

# Spread Spectrum Clock Generator

## Ultra Low Power Mobile EMI Reduction IC

# SSDCI3138AF



### ■ DESCRIPTION

The SSDCI3138AF is a versatile 1x spread spectrum frequency modulator designed to reduce electromagnetic interference (EMI) clock and data source, allowing system wide reduction of EMI of down stream clock and data dependent signals. The SSDCI3138AF allows significant system cost savings by reducing the number of circuit board layers ferrite beads, shielding and other passive components that are traditionally required to pass EMI regulations. The SSDCI3138AF family of mobile active EMI management ICs are unique in their design by eliminating the use of conventional PLLs. This allows operation on aperiodic as well periodic signals. The peak energy is distributed over a wider and controlled energy band thereby significantly lowering system

EMI compared to the typical narrow band signal produced by oscillators and most frequency generators. Lowering EMI by increasing a signal's bandwidth is known as "Spread Spectrum" or active EMI management.

3138 has an input frequency range of 10 MHz to 60 MHz over a wide voltage range of 1.65V to 3.6V and generates a 1x spread spectrum output. The device can be placed in "power save mode" by setting the PDB pin to GND where in it draws typically 0.1uA and also steers the MODOUT pin to a High-Z state. The device has two "Spreading Range control pins" SS1 and SS0 to allow flexibility and optimization of both EMI compliance as well in system design.

