SiT9102

PRELIMINARY

LVPECL/LVDS/CML
10 to 220 MHz High Performance Oscillator

Features

- Extremely low RMS phase jitter (random)
  - <1 ps (typical)
- Wide frequency range
  - 10 MHz to 220 MHz
- Low frequency tolerance
  - ±10 PPM, ±12 PPM, ±15 PPM
  - ±20 PPM, ±25 PPM, ±50 PPM
- Operating voltage
  - 1.8, 2.5 or 3.3 V
- Operating temperature range
  - Industrial, -40 to 85 °C
  - Extended Commercial, -20 to 70 °C
  - Commercial, 0 to 70 °C
- Small footprint
  - 5.0 x 3.2 x 0.85 mm
  - 7.0 x 5.0 x 0.85 mm
- Pb-free and ROHs compliant
- Spread Spectrum Option (contact factory)
- Ultra-reliable start up and greater immunity from interference

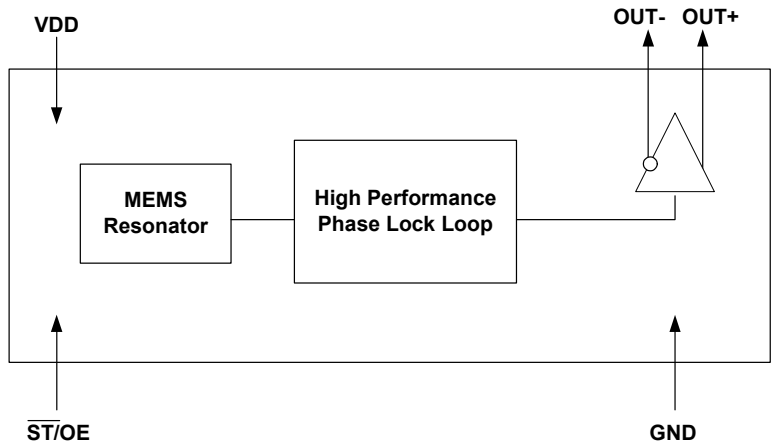
Benefits

- Ultra fast lead time: 2 to 3 weeks
- No crystal or capacitors required
- Eliminates crystal qualification time
- 50% + board saving space
- More cost effective than quartz oscillators, quartz crystals and clock ICs.
- Completely quartz-free

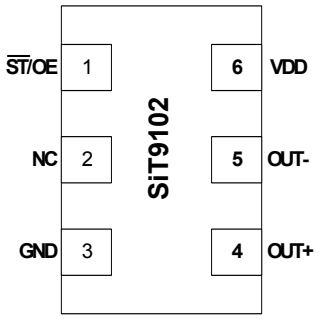
Applications

- Server
- Router
- RAID controller
- Gigabit Ethernet
- 10 Gigabit Ethernet
- Fiber Channel
- SATA / SAS
- PCI-Express
- System clock
- Networking and computing

Block Diagram



Pinout



Pin Description

Pin No.	Name		Pin Description
1	$\overline{ST}$/OE	Input	Standby or Output Enable pin for OUT+ and OUT-. OE: When High or Open : OUT+ and OUT- = active When Low : OUT+ and OUT- = High Impedance state $\overline{ST}$: When High or Open : OUT+ and OUT- = active When Low : OUT+ and OUT- = High Impedance State
2	NC	NA	Do Not connect pin, leave it floating.
3	GND	Power	VDD power supply ground. Connect to Ground
4	OUT+	Output	1 to 220 MHz programmable clock output .
5	OUT-	Output	1 to 220 MHz programmable clock output .

Absolute Maximum Ratings

Attempted operation outside the absolute maximum ratings of the part may cause permanent damage to the part. Actual performance of the IC is only guaranteed within the operational specifications, not at absolute maximum ratings.

