

# Peak EMI Reduction IC

## SSDCI2501AF

### ■ DESCRIPTION

SSDCI2501AF is a clock generator for EMI (Electro Magnetic Interference) reduction. The peak of unnecessary (EM) can be attenuated by making the oscillation frequency slightly modulate periodically with the internal modulator. SSDCI2501AF accepts an external reference, and locks on to it delivering a 1x modulated clock output

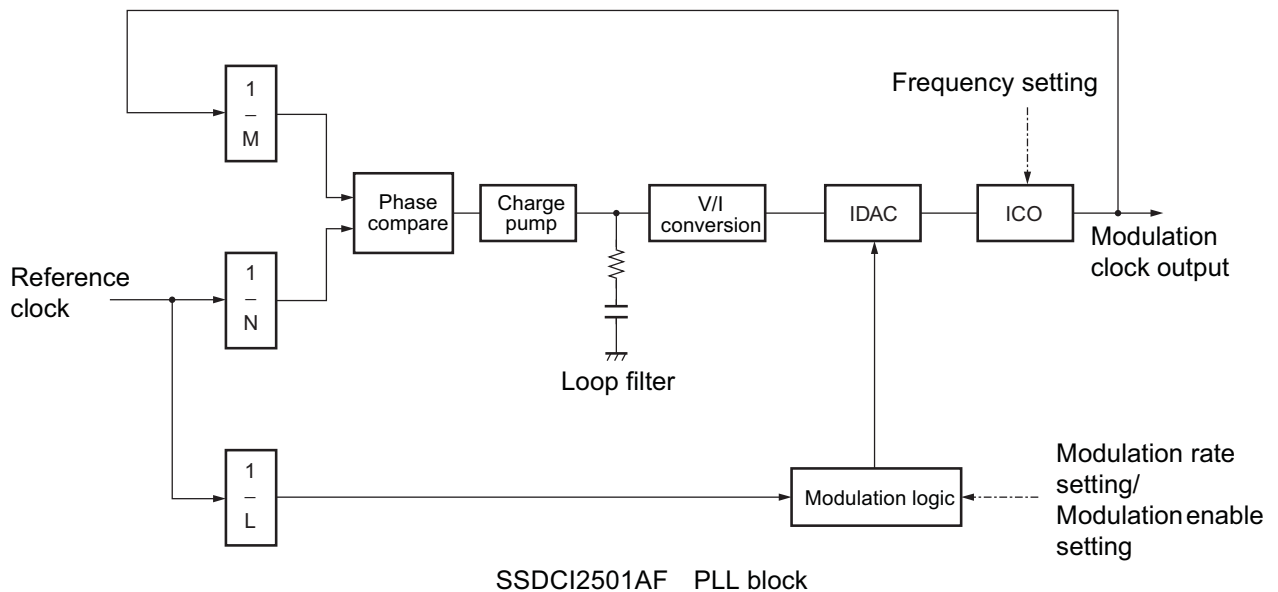
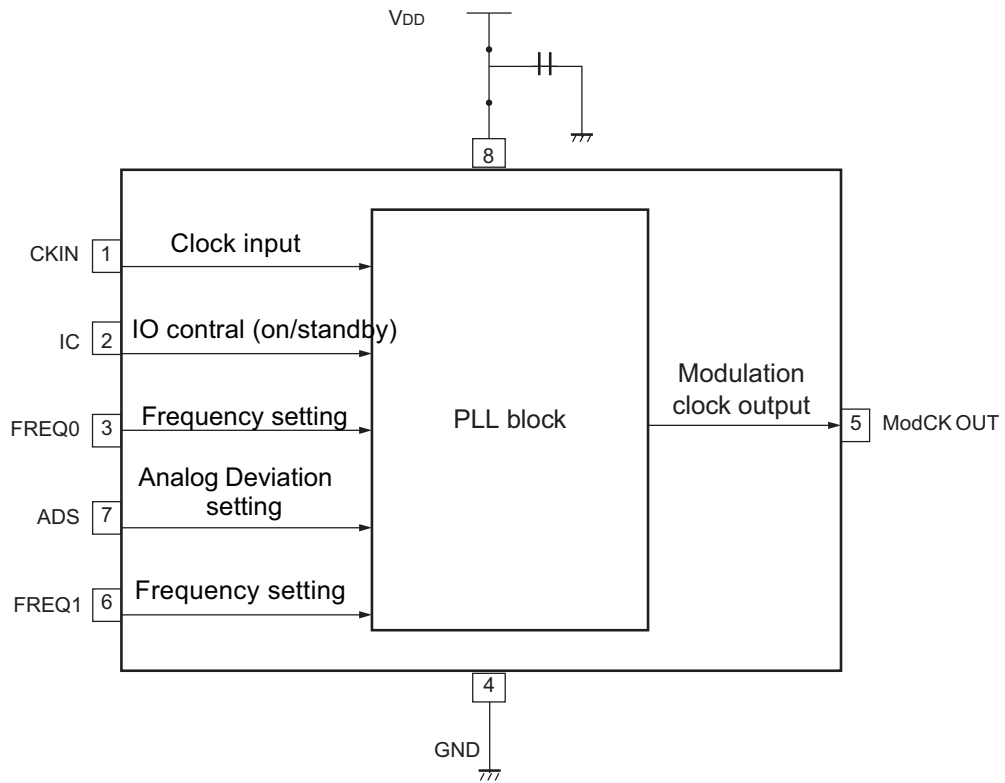
### ■ FEATURE