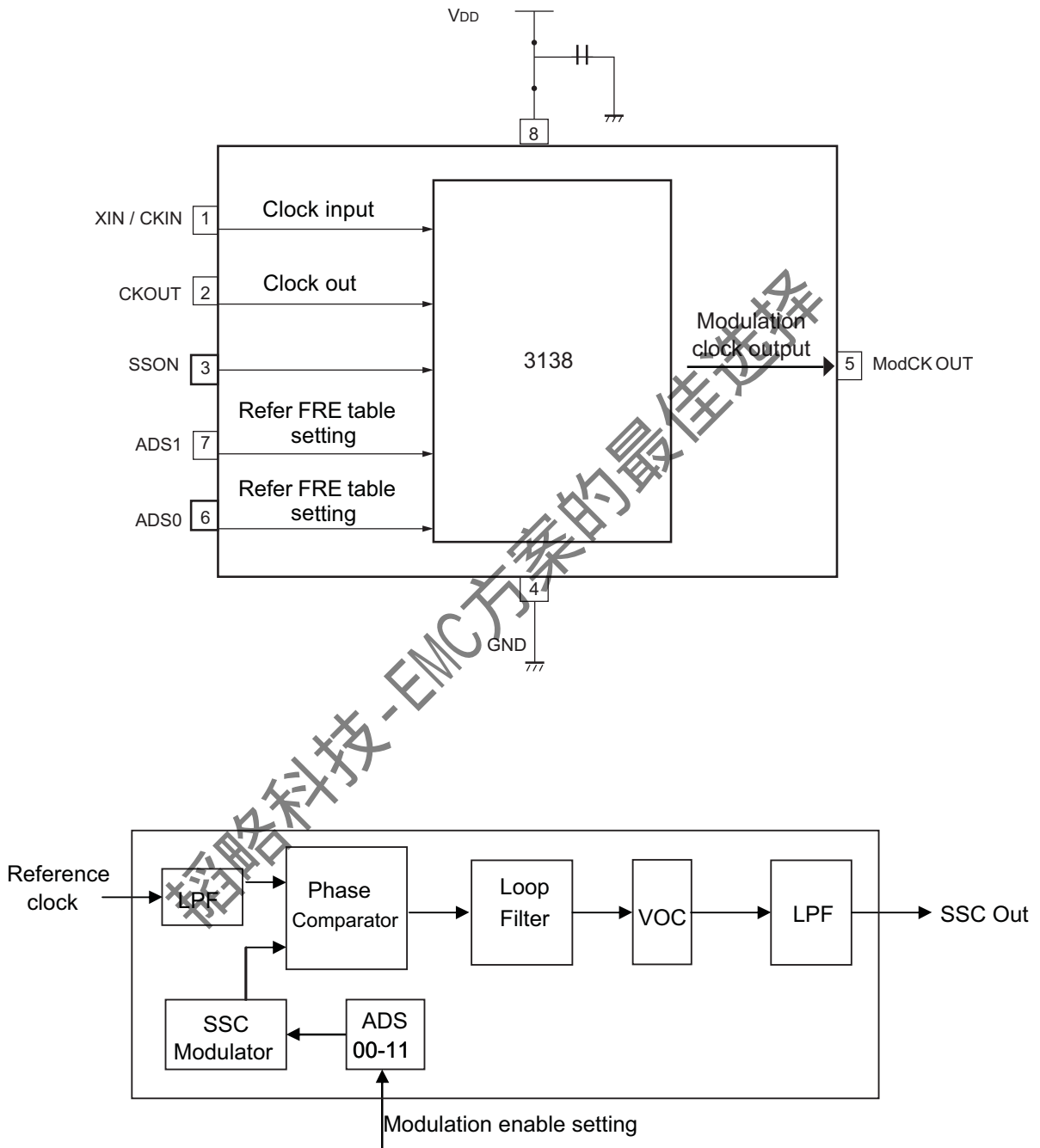
### ■ FEATURE

- FCC approved method of EMI attenuation.
- Generates a 1X low EMI spread spectrum clock of the input frequency.
- Input / Output frequency
  - VDD 1.65V-3.6V 10 MHz to 60 MHz
- Multiple Deviation Selections
- (Refer product table)
- Power save mode
- 8-pin TDFN package
- Operating Temperature -40°C to 85 °C

### ■ Application

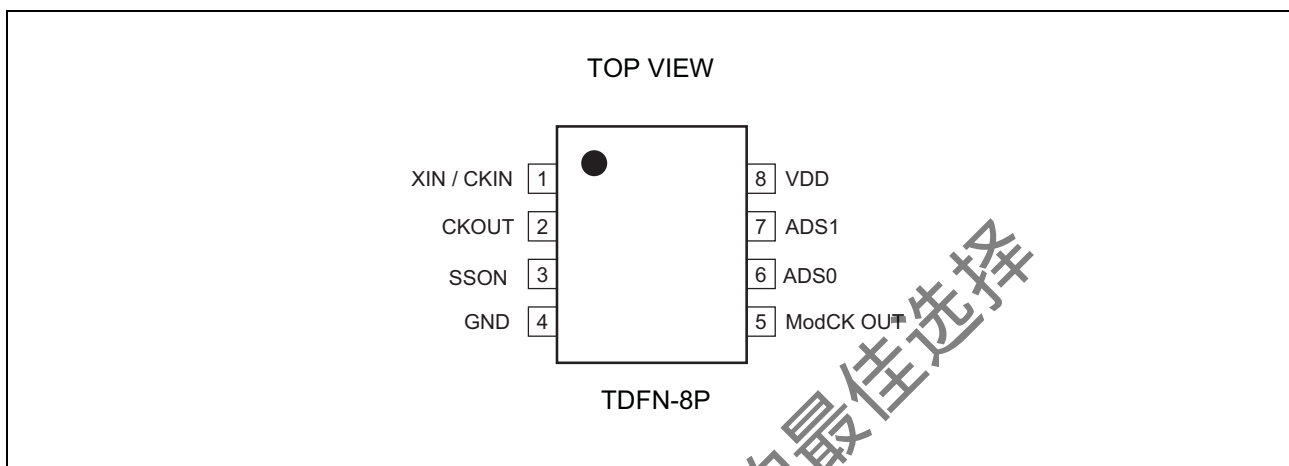
3138 is targeted for consumer electronics application such as MFP, STB, DSC, MID, HDMI, LCD panel Camcorder, and other timing sensitive analog video imaging applications. Applications of HDMI, RJ45 port has good compatibility