Absolute Maximum Table

Parameter	Min.	Max.	Unit
Storage Temperature	-65	150	°C
VDD	-0.5	+4.00	V
Theta JA (with copper plane on VDD and GND)	–	TBD	°C/W
Theta JC (with PCB traces of 0.010 inch to all pins)	–	TBD	°C/W
Soldering Temperature (follow standard Pb free soldering guidelines)	–	260	°C
Number of Program Writes	–	1	NA
Program Retention over -40 to 125C, Process, VDD (0 to 3.6V)	–	1,000+	years
Human Body Model (JESD22-A114)	2000	–	–
Charged Device Model (JESD22-C101)	750	–	–
Machine Model (JESD22-A115)	200	–	–

Environmental Compliance

Parameter	Condition/Test Method
Mechanical Shock	MIL-STD-883F, Method 2002, 50 KG Shock
Mechanical Vibration	MIL-STD-883F, Method 2007, 70 G Vibration
Temperature Cycle	MIL-STD-883F, Method 1010-65-150°C (1000 cycle)
Solderability	MIL-STD-883F, Method 2003
Moisture Sensibility Level	MSL1

DC Electrical Specifications

LVCOMS, 3.3V ±10% or 2.5V ±10% or 1.8V ±5%,-40 to 85°C

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{IH}	Input High Voltage		70	–	–	%Vdd
V_{IL}	Input Low Voltage		–	–	30	%Vdd
I_{IH}	Input High Current	OE or ST pin	–	–	TBD	µA
I_{IL}	Input Low Current	OE or ST pin	TBD	–	–	µA

LVPECL, 3.3V ±10% or 2.5V ±10%, -40 to 85°C

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{DD}	Supply Voltage		2.97	3.3	3.63	V
			2.25	2.5	2.75	V
I_{DD}	Supply Current	V_{DD} = 3.3V	–	70	TBD	mA
		V_{DD} = 2.5V	–	70	TBD	mA
V_{OH}	Output High Voltage	50 Ohm termination to V_{DD} - 2.0V See Figure 1.	V_{DD}-1.1	–	V_{DD}-0.7	V
V_{OL}	Output Low Voltage		V_{DD}-2.0	–	V_{DD}-1.4	V
V_{swing}	Pk-PK Output Voltage Swing		600	800	1000	mV

LVDS, 3.3V ±10% or 2.5V ±10%, -40 to 85°C

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{DD}	Supply Voltage		2.97	3.3	3.63	V
			2.25	2.5	2.75	V
I_{DD}	Supply Current	V_{DD} = 3.3V	–	40	TBD	mA
		V_{DD} = 2.5V	–	40	TBD	mA
V_{OD1}	Differential Output Voltage	Swing Mode = Normal Single load termination. See Figure 2.	250	350	400	mV
ΔV_{OD1}	V_{OD} Magnitude Change		–	–	50	mV
V_{OS1}	Offset Voltage		–	1.2	–	V
ΔV_{OS1}	V_{OS} Magnitude Change		–	–	50	mV
V_{OD2}	Differential Output Voltage	Swing Mode = High Single load termination. See Figure 2.	500	700	800	mV
ΔV_{OD2}	V_{OD} Magnitude Change		–	–	50	mV
V_{OS2}	Offset Voltage		–	1.2	–	V
ΔV_{OS2}	V_{OS} Magnitude Change		–	–	50	mV
V_{OD3}	Differential Output Voltage	Swing Mode = High Double load termination. See Figure 3.	250	350	400	mV
ΔV_{OD3}	V_{OD} Magnitude Change		–	–	50	mV
V_{OS3}	Offset Voltage		–	1.2	–	V
ΔV_{OS3}	V_{OS} Magnitude Change		–	–	50	mV

