General Description

The DS1088C is a low-cost clock generator that produces a square-wave output without external timing components. The fixed-frequency oscillator is available in a factory-calibrated frequency of 133MHz. The device has a power-down pin for power-sensitive applications.

Applications

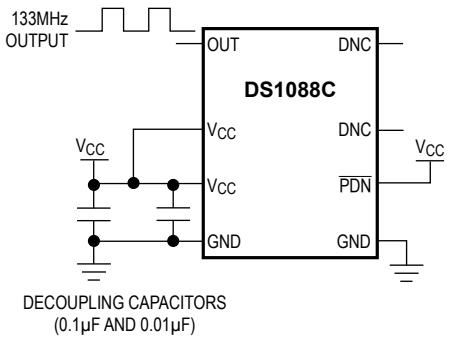
- Printers
- Copiers
- Computer Peripherals
- POS Terminals
- Cable Modems

Ordering Information **appears at end of data sheet.**

Features

- Factory-Programmed, 133MHz Square-Wave Generator
- Single Output
- No External Timing Components Required
- 2.7V to 3.6V Supply
- Power-Down Mode
- Wide Temperature Range (-20°C to +85°C)

Typical Operating Circuit



For related parts and recommended products to use with this part, refer to www.maximintegrated.com/DS1088C.related.

19-6186; Rev 1; 4/15

maxim integrated™

Absolute Maximum Ratings

(Voltages relative to ground.)
Voltage Range on V_{CC}.....-0.5V to +6.0V
Voltage Range on $\overline{PDN}$..... -0.5V to (V_{CC} + 0.5V)*
Operating Temperature Range..... -20°C to +85°C
Storage Temperature Range..... -55°C to +125°C
Lead Temperature (TDFN only; soldering, 10s).....+300°C
Soldering Temperature (reflow).....+260°C

**Not to exceed +6.0V.*

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions

(T_A = -20°C to +85°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage	V_{CC}	(Note 1)	2.7		3.6	V
High-Level Input Voltage ($\overline{PDN}$)	V_{IH}		0.7 x V_{CC}		V_{CC} + 0.3	V
Low-Level Input Voltage ($\overline{PDN}$)	V_{IL}		-0.3		0.3 x V_{CC}	V

DC Electrical Characteristics

(V_{CC} = 2.7V to 3.6V, T_A = -20°C to +85°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
High-Level Output Voltage (OUT)	V_{OH}	I_{OH} = -4mA, V_{CC} = MIN	V_{CC} - 0.4			V
Low-Level Output Voltage (OUT)	V_{OL}	I_{OL} = 4mA			0.4	V
High-Level Input Current ($\overline{PDN}$)	I_{IH}	V_{CC} = 3.6V			1	µA
Low-Level Input Current ($\overline{PDN}$)	I_{IL}	V_{IL} = 0V	-1			µA
Supply Current (Active)	I_{CC}	V_{CC} = 3.6V, C_L = 15pF, f_O = 133MHz		15	24	mA
Standby Current (Power-Down)	I_{CCQ}	Power-down mode			10	µA

Oscillator Characteristics—TDFN

(V_{CC} = 2.7V to 3.6V, T_A = -20°C to +85°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Output Frequency Range Available	f_O				133.3		MHz
Output Frequency Tolerance	$\frac{\Delta f_O}{f_O}$	V_{CC} = 3.3V, T_A = +25°C (Note 2)		-0.3		+0.3	%
Voltage Frequency Variation	$\frac{\Delta f_V}{f_O}$	Over voltage range, T_A = +25°C (Note 3)		-0.35		+0.35	%
Temperature Frequency Variation	$\frac{\Delta f_T}{f_O}$	Over temperature range, V_{CC} = 3.3V (Notes 4, 5)	-20°C to +25°C	-0.7		+0.7	%
			+25°C to +85°C	-0.5		+0.5	
Frequency Variation Over Voltage and Temperature	$\frac{\Delta f_{V,T}}{f_O}$	Over voltage and temperature range		-1.0		+1.0	%