■ BLOCK DIAGRAM



SSDCI3138AF block

■ PIN ASSIGNMENT



■ PIN DESCRIPTION

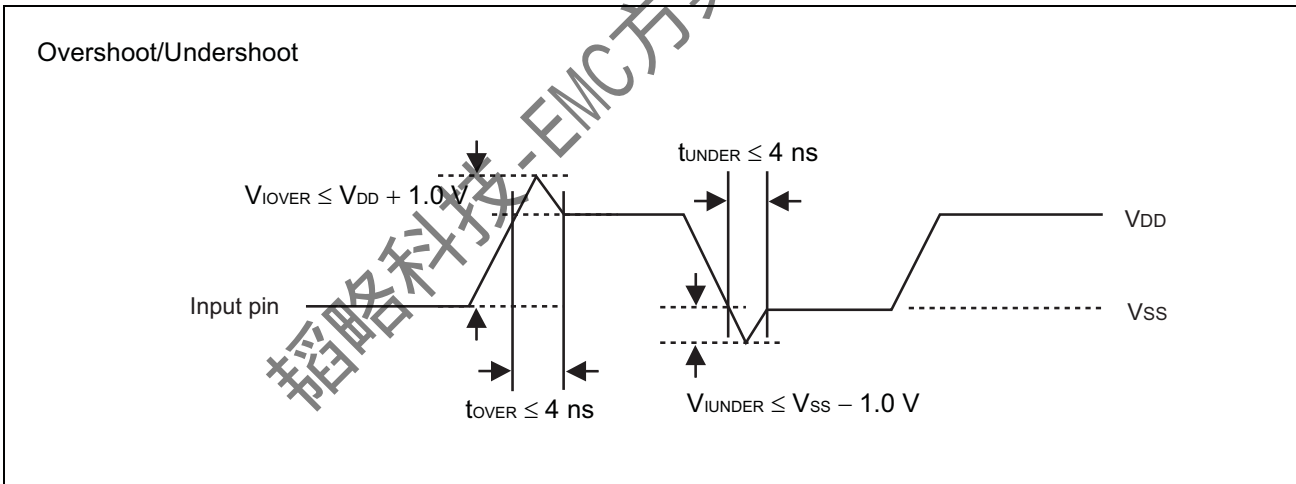
Pin name	I/O	Pin no.	Description
XIN / CKIN	I	1	Clock input pin (or External reference clock input).
CKOUT	O	2	Crystal connection( external reference, this pin should be left open)
SSON	I	3	ModCK OUT ON/OFF 1=ON 0=OFF
GND	---	4	GND pin
ModCK OUT	O	5	Modulation clock output
ADS	I	6	Analog Spreading Range Selection(refer Functionality Table)
ADS	I	7	Analog Spreading Range Selection(refer Functionality Table)
VDD	---	8	Power supply voltage pin

■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating		Unit
		Min	Max	
Power supply voltage*	$V_{DD}$	- 0.5	+ 4.5	V
Input voltage*	$V_I$	$V_{SS} - 0.5$	$V_{DD} + 0.5$	V
Output voltage*	$V_O$	$V_{SS} - 0.5$	$V_{DD} + 0.5$	V
Storage temperature	$T_{ST}$	- 55	+ 125	°C
Operation junction temperature	$T_J$	-40	+85	°C
Output current	$I_O$	2	4	mA
Overshoot	$V_{IOVER}$	—	$V_{DD} + 1.0$ ( $t_{OVER} \leq 4\text{ns}$ )	V
Undershoot	$V_{IUNDER}$	$V_{SS} - 1.0$ ( $t_{UNDER} \leq 4\text{ns}$ )	—	V

\* : The parameter is based on  $V_{SS} = 0.0\text{ V}$ .

WARNING: Semiconductor devices can be permanently damaged by application of stress (voltage, current, temperature, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.



■ ELECTRICAL CHARACTERISTICS

• DC Characteristics

(Ta = -40 °C to +85 °C, VDD = 3.3 V ± 0.3 V, VSS = 0.0 V)

Parameter	Symbol	Pin	Conditions	Value			Unit
				Min	Typ	Max	
Output voltage	V <sub>OH</sub>	CKOUT	"H" level output I <sub>OH</sub> = -4 mA	0.66V <sub>DD</sub>	—	V <sub>DD</sub>	V
	V <sub>OL</sub>	CKOUT	"L" level output I <sub>OL</sub> = 4 mA	V <sub>SS</sub>	—	0.33V <sub>DD</sub>	V
Output impedance	Z <sub>o</sub>	CKOUT	10 MHz to 60 MHz	—	30	—	Ω
Input capacitance	C <sub>IN</sub>	CKIN,	Ta = +25 °C, V <sub>DD</sub> = V <sub>I</sub> = 0.0 V, f = 1 MHz	—	—	16	pF
Load capacitance	C <sub>L</sub>	CKOUT	10 MHz to 60 MHz	—	—	10	pF
Power supply current	I <sub>CC</sub>	V <sub>DD</sub>	No load capacitance at 27 MHz	—	3.0	4	mA
Power down current	I <sub>pd</sub>	V <sub>DD</sub>	Input clock stopping	—	4	—	μA