- Power down pin : 4  $\mu$ A (Typ-sample) consumption current at power down
- Input frequency : 14.0 MHz to 88.0 MHz
- Output frequency : 14.0 MHz to 88.0 MHz
- Analog Deviation Selection
- Modulation clock output Duty : 40% to 60%
- Power supply voltage : 2.5V--3.3 V
- Package : 8-pin TDFN
- Operating temperature:-40°C to+85°C

### ■ Application

SSDCI2501AF is targeted for use in consumer electronic applications like mobile phones, Camera modules, MFP and DPF.

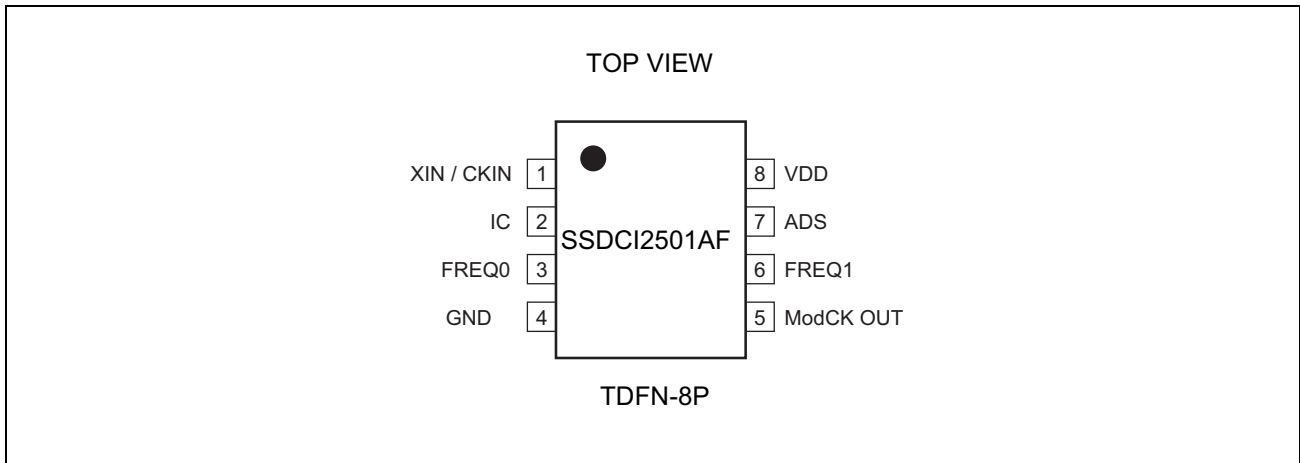
■ BLOCK DIAGRAM



SSDCI2501AF PLL block

A glitchless IDAC (current output D/A converter) provides precise modulation, thereby dramatically reducing EMI.

