

**PWM BOOST CONTROLLER**

PRODUCTION DATA SHEET

**Pb Free Product**
**DESCRIPTION**

The NX2158 controller IC is a boost controller IC designed for step up DC to DC converter applications. The NX2158 operates at programmable frequency from 200kHz to 2MHz and employs cycle by cycle current limiting by sensing the R<sub>dson</sub> of NMOSFET.

Other features of the device are: thermal shutdown, adaptive deadband control, internal digital soft start, VCC UVLO and Shutdown capability via the ENBUS pin.

**FEATURES**

- Single Supply Voltage from 3V to 5.5V
- Programmable Frequency up to 2MHz
- Internal Digital Soft Start Function
- Cycle by Cycle Current Limit by Sensing R<sub>dson</sub> of NMOSFET
- Pb-free and RoHS compliant

**APPLICATIONS**

- USB 3.0 3.3V to 5V conversion

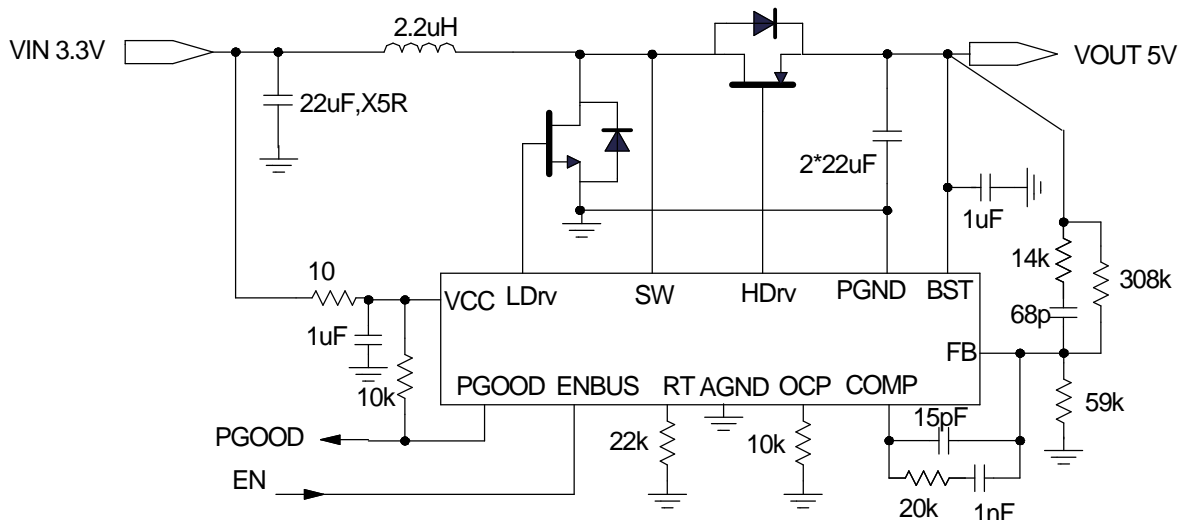
**TYPICAL APPLICATION**


Figure1 - Typical application of NX2158

**ORDERING INFORMATION**

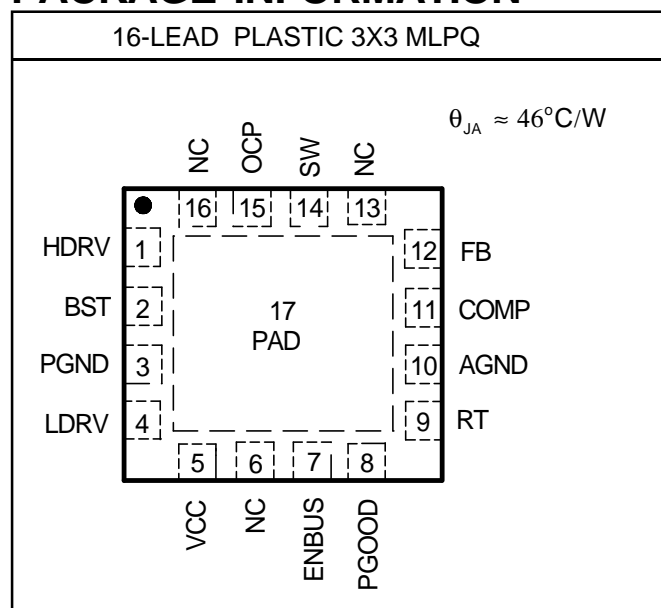
Device	Temperature	Package	Frequency	Pb-Free
NX2158CMTR	0 to 70°C	3X3 MLPQ-16L	200kHz to 2MHz	Yes

**Package Marking : NX2158XXX** XXX is date code. For example, 935 means that this NX2158 is packaged in the 35th week of 2009