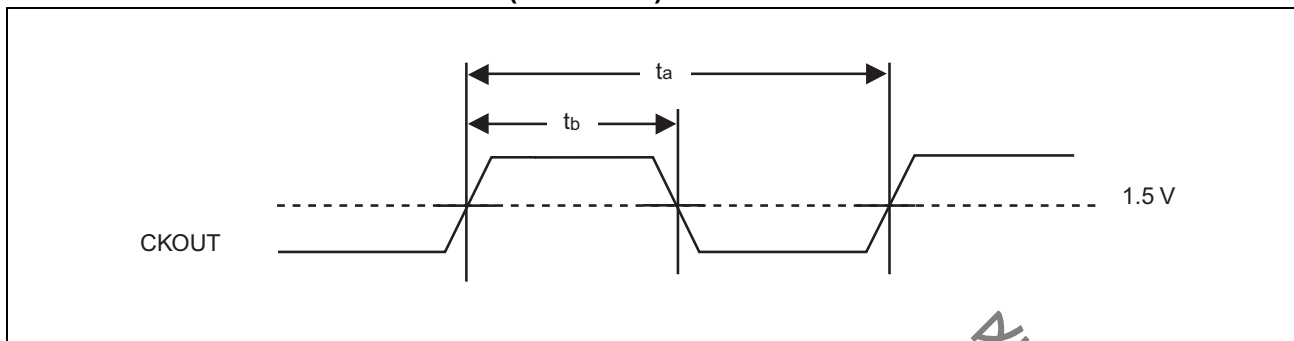
• AC Characteristics

(Ta = -40°C to +85 °C, VDD = 3.3 V ± 0.3 V, VSS = 0.0 V)

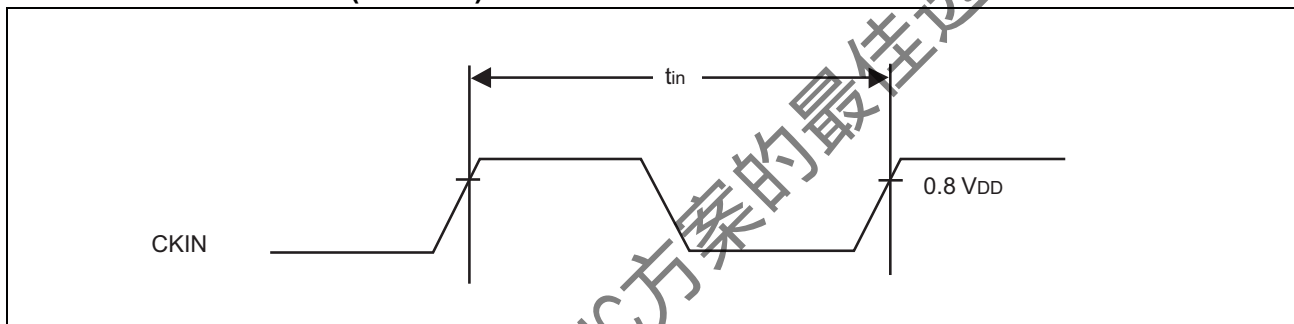
Parameter	Symbol	Pin	Conditions	Value			Unit
				Min	Typ	Max	
Input frequency	f <sub>in</sub>	CKIN	—	10.0	—	60	MHz
Output frequency	f <sub>OUT</sub>	CKOUT	—	10.0	—	60	MHz
Output slew rate	SR	CKOUT	Load capacitance 15 pF 0.4 V to 2.4 V	0.4	—	4.0	V/ns
Output clock duty cycle	t <sub>bcc</sub>	CKOUT	1.5 V	45	—	55	%
Output Rise Time			between 20% to 80%		0.9		nS
Output Fall Time			between 80% to 20%		0.9		nS
Cycle-cycle jitter	t <sub>JC</sub>	CKOUT	No load capacitance, Ta = +25 °C, V <sub>DD</sub> = 3.3 V	—	—	40	ps-rms

Note : The modulation clock stabilization wait time is required after the power is turned on, the IC recovers from power saving, or after ENS (modulation ON/OFF) setting is changed. For the modulation clock stabilization wait time, assign the maximum value for lock-up time.