■ PIN ASSIGNMENT



■ PIN DESCRIPTION

Pin name	I/O	Pin no.	Description
XIN / CKIN	I	1	Clock input pin (or External reference clock input).
IC	I	2	Power Down. Outputs will be tri-stated when power down is standby Pull HIGH to disable power down and enable output.
FREQ0	I	3	Frequency setting pin
GND	---	4	GND pin
MODCK OUT	O	5	Modulation clock output
FREQ1	I	6	Frequency setting pin
ADS	I	7	Analog Deviation Selection through external resistor to GND.
VDD	---	8	Power supply voltage pin

**■ PIN SETTING**

When changing the pin setting, the stabilization wait time for the modulation clock required. The stabilization wait time for the modulation clock takes the maximum value of Lock-Up time in “■ ELECTRICAL CHARACTERISTICS • AC Characteristics”.

**ADS modulation enable setting**

Resistance(K ohm)	Deviation(+/-%)
0-1000K	3.0 - 0.25
---	---

Note : Analog Deviation Selection through external resistor to GND.  
Spectrum is spread (modulated) by centering on the input frequency.

**FREQ0, FREQ1 frequency setting**

FREQ0	FREQ1	Input frequency range
H	H	10 MHz to 36 MHz
H	L	20 MHz to 56 MHz
L	H	40 MHz to 68 MHz
L	L	57 MHz to 88 MHz

Note : It is set according to the frequency of the clock input to the device. Set FREQ0 pin to “H” for the pin opened because FREQ0 pin has pull-up resistor.

## SSDCI2501AF

**ABSOLUTE MAXIMUM RATING**

Symbol	Parameter	Rating	Unit
$V_{DD}, V_{IN}$	Voltage on any input pin with respect to Ground	-0.5 to +4.6	V
$T_{STG}$	Storage temperature	-65 to +125	°C
$T_s$	Max. Soldering Temperature (10 sec)	260	°C
$T_J$	Junction Temperature	150	°C
$T_{DV}$	Static Discharge Voltage (As per JEDEC STD22-A114-B)	2	kV

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

**DC ELECTRICAL CHARACTERISTICS**

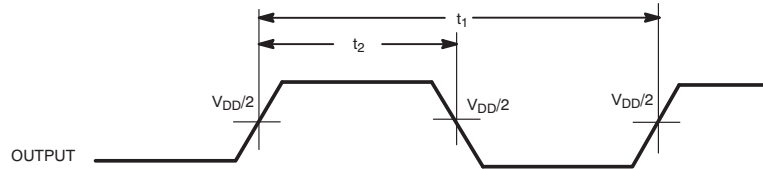
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{DD}$	Supply Voltage		2.3	2.7	3.6	V
$V_{IH}$	Input HIGH Voltage		$0.65 * V_{DD}$			V
$V_{IL}$	Input LOW Voltage				$0.35 * V_{DD}$	V
$I_{IH}$	Input HIGH Current	$V_{IN} = V_{DD}$			10	μA
$I_{IL}$	Input LOW Current	$V_{IN} = 0$ V for MR pin			10	μA
$V_{OH}$	Output HIGH Voltage	$I_{OH} = -16$ mA	$0.75 * V_{DD}$			V
$V_{OL}$	Output LOW Voltage	$I_{OL} = 16$ mA			$0.25 * V_{DD}$	V
$I_{CC}$	Static Supply Current	PD#/OE pin pulled to GND			10	μA
$Z_o$	Output Impedance			13		Ω

**AC ELECTRICAL CHARACTERISTICS**

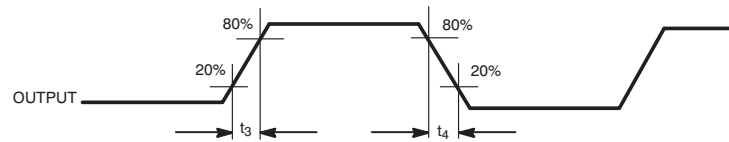
Parameter	Test Conditions	Min	Typ	Max	Unit
Duty Cycle (Note 1 and 2)	Measured at $V_{DD} / 2$	40	50	60	%
Rise Time (Note 1 and 2)	Measured between 20% to 80%		0.8	1.2	ns
Fall Time (Note 1 and 2)	Measured between 80% to 20%		0.8	1.2	ns

- All parameters are specified with 15 pF loaded output.
- Parameter is guaranteed by design and characterization. Not 100% tested in production.