**ABSOLUTE MAXIMUM RATINGS**(NOTE1)

VCC to GND .....	6.5V
BST to GND Voltage .....	6.5V
VIN to GND Voltage .....	6.5V
SW to GND .....	-2V to 6.5V
All other pins .....	-0.3V to 6.5V
Storage Temperature Range .....	-65°C to 150°C
Operating Junction Temperature Range .....	-40°C to 125°C

NOTE1: Stresses above those listed in "ABSOLUTE MAXIMUM RATINGS", may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

**PACKAGE INFORMATION**

**ELECTRICAL SPECIFICATIONS**

Unless otherwise specified, these specifications apply over  $V_{CC}=3.3\text{V}$ ,  $V_{ENBUS}=1.5\text{V}$ ,  $V_{BST}=5\text{V}$ ,  $T_A = 25^{\circ}\text{C}$ . Low duty cycle pulse testing is used which keeps junction and case temperatures equal to the ambient temperature.

PARAMETER	SYM	Test Condition	Min	TYP	MAX	Units
<b>Reference Voltage</b>						
Ref Voltage	$V_{REF}$		0.793	0.8	0.808	V
Ref Voltage line regulation		$V_{CC}=3\text{V to }5.5\text{V}$		0.7	1	%
<b>Supply Voltage(VCC)</b>						
$V_{CC}$ Voltage Range	$V_{in}$					V
Input Voltage Current(Static)		No switching, ENBUS=0V		3		mA
Input Voltage Current (Dynamic)		COMP=2.4V		3.5		mA
<b>Under Voltage Lockout</b>						
$V_{CC}$ -Threshold	$V_{CC\_UVLO}$	$V_{CC}$ Rising	2.6	2.8	3	V
$V_{CC}$ -Hysteresis	$V_{CC\_Hyst}$	$V_{CC}$ Falling	0.1	0.2	0.355	V

PARAMETER	SYM	Test Condition	Min	TYP	MAX	Units
<b>ENBUS</b>						
ENBUS threshold			1	1.2	1.4	V
ENBUS Hysteresis			0.05	0.1	0.15	V
<b>SS</b>						
Soft Start time	T <sub>ss</sub>	Rt=44k		1.6		mS
<b>Oscillator (Rt)</b>						
Frequency	F <sub>S</sub>	Rt=44k	550	640	720	kHz
Ramp-Amplitude Voltage	V <sub>RAMP</sub>		0.4	0.5	0.58	V
LDRV Max Duty Cycle		Rt=44k	60	70	80	%
HDRV Min Controlable On Time					250	nS
<b>Error Amplifiers</b>						
Transconductance			1500	1800	2500	umho
Input Bias Current	I <sub>b</sub>				100	nA
Comp SD Threshold				0.3		V
<b>High Side Driver (C<sub>L</sub>=2200pF)</b>						
Output Impedance , Sourcing	R <sub>source</sub> (Hdrv)	I=200mA		1.9		ohm
Output Impedance , Sinking	R <sub>sink</sub> (Hdrv)	I=200mA		1.7		ohm
Rise Time	THdrv(Rise)			14		ns
Fall Time	THdrv(Fall)			17		ns
Deadband Time	Tdead(L to	Ldrv going Low to Hdrv		30		ns
<b>Low Side Driver (C<sub>L</sub>=2200pF)</b>						
Output Impedance, Sourcing	R <sub>source</sub> (Ldrv)	I=200mA		1.9		ohm
Output Impedance, Sinking	R <sub>sink</sub> (Ldrv)	I=200mA		1		ohm
Current						
Rise Time	TLdrv(Rise)			13		ns
Fall Time	TLdrv(Fall)			12		ns
Deadband Time	Tdead(H to L)	SW going Low to Ldrv going High, 10% to 10%		10		ns
<b>OCP</b>						
OCP current			30	37	50	uA
<b>Over temperature</b>						
Threshold				150		°C
Hysteresis				20		°C
<b>PGOOD</b>						
Pgood high rising threshold			78	90	95	% Vref
Power good hysteresis				5		%