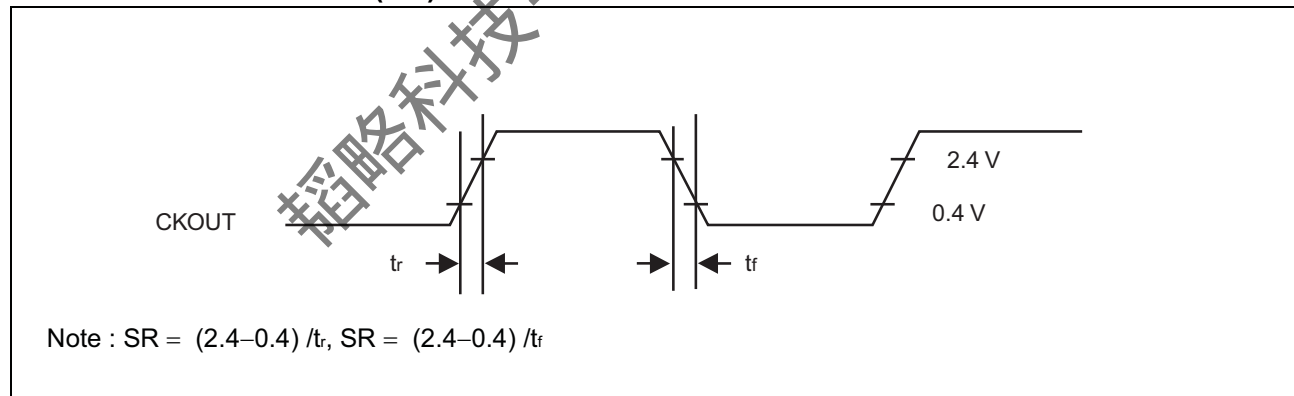
■ OUTPUT CLOCK DUTY CYCLE ( $t_{DCC} = t_b/t_a$ )



■ INPUT FREQUENCY ( $f_{in} = 1/t_{in}$ )



■ OUTPUT SLEW RATE (SR)