CML, 3.3V ±10% or 2.5V ±10% or 1.8V ±5%,-40 to 85°C

Symbol	Parameter	Condition		Min.	Typ.	Max.	Unit
V_{DD}	Supply Voltage			2.97	3.3	3.63	V
				2.25	2.5	2.75	V
				1.71	1.8	1.89	V
I_{DD}	Supply Current	V_{DD} = 3.3V	Excluding Load Termination Current	–	70	TBD	mA
		V_{DD} = 2.5V		–	70	TBD	mA
		V_{DD} = 1.8V		–	70	TBD	mA
V_{OH1}	Output High Voltage	Swing Mode = Normal Single Load Termination See Figure 4.		V_{DD}-0.1	–	V_{DD}	V
V_{OL1}	Output Low Voltage			V_{DD}-0.5	V_{DD}-0.4	V_{DD}-0.3	V
V_{swing1}	Pk-PK Output Voltage Swing			300	400	500	mV
V_{OH2}	Output High Voltage	Swing Mode = High Single Load Termination See Figure 4.		V_{DD}-0.1	–	V_{DD}	V
V_{OL2}	Output Low Voltage			V_{DD}-1.0	V_{DD}-0.8	V_{DD}-0.6	V
V_{swing2}	Pk-PK Output Voltage Swing			600	800	1000	mV
V_{OH3}	Output High Voltage	Swing Mode = High Double Load Termination See Figure 5.		V_{DD}-0.1	–	V_{DD}	V
V_{OL3}	Output Low Voltage			V_{DD}-0.5	V_{DD}-0.4	V_{DD}-0.3	V
V_{swing3}	Pk-PK Output Voltage Swing			300	400	500	mV

AC Electrical Specifications

LVPECL, 3.3V ±10% ,-40 to 85°C

Symbol	Parameter	Condition		Min.	Typ.	Max.	Unit
F_{out}	Output Frequency			10	–	220	MHz
F_{sta}	Frequency Stability	Inclusive of initial tolerance, operating temp., rated power supply voltage change, load change	0 to 70°C	-10	–	+10	PPM
			-20 to 70°C	-12	–	+12	PPM
			-40 to 85°C	-15	–	+15	PPM
			0 to 70°C	-25		+25	PPM
			-20 to 70°C	-50		+50	PPM
			-40 to 85°C	-100		+100	PPM
F_{age}	Aging	First year @ 25°C		–	–	1	PPM
DC	Duty Cycle			45	–	55	%
t_R/t_F	Output Rise/Fall Time	20% to 80%		TBD	300	TBD	ps
PH_J	RMS Phase Jitter (random)	F_{out} = 106.25 MHz @ BW: 637 kHz to10 MHz		–	0.8	–	ps
		F_{out} = 156.25 MHz @ BW: 1.87 to 20 MHz		–	0.5	–	ps
		F_{out} = 200 MHz @ BW: 1 to 20 MHz		–	0.5	–	ps
P_J	RMS Period Jitter	F_{out} = 106.25 MHz		–	3.0	TBD	ps
		F_{out} = 156.25 MHz		–	2.5	TBD	ps
		F_{out} = 200 MHz		–	2.0	TBD	ps

LVPECL, 2.5V ±10% ,-40 to 85°C

Symbol	Parameter	Condition		Min.	Typ.	Max.	Unit
F_{out}	Output Frequency			10	–	220	MHz
F_{sta}	Frequency Stability	Inclusive of initial tolerance, operating temp., rated power supply voltage change, load change	0 to 70°C	-10	–	+10	PPM
			-20 to 70°C	-12	–	+12	PPM
			-40 to 85°C	-15	–	+15	PPM
			0 to 70°C -20 to 70°C -40 to 85°C	-25		+25	PPM
				-50		+50	PPM
				-100		+100	PPM
F_{age}	Aging	First year @ 25°C		–	–	1	PPM
DC	Duty Cycle			45	–	55	%
t_R/t_F	Output Rise/Fall Time	20% to 80%		–	300	TBD	ps
PH_J	RMS Phase Jitter (random)	F_{out} = 106.25 MHz @ BW: 637 kHz to10 MHz		–	0.8	–	ps
		F_{out} = 156.25 MHz @ BW: 1.87 to 20 MHz		–	0.5	–	ps
		F_{out} = 200 MHz @ BW: 1 to 20 MHz		–	0.5	–	ps
P_J	RMS Period Jitter	F_{out} = 106.25 MHz		–	3.0	TBD	ps
		F_{out} = 156.25 MHz		–	2.5	TBD	ps
		F_{out} = 200 MHz		–	2.0	TBD	ps