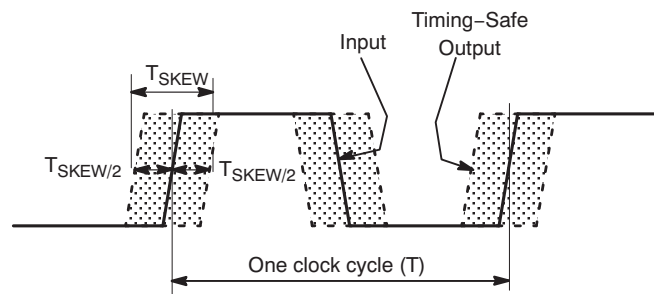
**SSDCI2501AF  
SWITCHING WAVEFORMS**



**Duty Cycle Timing**

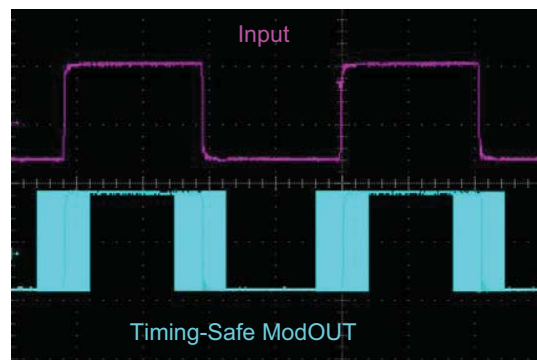
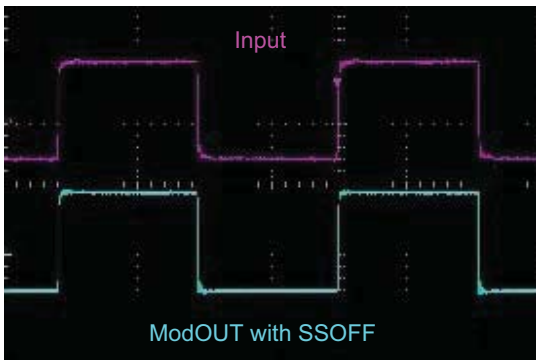


**Output Rise/Fall Time**



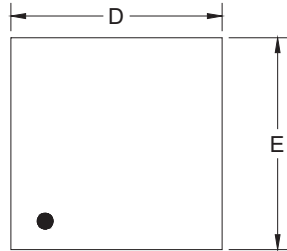
$T_{SKEW}$  represents input-output skew when spread spectrum is on  
For example,  $T_{SKEW} / 2 = 0.20 * T$  for an Input clock of 24 MHz, translates in to  $(1/24 \text{ MHz}) * 0.20 = 8.33 \text{ ns}$