Oscillator Characteristics—WLP

(V_{CC} = 2.7V to 3.6V, T_A = -20°C to +85°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Output Frequency	f_O				133.3		MHz
Output Frequency Tolerance	$\frac{\Delta f_O}{f_O}$	V_{CC} = 3.3V, T_A = +25°C (Note 2)		-3		+3	%
Voltage Frequency Variation	$\frac{\Delta f_V}{f_O}$	Over voltage range, T_A = +25°C (Note 3)		-3.5		+3.5	%
Temperature Frequency Variation	$\frac{\Delta f_T}{f_O}$	Over temperature range, V_{CC} = +3.3V (Notes 4, 5)	-20°C to +25°C	-7		+7	%
			+25°C to +85°C	-5		+5	
Frequency Variation Over Voltage and Temperature	$\frac{\Delta f_T}{f_O}$	Over voltage and temperature range		-10		+10	%

AC Electrical Characteristics

(V_{CC} = 2.7V to 3.6V, T_A = -20°C to +85°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Power-Up Time	t_{POR} + t_{STAB}	(Note 6)			100	µs
OUT Disabled After Entering Power-Down Mode	t_{PDN}	(Note 7)			7	µs
Load Capacitance	C_L	(Note 8)		15	50	pF
Output Duty Cycle (OUT)			40		60	%

Note 1: All voltages are referenced to ground.

Note 2: Typical frequency shift due to aging is within ±0.2%. Aging stressing includes level 1 moisture reflow preconditioning (24hr +125°C bake, 168hr +85°C/85%RH moisture soak, and three solder reflow passes +240°C +0°C/-5°C peak) followed by1000hr (max) V_{CC} biased +125°C OP/L, 1000hr unbiased +150°C bake, 1000 temperature cycles at -55°C to +125°C and 168hr +121°C/2 ATM steam/unbiased autoclave.

Note 3: This is the change in output frequency due to changes in voltage at T_A = +25°C.

Note 4: Guaranteed by design.

Note 5: This is the change in output frequency due to changes in temperature from the +25°C frequency at V_{CC} = 3.3V.

Note 6: This indicates the time elapsed between power-up and the output becoming active. An on-chip delay is intentionally introduced to allow the oscillator to stabilize. t_{STAB} is equivalent to approximately 512 clock cycles and will depend on the programmed oscillator frequency.

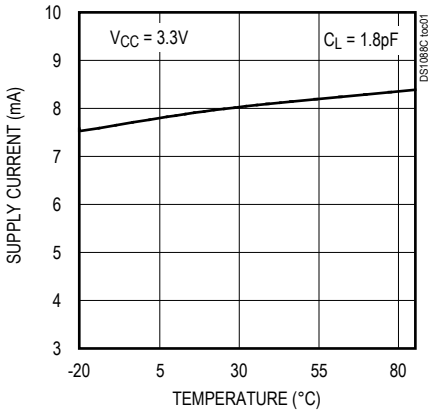
Note 7: Output disabled in two cycles or less of the output frequency.

Note 8: Output voltage swings may be impaired at high frequencies combined with high-output loading.

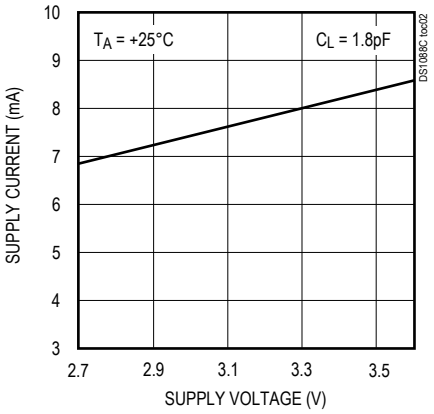
Typical Operating Characteristics

(V_{CC} = 3.3V, T_A = +25°C, unless otherwise noted.)

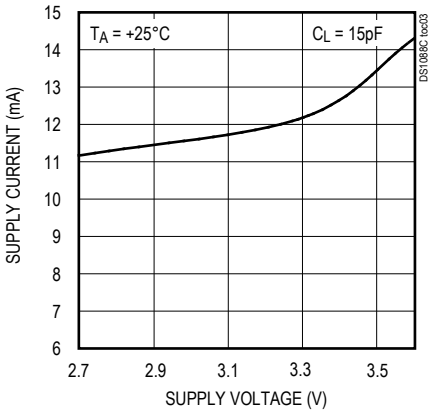
ACTIVE SUPPLY CURRENT vs. TEMPERATURE



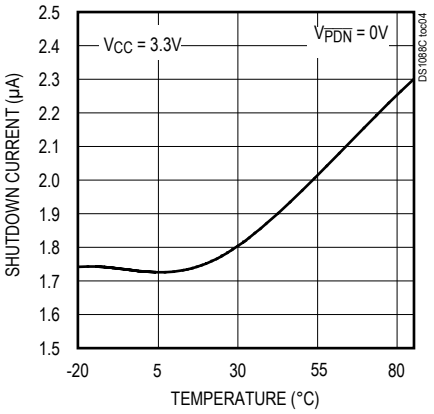
ACTIVE SUPPLY CURRENT vs. SUPPLY VOLTAGE



