

Features

- FCC approved method of EMI attenuation
- Generates a 1X low EMI Phase Modulated replication of the input signal
- VDD 1.6V ~ 3.6V, 20MHz to 38MHz
- Multiple Deviation Options
- 4-pin μ DFN package
- Slew rate controlled buffer for enhanced EMI reduction
- Operating temperature -40°C to 125°C for Automotive AEC-Q100

Applications

- The QE101 series is targeted towards LED displays, Camera modules, Cell phones, MIDs, Netbooks and numerous other “power and space” sensitive applications.

Product Description

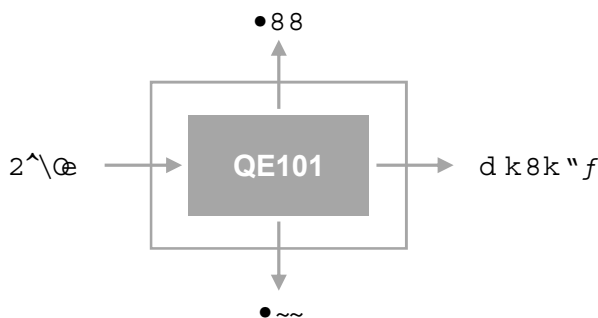
The QE101 is a versatile 1x Active EMI management IC designed to provide system wide reduction of Electromagnetic Interference (EMI) and Radio Frequency Interference (RFI) from clock and data sources. This allows significant system cost savings by reducing the number of circuit board layers, ferrite beads, shielding and other passive components that are traditionally required to pass EMI regulations.

The QE101 family of mobile active EMI management ICs is unique in its design and is based on the phase controlled active EMI management technology. This allows operation on aperiodic as well as periodic signals. By the precise placement of the edges of the reconstructed input signal, the peak energy of the output 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.

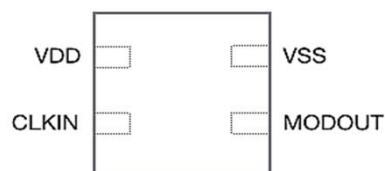
The QE101 has an input frequency range of 20MHz to 38MHz over a wide voltage range of 1.6V to 3.6V. The device has only 4 pins providing the smallest footprint ideally suited for mobile and space constrained applications.

The device is available in 4-pin μ DFN package.

Block Diagram



Pin Configuration



Pin Description

Pin#	Pin Name	Type	Description
1	VDD	P	System Power Supply pin
2	CLKIN	I	Clock input
3	MODOUT	O	1X phase modulated buffered output
4	VSS	P	System ground reference input

Operating Conditions

Parameter	Description	Min	Max	Unit
VDD _(3.3V)	Supply Voltage	1.6	3.6	V
T _A	Operating Temperature (Ambient Temperature)	-40	+125	°C
C _L	Load Capacitance		20	pF
C _{IN}	Input Capacitance		5	pF

Absolute Maximum Rating

Symbol	Parameter	Rating	Unit
V _{in}	Voltage on any 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

Note: These are stress ratings only and are not implied nor guaranteed for functional use. Exposure to absolute maximum ratings for prolonged periods of time may affect device reliability.

Functional Table

Part Number	Freq. Range (MHz)	Freq. (MHz)	Deviation (%)
QE101 (1.8V)	20 ~ 38	24	±0.43
		27	±0.48
		37	±0.50
QE101 (3.3V)	20 ~ 38	24	±0.25
		27	±0.27
		37	±0.28

Note: Frequency deviation can vary over voltage and temperature by 5%.

DC Electrical Characteristics (1.8 +/-0.2V)

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
VDD	Supply Voltage		1.6	1.8	2.0	V
V _{IH}	Input HIGH Voltage		0.66 * VDD			V
V _{IL}	Input LOW Voltage				0.33 * VDD	V
I _{IH}	Input HIGH Current (pin 5 and 6)	V _{IN} = VDD			10	μA
I _{IL}	Input LOW Current (pin 5 and 6)	V _{IN} = 0V			10	μA
V _{OH}	Output HIGH Voltage	I _{OH} = -4mA	0.75 * VDD			V
V _{OL}	Output LOW Voltage	I _{OL} = +4mA			0.25 * VDD	V
I _{CC}	Static Supply Current	CLKIN = VSS or VDD		0.1	1.0	μA
I _{DD}	Dynamic Supply Current	27MHz	Unloaded	3.0	4.0	mA
			10pF load	3.5	4.5	
Z ₀	Output Impedance			25		Ω

Switching Characteristics (1.8V +/-0.2V)

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
INPUT	Input Frequency		20	24	38	MHz
MODOUT	Output Frequency		20	24	38	MHz
T_d	Duty Cycle ^{1,2} = $(t_2 / t_1) * 100$	Measured at VDD/2	45	50	55	%
t_3	Output Rise Time ^{1,2}	Measured between 20% to 80%	0.8	1.5	1.8	nS
t_4	Output Fall Time ^{1,2}	Measured between 80% to 20%	0.8	1.0	1.8	nS
t_j	Cycle-to-cycle jitter ²	No spreading unloaded outputs 27MHz		±150		pS

Note:
 1. All parameters specified with loaded outputs.
 2. Parameter is guaranteed by design and characterization. Not 100% tested in production.