LVDS, 3.3V ±10% ,-40 to 85°C

Symbol	Parameter	Condition		Min.	Typ.	Max.	Unit
F_{out}	Output Frequency			10	–	220	MHz
F_{sta}	Frequency Stability	Inclusive of initial tolerance, operating temp., rated power supply voltage change, load change	0 to 70°C	-10	–	+10	PPM
			-20 to 70°C	-12	–	+12	PPM
			-40 to 85°C	-15	–	+15	PPM
			0 to 70°C -20 to 70°C -40 to 85°C	-25		+25	PPM
				-50		+50	PPM
				-100		+100	PPM
F_{age}	Aging	First year @ 25°C		–	–	1	PPM
DC	Duty Cycle			45	–	55	%
t_R/t_F	Output Rise/Fall Time	20% to 80%		–	300	TBD	ps
PH_J	RMS Phase Jitter (random)	F_{out} = 106.25 MHz @ BW: 637 kHz to10 MHz		–	0.8	–	ps
		F_{out} = 156.25 MHz @ BW: 1.87 to 20 MHz		–	0.5	–	ps
		F_{out} = 200 MHz @ BW: 1 to 20 MHz		–	0.5	–	ps
P_J	RMS Period Jitter	F_{out} = 106.25 MHz		–	3.0	TBD	ps
		F_{out} = 156.25 MHz		–	2.5	TBD	ps
		F_{out} = 200 MHz		–	2.0	TBD	ps

LVDS, 2.5V ±10% ,-40 to 85°C

Symbol	Parameter	Condition		Min.	Typ.	Max.	Unit
F_{out}	Output Frequency			10	–	220	MHz
F_{sta}	Frequency Stability	Inclusive of initial tolerance, operating temp., rated power supply voltage change, load change	0 to 70°C	-10	–	+10	PPM
			-20 to 70°C	-12	–	+12	PPM
			-40 to 85°C	-15	–	+15	PPM
			0 to 70°C -20 to 70°C -40 to 85°C	-25		+25	PPM
				-50		+50	PPM
				-100		+100	PPM
F_{age}	Aging	First year @ 25°C		–	–	1	PPM
DC	Duty Cycle			45	–	55	%
t_R/t_F	Output Rise/Fall Time	20% to 80%		–	300	TBD	ps
PH_J	RMS Phase Jitter (random)	F_{out} = 106.25 MHz @ BW: 637 kHz to10 MHz		–	0.8	–	ps
		F_{out} = 156.25 MHz @ BW: 1.87 to 20 MHz		–	0.5	–	ps
		F_{out} = 200 MHz @ BW: 1 to 20 MHz		–	0.5	–	ps
P_J	RMS Period Jitter	F_{out} = 106.25 MHz		–	3.0	TBD	ps
		F_{out} = 156.25 MHz		–	2.5	TBD	ps
		F_{out} = 200 MHz		–	2.0	TBD	ps

CML, 3.3V ±10% ,-40 to 85°C

Symbol	Parameter	Condition		Min.	Typ.	Max.	Unit
F_{out}	Output Frequency			10	–	220	MHz
F_{sta}	Frequency Stability	Inclusive of initial tolerance, operating temp., rated power supply voltage change, load change	0 to 70°C	-10	–	+10	PPM
			-20 to 70°C	-12	–	+12	PPM
			-40 to 85°C	-15	–	+15	PPM
			0 to 70°C -20 to 70°C -40 to 85°C	-25		+25	PPM
				-50		+50	PPM
				-100		+100	PPM
F_{age}	Aging	First year @ 25°C		–	–	1	PPM
DC	Duty Cycle			45	–	55	%
t_R/t_F	Output Rise/Fall Time	20% to 80%		–	300	TBD	ps
PH_J	RMS Phase Jitter (random)	F_{out} = 106.25 MHz @ BW: 637 kHz to10 MHz		–	0.8	–	ps
		F_{out} = 156.25 MHz @ BW: 1.87 to 20 MHz		–	0.5	–	ps
		F_{out} = 200 MHz @ BW: 1 to 20 MHz		–	0.5	–	ps
P_J	RMS Period Jitter	F_{out} = 106.25 MHz		–	3.0	TBD	ps
		F_{out} = 156.25 MHz		–	2.5	TBD	ps
		F_{out} = 200 MHz		–	2.0	TBD	ps