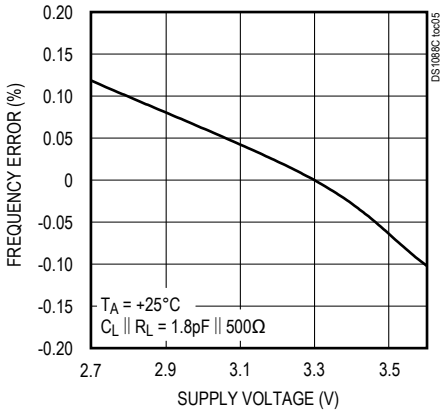
ACTIVE SUPPLY CURRENT vs. SUPPLY VOLTAGE



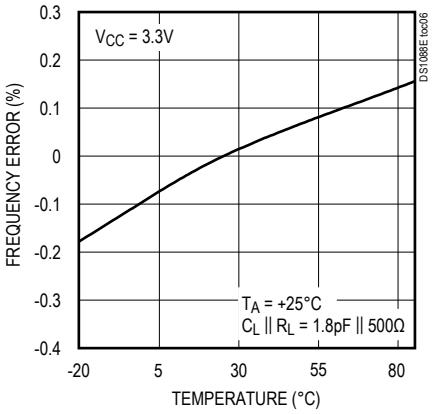
SHUTDOWN SUPPLY CURRENT vs. TEMPERATURE



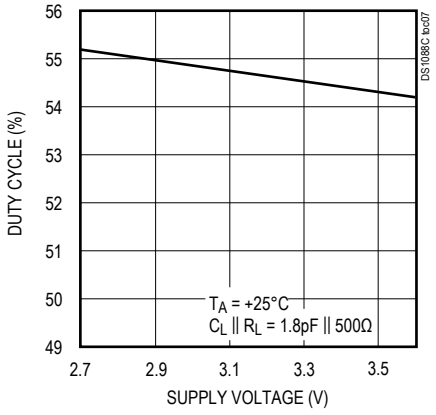
FREQUENCY ERROR vs. SUPPLY VOLTAGE



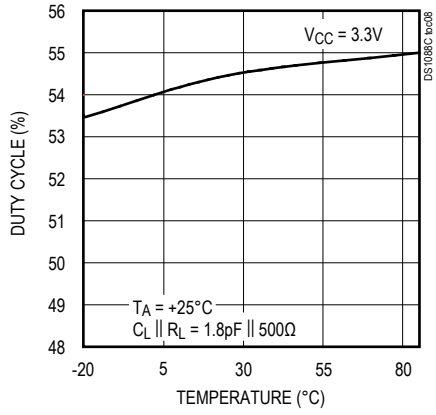
FREQUENCY ERROR vs. TEMPERATURE



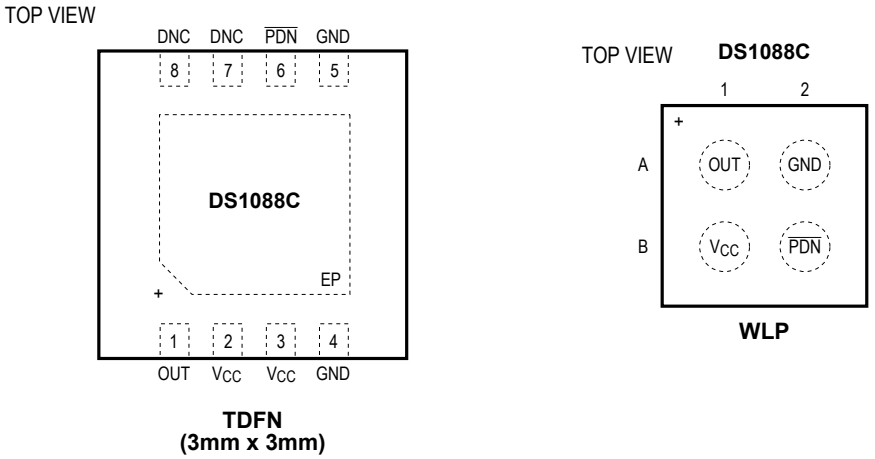
DUTY CYCLE vs. SUPPLY VOLTAGE



DUTY CYCLE vs. TEMPERATURE



Pin/Bump Configurations



Pin/Bump Descriptions

PIN/BUMP		NAME	FUNCTION
TDFN-EP	WLP		
1	A1	OUT	Oscillator Output
2, 3	B1	V_{CC}	Power Supply
4, 5	A2	GND	Ground
6	B2	$\overline{PDN}$	Active-Low Power-Down. When the pin is high, the oscillator is enabled. When the pin is low, the oscillator is disabled (power-down mode).
7, 8	—	DNC	Do Not Connect. The DNC pins are internally connected to ground.
—	—	EP	Exposed Pad (TDFN Only). Internally connected to GND. Connect to the ground plane to minimize noise injection. Not intended for use as the device electrical ground.

Detailed Description

The DS1088C is a low-cost clock generator that produces a square-wave output without external timing components. The fixed-frequency oscillator is available in a factory-calibrated frequency of 133MHz. The DS1088C has a power-down pin for power-sensitive applications. A block diagram of the DS1088C is shown in Figure 1.

Output Frequency

The internal oscillator frequency is divided by the factory-programmed prescaler to produce an output frequency of 133MHz.

Power-Down Mode