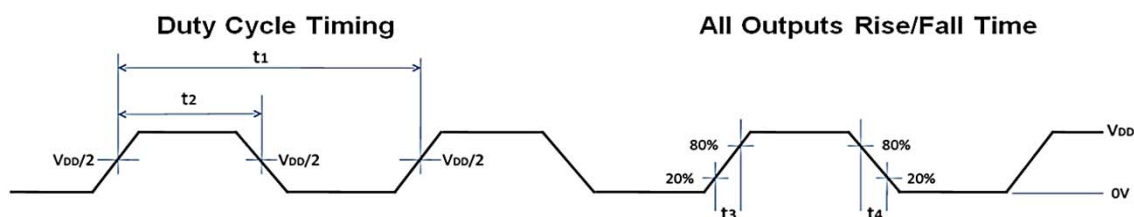
DC Electrical Characteristics (3.3 +/-0.3V)

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
VDD	Supply Voltage		3.0	3.3	3.6	V
V _{IH}	Input HIGH Voltage		0.66 * VDD			V
V _{IL}	Input LOW Voltage				0.33 * VDD	V
I _{IH}	Input HIGH Current (pin 5 and 6)	V _{IN} = VDD			10	µA
I _{IL}	Input LOW Current (pin 5 and 6)	V _{IN} = 0V			10	µA
V _{OH}	Output HIGH Voltage	I _{OH} = -8mA	0.75 * VDD			V
V _{OL}	Output LOW Voltage	I _{OL} = +8mA			0.25 * VDD	V
I _{CC}	Static Supply Current	CLKIN = VSS or VDD		0.1	1.0	µA
I _{DD}	Dynamic Supply Current	27MHz				
		Unloaded		6.0	7.0	mA
		10pF load		7.0	8.0	
Z ₀	Output Impedance			25		Ω

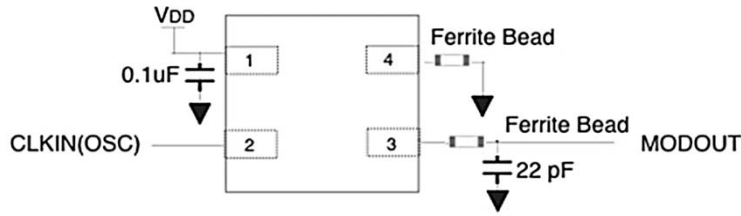
Switching Characteristics (3.3V +/-0.3V)

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
INPUT	Input Frequency		20	24	38	MHz
MODOUT	Output Frequency		20	24	38	MHz
T_d	Duty Cycle ^{1,2} = $(t_2 / t_1) * 100$	Measured at VDD/2	45	50	55	%
t_3	Output Rise Time ^{1,2}	Measured between 20% to 80%	0.6	1.5	2.5	nS
t_4	Output Fall Time ^{1,2}	Measured between 80% to 20%	0.6	1.4	2.5	nS
t_j	Cycle-to-cycle jitter ²	No spreading unloaded outputs 27MHz		±150		pS

Note:
 1. All parameters specified with loaded outputs.
 2. Parameter is guaranteed by design and characterization. Not 100% tested in production.



Application Schematic



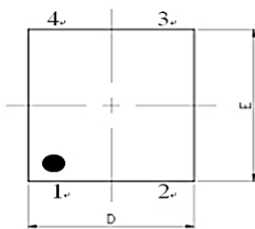
Ordering Information

Part Number	Temp. Grade Indicator	Temp. Grade	Temp. Range
QE101C	C	Commercial	0°C ~ +70°C
QE101I	I	Industrial	-20°C ~ +85°C
QE101E	E	AEC-Q100, Grade 2	-40°C ~ +105°C
QE101A	A	AEC-Q100, Grade 1	-40°C ~ +125°C

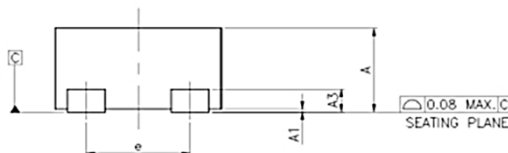
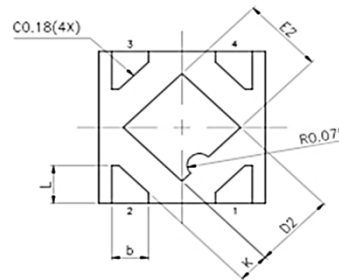
Package Dimension

μDFN

Top View



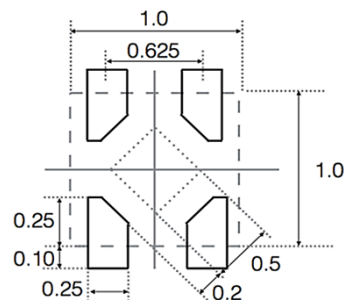
Bottom View



(Unit: mm)

JEDEC OUTLINE	N/A		
PKG CODE	UDFN(W103)		
SYMBOLS	MIN.	NOM.	MAX.
A	0.50	0.55	0.60
A1	0.00	0.02	0.05
A3	0.150 REF.		
b	0.175	0.225	0.275
D	1.00 BSC		
E	1.00 BSC		
e	0.625 BSC		
L	0.20	0.25	0.30
K	0.20	—	—

Recommended footprint



PAD SIZE	D2			E2			LEAD FINISH		JEDEC CODE
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	Pure Tin	PPF	
23X23* MIL	0.40	0.50	0.60	0.40	0.50	0.60	V	X	N/A

*" is a universal character, which means maybe replaced by specific character, the actual character please refers to the bonding diagram.

(Unit: mm)