**Input-Output Skew**

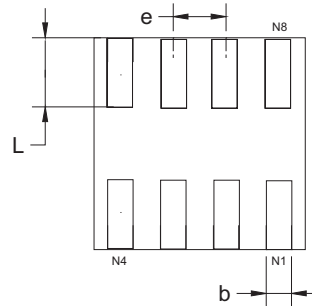


**Typical Example of Timing-Safe Waveform**

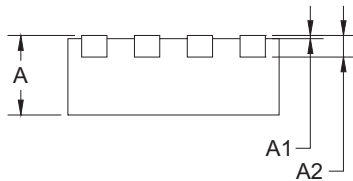
**TDFN-2x2-8L**



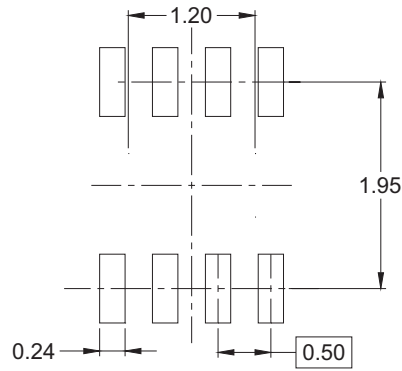
**TOP VIEW**



**BOTTOM VIEW**



**SIDE VIEW**



**RECOMMENDED LAND PATTERN (Unit: mm)**

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	1.900	2.100	0.075	0.083
E	1.900	2.100	0.075	0.083
b	0.180	0.300	0.007	0.012
L	0.500	0.600	0.020	0.024
e	0.500 TYP		0.020 TYP	

**ORDERING INFORMATION**

Part Number	Temperature	Package Type	Shipping†
SSDCI2501AF - 08-CT	-40°C to +85°C	8-Pin (2 mm x 2 mm) TDFN (Pb-Free)	3000 / Tape & Reel

**Device Ordering Information**

SSDCI 2501A F - 08 - CT

T = Tape & Reel, R = Tube or Tray																					
<table border="0"> <tr> <td>O = TSOT23</td> <td>U = MSOP</td> <td>J=TSOT26</td> </tr> <tr> <td>S = SOIC</td> <td>E = TQFP</td> <td>C=TDFN (2X2)</td> </tr> <tr> <td>T = TSSOP</td> <td>L = LQFP</td> <td></td> </tr> <tr> <td>A = SSOP</td> <td>U = MSOP</td> <td></td> </tr> <tr> <td>V = TVSOP</td> <td>P = PDIP</td> <td></td> </tr> <tr> <td>B = BGA</td> <td>D = QSOP</td> <td></td> </tr> <tr> <td>Q = QFN</td> <td>X = SC-70</td> <td></td> </tr> </table>	O = TSOT23	U = MSOP	J=TSOT26	S = SOIC	E = TQFP	C=TDFN (2X2)	T = TSSOP	L = LQFP		A = SSOP	U = MSOP		V = TVSOP	P = PDIP		B = BGA	D = QSOP		Q = QFN	X = SC-70	
O = TSOT23	U = MSOP	J=TSOT26																			
S = SOIC	E = TQFP	C=TDFN (2X2)																			
T = TSSOP	L = LQFP																				
A = SSOP	U = MSOP																				
V = TVSOP	P = PDIP																				
B = BGA	D = QSOP																				
Q = QFN	X = SC-70																				
DEVICE PIN COUNT																					
F = LEAD FREE AND RoHS COMPLIANT PART G = GREEN PACKAGE, LEAD FREE, and RoHS																					
PART NUMBER																					
<table border="0"> <tr> <td>I= Industrial (-40 °C to +85 °C)</td> <td>P or n/c = Commercial (0 °C to +70°C)</td> </tr> <tr> <td>A = Clock Generator</td> <td>F = Power Management</td> </tr> <tr> <td>B = Non PLL based</td> <td>G = Power Management</td> </tr> <tr> <td>C = EMI Reduction</td> <td>H = Power Management</td> </tr> <tr> <td>D = DDR support products</td> <td>I = Hi Performance</td> </tr> <tr> <td>E = STD Zero Delay Buffer</td> <td>J = Reserved</td> </tr> </table>	I= Industrial (-40 °C to +85 °C)	P or n/c = Commercial (0 °C to +70°C)	A = Clock Generator	F = Power Management	B = Non PLL based	G = Power Management	C = EMI Reduction	H = Power Management	D = DDR support products	I = Hi Performance	E = STD Zero Delay Buffer	J = Reserved									
I= Industrial (-40 °C to +85 °C)	P or n/c = Commercial (0 °C to +70°C)																				
A = Clock Generator	F = Power Management																				
B = Non PLL based	G = Power Management																				
C = EMI Reduction	H = Power Management																				
D = DDR support products	I = Hi Performance																				
E = STD Zero Delay Buffer	J = Reserved																				
Spread Spectrum Device CO.,LTD																					