CML, 2.5V ± 10% ,-40 to 85°C

Symbol	Parameter	Condition		Min.	Typ.	Max.	Unit
F_{out}	Output Frequency			10	–	220	MHz
F_{sta}	Frequency Stability	Inclusive of initial tolerance, operating temp., rated power supply voltage change, load change	0 to 70°C	-10	–	+10	PPM
			-20 to 70°C	-12	–	+12	PPM
			-40 to 85°C	-15	–	+15	PPM
			0 to 70°C -20 to 70°C -40 to 85°C	-25		+25	PPM
				-50		+50	PPM
				-100		+100	PPM
F_{age}	Aging	First year @ 25°C		–	–	1	PPM
DC	Duty Cycle			45	–	55	%
t_R/t_F	Output Rise/Fall Time	20% to 80%		–	300	TBD	ps
PH_J	RMS Phase Jitter (random)	F_{out} = 106.25 MHz @ BW: 637 kHz to10 MHz		–	0.8	–	ps
		F_{out} = 156.25 MHz @ BW: 1.87 to 20 MHz		–	0.5	–	ps
		F_{out} = 200 MHz @ BW: 1 to 20 MHz		–	0.5	–	ps
P_J	RMS Period Jitter	F_{out} = 106.25 MHz		–	3.0	TBD	ps
		F_{out} = 156.25 MHz		–	2.5	TBD	ps
		F_{out} = 200 MHz		–	2.0	TBD	ps

CML, 1.8V ± 5% ,-40 to 85°C

Symbol	Parameter	Condition		Min.	Typ.	Max.	Unit
F_{out}	Output Frequency			10	–	220	MHz
F_{sta}	Frequency Stability	Inclusive of initial tolerance, operating temp., rated power supply voltage change, load change	0 to 70°C	-15	–	+15	PPM
			-20 to 70°C	-20	–	+20	PPM
			-40 to 85°C	-20	–	+20	PPM
			0 to 70°C -20 to 70°C -40 to 85°C	-25		+25	PPM
				-50		+50	PPM
				-100		+100	PPM
F_{age}	Aging	First year @ 25°C		–	–	1	PPM
DC	Duty Cycle			45	–	55	%
t_R/t_F	Output Rise/Fall Time	20% to 80%		–	300	TBD	ps
PH_J	RMS Phase Jitter (random)	F_{out} = 106.25 MHz @ BW: 637 kHz to10 MHz		–	0.8	–	ps
		F_{out} = 156.25 MHz @ BW: 1.87 to 20 MHz		–	0.5	–	ps
		F_{out} = 200 MHz @ BW: 1 to 20 MHz		–	0.5	–	ps
P_J	RMS Period Jitter	F_{out} = 106.25 MHz		–	3.0	TBD	ps
		F_{out} = 156.25 MHz		–	2.5	TBD	ps
		F_{out} = 200 MHz		–	2.0	TBD	ps