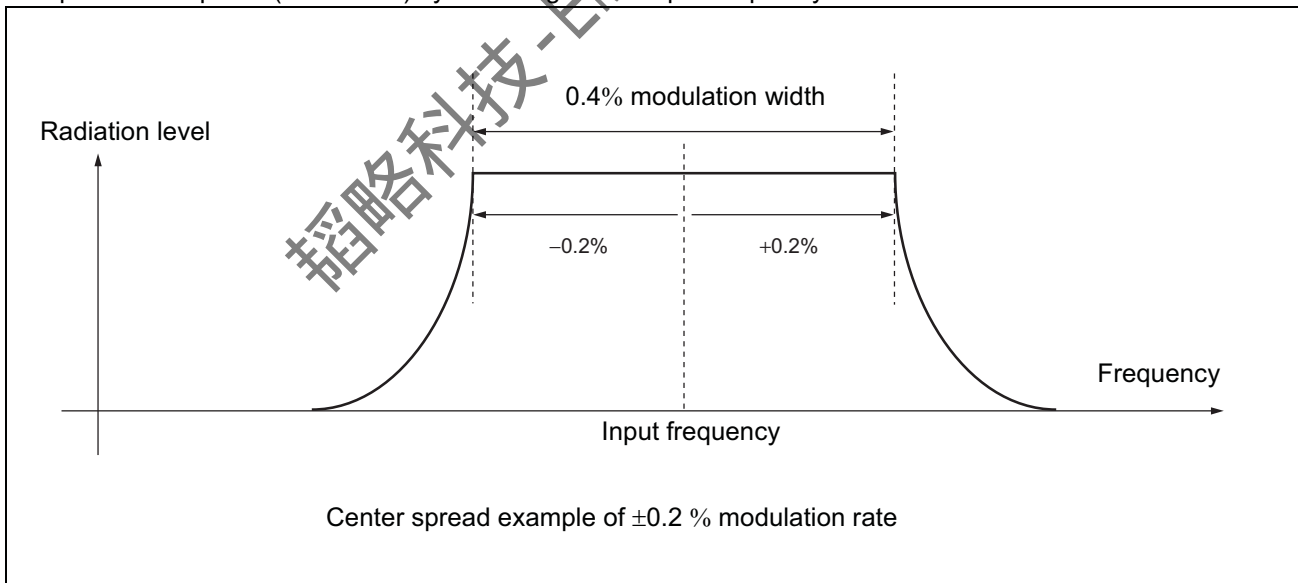
Functional Table

Vdd(V)	Freq. Range (MHz)	Freq. (MHz)	Spreading Range (%)							
			SS1	SS0	SS1	SS0	SS1	SS0	SS1	SS0
			0	0	0	1	1	0	1	1
1.8	10~33	12	±0.05		±0.10		±0.14		±0.18	
1.8		24	±0.06		±0.12		±0.15		-	
1.8		27	±0.07		±0.13		±0.13		-	
1.8		32	±0.08		-		-		-	
3.3	10~60	12	±0.03		±0.06		±0.09		±0.11	
3.3		24	±0.05		±0.10		±0.13		±0.16	
3.3		27	±0.06		±0.12		±0.15		±0.17	
3.3		32	±0.06		±0.12		±0.15		±0.17	

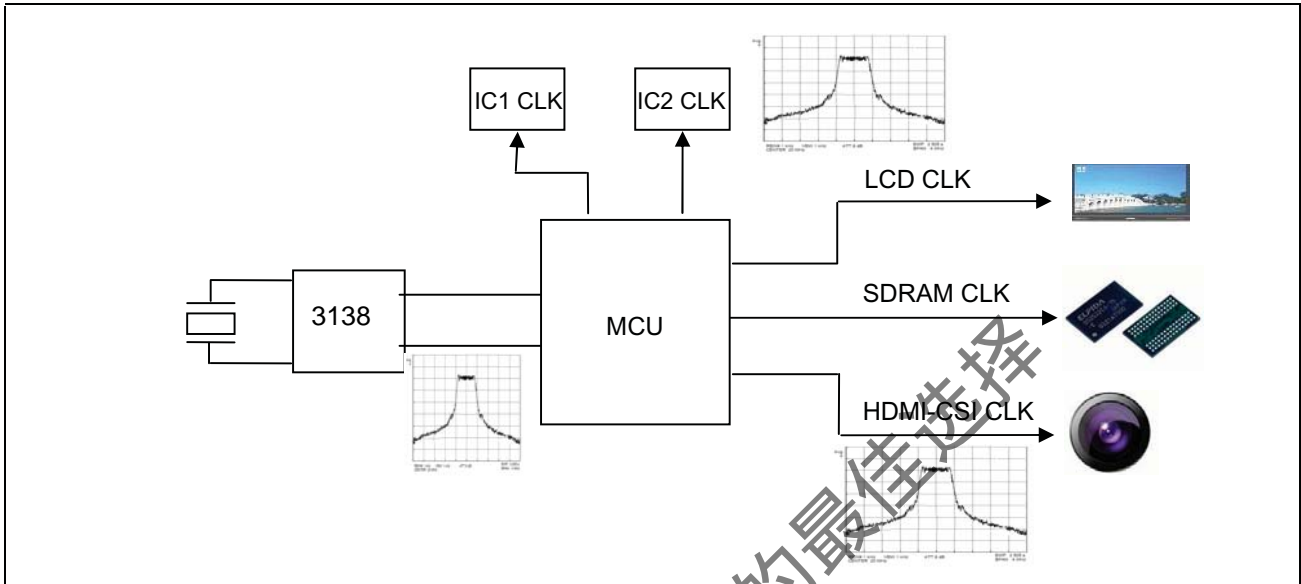
Note: Frequency Spreading Range can vary over voltage and temperature by 5%

• Center spread

Spectrum is spread (modulated) by centering on the input frequency.