**PIN DESCRIPTIONS**

<b>PIN #</b>	<b>PIN SYMBOL</b>	<b>PIN DESCRIPTION</b>
5	VCC	Voltage supply for the low side fet driver and internal logic circuit. A high frequency 1uF ceramic capacitor must be connected from this pin to the GND pin as close as possible.
7	ENBUS	Enable pin for the controller.
12	FB	This pin is the error amplifier inverting input.
11	COMP	This pin is the output of the error amplifier and together with FB pin is used to compensate the voltage control feedback loop. This pin is also used as a shut down pin. When this pin is pulled below 0.3V, both drivers are turned off and internal soft start is reset.
2	BST	This pin supplies voltage to the high side driver. A high frequency ceramic capacitor of 0.1 to 1 uF must be connected from this pin to ground.
15	OCP	An internal current source is flown to the OCP resistor sets the OCP voltage across the R <sub>dson</sub> of the low side MOSFET. Current limit point is this voltage divided by the R <sub>ds-on</sub> .
14	SW	This pin is used by driver circuit and also sensing the RDSON of NMOSFET.
1	HDRV	PMOS MOSFET gate driver.
3	PGND	Power ground.
10	AGND	Analog ground
4	LDRV	NMOSFET gate driver.
7	RT	Oscillator's frequency can be set by using an external resistor from this pin to GND.
8	PGOOD	Power good indicator.
17	PAD	PAD should be connected to ground.
13,16	NC	Not used.

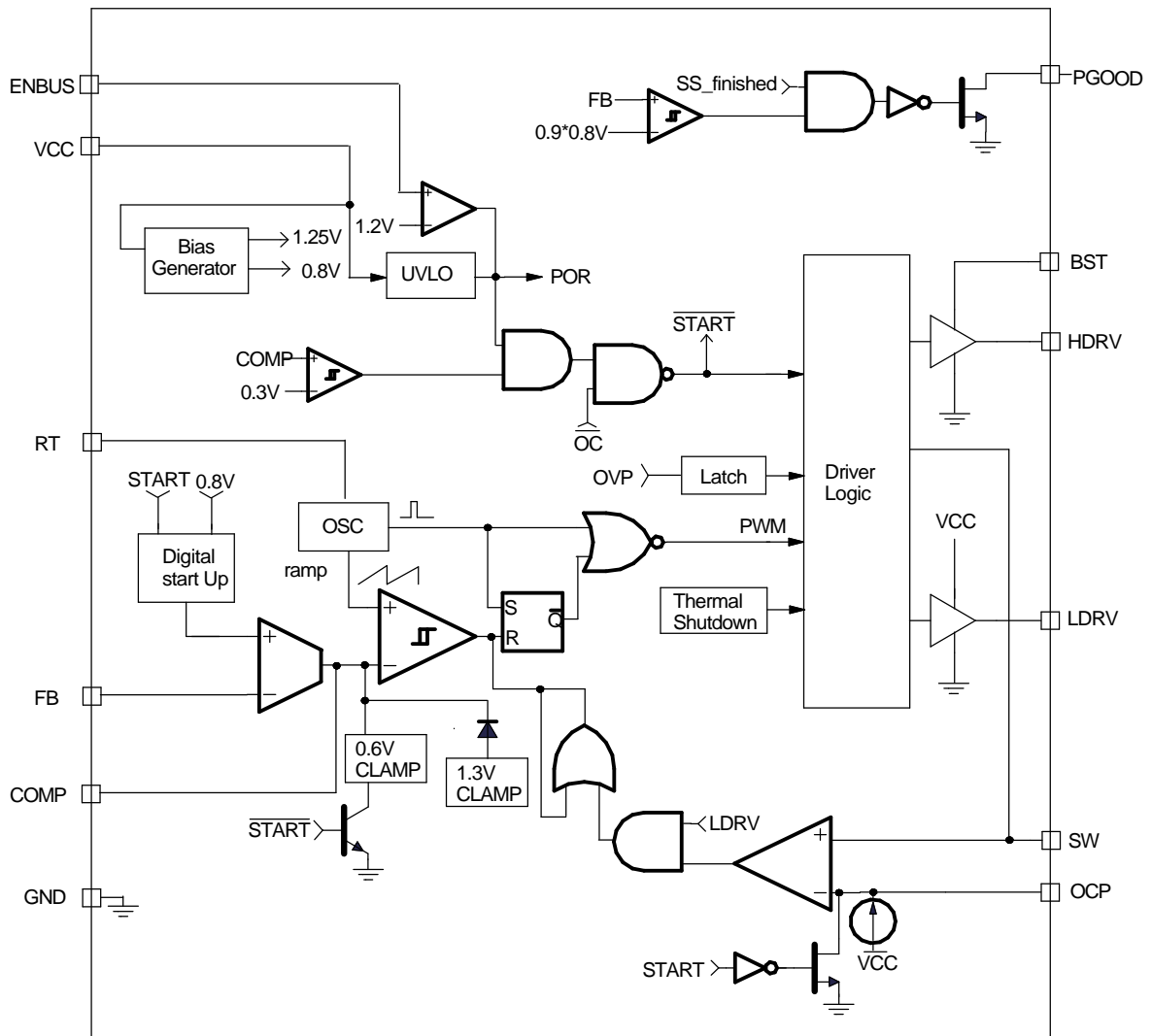
**BLOCK DIAGRAM**


Figure 2 - Simplified block diagram of the NX2158