
	Default	0	0	0	0	0	0	0	1
	Access	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
03h	Name	VENDOR<2>	VENDOR<l>	VENDOR<0>	PGOOD	DIE_ID<3>	DIE_ID<2>	DIE_ID<l>	DIE_ID<0>
	Default	1	0	0	0	1	1	0	0
	Access	R	R	R	R	R	R	R	R

Output Voltage Setting

XZ3215 ：Vout=0.603V+12.826mV*B<5:0>(Addr 00h/01h)

XZ3215

PCB GUIDELINE

A recommended PCB layout is shown below. The input capacitor has to be placed as close to the XZ3215 as possible.
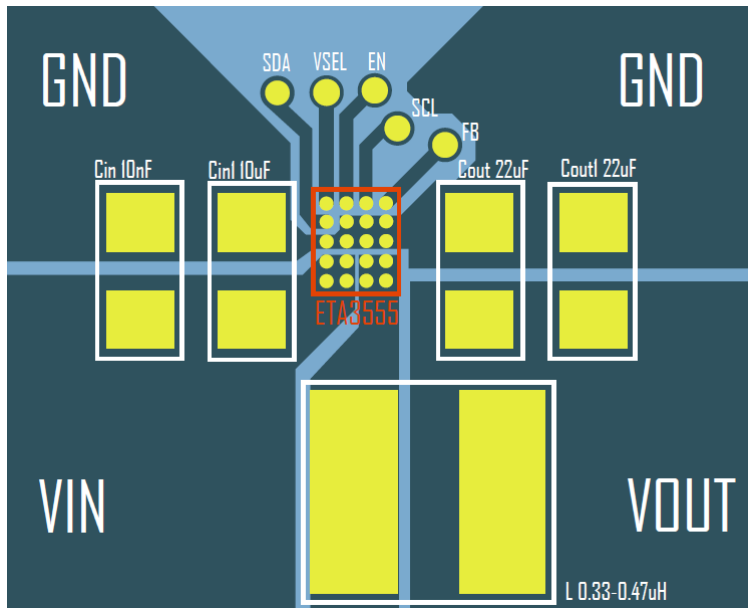
PACKAGE OUTLINE

Package: CSP-20 (4x5)