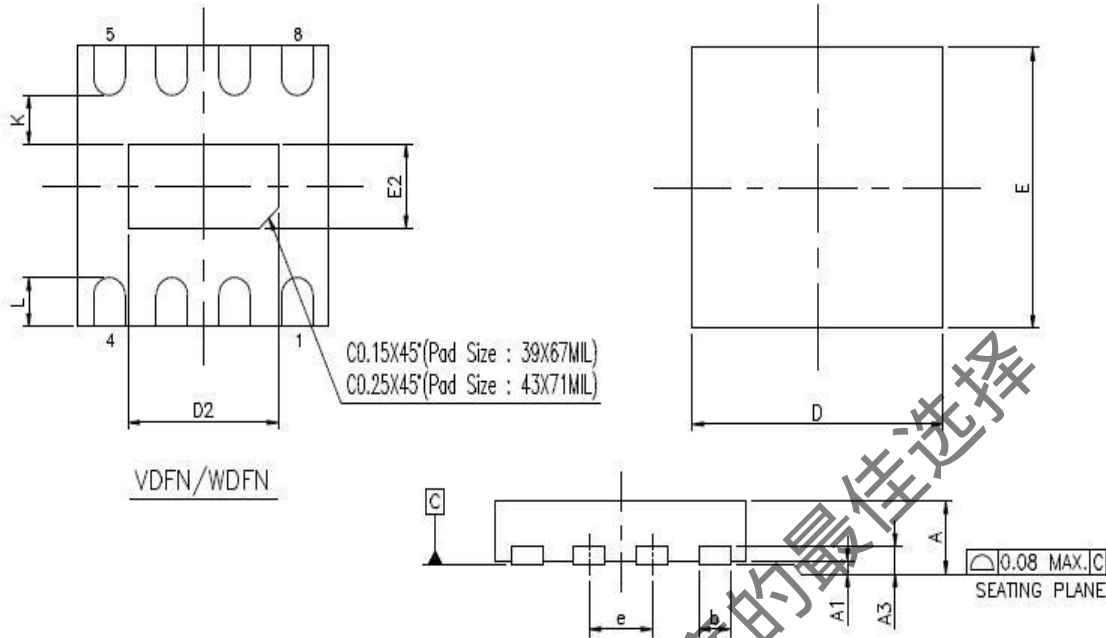


- Diagram of CLK spread





TDFN-2x2-8L

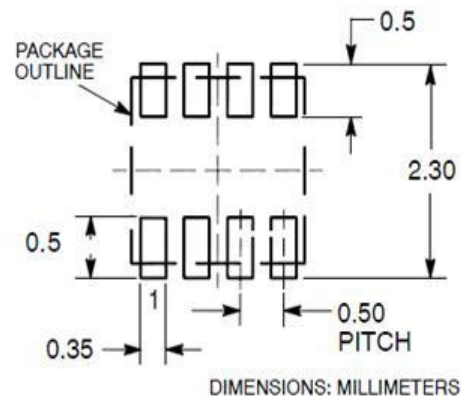


JEDEC OUTLINE	MO-229		
PKG CODE	WDFN		
SYMBOLS	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3	0.203 REF.		
b	0.20	0.25	0.30
D	1.95	2.00	2.05
E	1.95	2.00	2.05
e	.5 BSC		
K	0.20	....	....

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.15mm AND 0.30mm FROM THE TERMINAL TIP. IF THE TERMINAL HAS THE OPTIONAL RADIUS ON THE OTHER END OF THE TERMINAL, THE DIMENSION b SHOULD NOT BE MEASURED IN THAT RADIUS AREA.
3. BILATERAL COPLANARITY ZONE APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.

RECOMMENDED SOLDERING FOOTPRINT\*



PAD SIZE	D2			E2			L			LEAD FINISH		JEDEC CODE	VDFN	WDFN
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	Pure	PPF			
43x71MIL	1.55	1.60	1.65	0.85	0.90	0.95	0.25	0.30	0.35	V	X	N/A	V	V

\*\*\* 表示汎用字元，此汎用字元可能被其它不同字元所取代，实际的字元请参照 bonding diagram 所示。  
 "" is an universal character, which means maybe replaced by specific character, the actual character please refers to the bonding diagram.

Ordering Code

Part Number	Package	Temperature
SSDCI3138AF-08-CT	8- pin 2-mm TDFN COL - TAPE & REEL, Green	-40°C to +85 °C

Device Ordering Information

SSDCI 3138A F-08-CT

韬略科技-EMC方案的最佳选择

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