Termination Diagrams

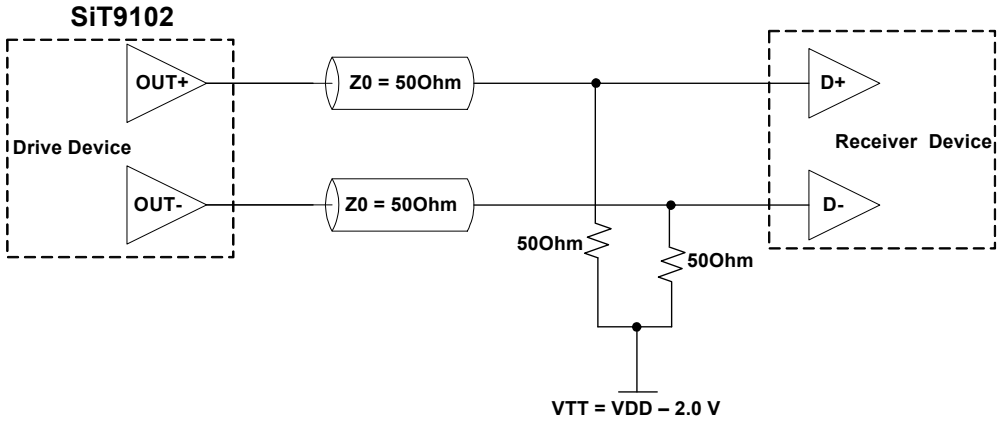


Figure 1. LVPECL Typical Termination

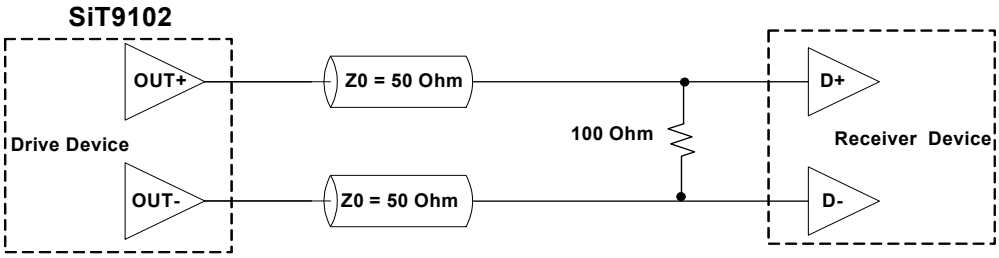
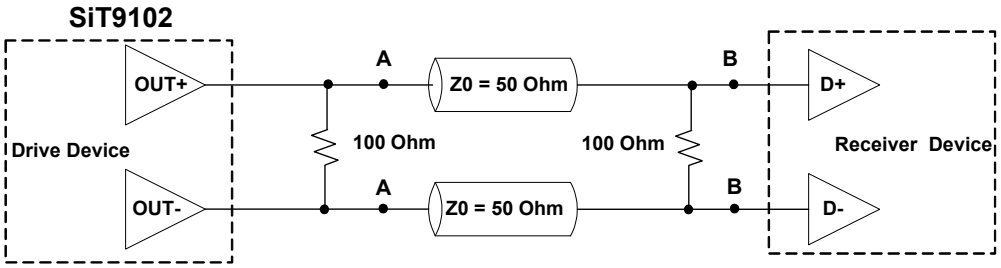


Figure 2. LVDS Single Termination (Load Terminated)



*Note: For AC coupled operation, include/insert decoupling caps at points **A** or **B***

Figure 3. LVDS Double Termination (Source + Load Terminated)