The $\overline{PDN}$ pin disables the internal oscillator and the oscillator output for power-sensitive applications. The power-down pin must remain low for at least two output frequency cycles plus 10µs for deglitching purposes. On power-up, the output is disabled until power is stable and the voltage-controlled oscillator has generated 512 clock cycles.

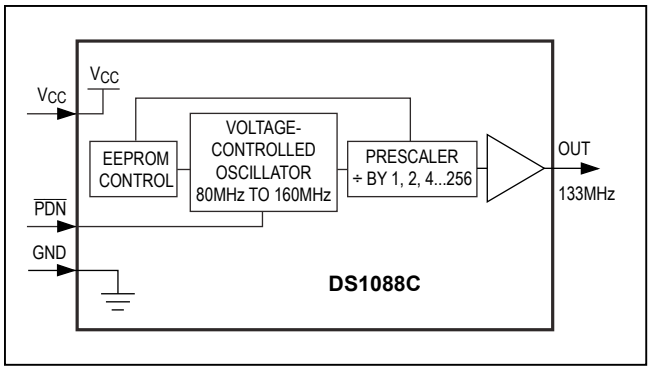


Figure 1. Block Diagram

Applications Information

Power-Supply Decoupling

To achieve the best results when using the DS1088C, the power supply must be decoupled with 0.01µF and 0.1µF high-quality, ceramic, surface-mount capacitors. Surface-mount components minimize lead inductance, which improves performance, and tend to have adequate high-frequency response for decoupling applications. These capacitors should be placed as close as possible to the V_{CC} and GND pins.

Chip Information

SUBSTRATE CONNECTED TO GROUND

Ordering Information

PART	FREQUENCY (MHz)	TEMP RANGE	PIN-PACKAGE
DS1088CN-133+T	133.3	-20°C to +85°C	8 TDFN-EP*
DS1088CX-133+T	133.3	-20°C to +85°C	4 WLP

+Denotes lead(Pb)-free/RoHS-compliant package.

T = Tape and reel.

**EP = Exposed pad.*

Package Information

For the latest package outline information and land patterns (footprints), go to **www.maximintegrated.com/packages**. Note that a "+", "#", or "-" in the package code indicates RoHS status only. Package drawings may show a different suffix character, but the drawing pertains to the package regardless of RoHS status.

PACKAGE TYPE	PACKAGE CODE	OUTLINE NO.	LAND PATTERN NO.
8 TDFN-EP	T833+2	**21-0137**	**90-0059**
4 WLP	W41D1+1	**21-0455**	Refer to **Application Note 1891**

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	3/12	Initial release	—
1	4/15	Removed automotive reference from data sheet	1