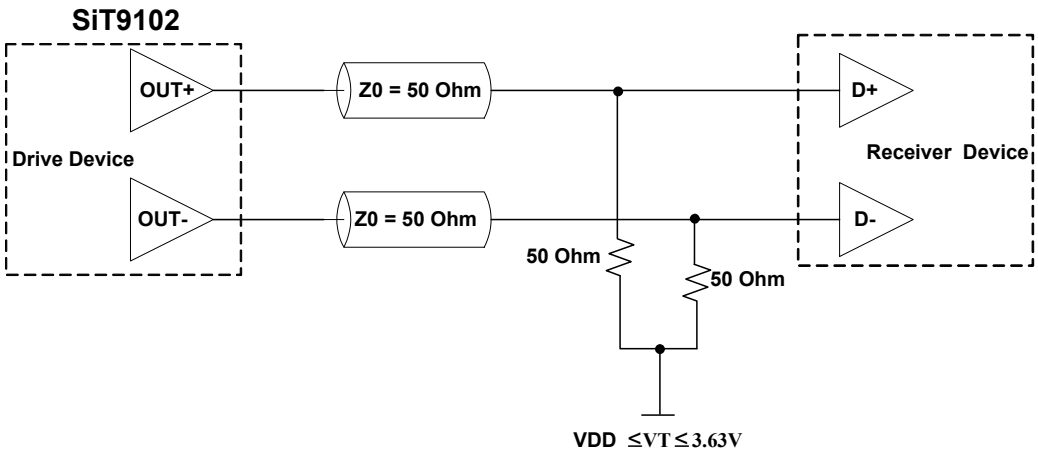
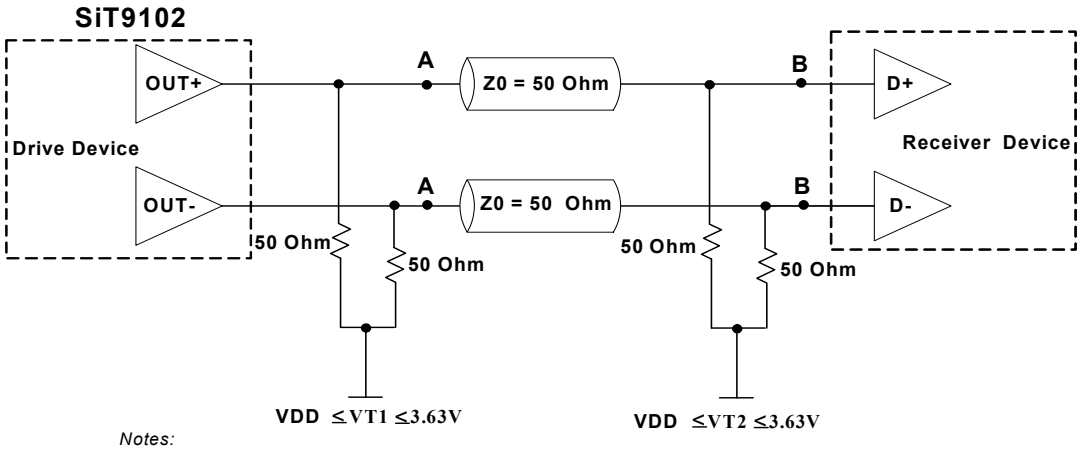


Figure 4. CML Single Load Termination



Notes:
1. For DC-coupled operation, VT1 = VT2
2. For AC-coupled operation, VT2 sets the input common mode of Receiver Device and need not to be related to VT1

Figure 5. CML Double Load Termination

Ordering Information

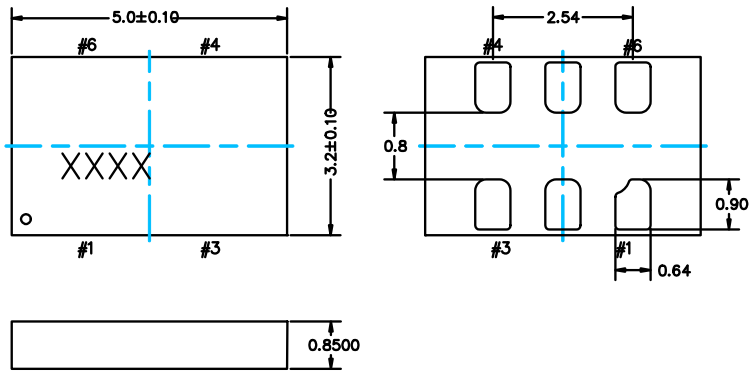
SiT9102AC – 132N33E123.12345T

- Part Family: "SiT9102"
- Revision Letter: "A" is the revision of Silicon
- Temperature Range: "N" Commercial 0 to 70°C; "C" Extended Commercial -20 to 70°C; "I" Industrial -40 to 85°C
- Signalling Type: "1" = LVPECL, "2" = LVDS, "3" = CML
- Package Size: "3" 5.0 x 3.2 mm; "4" 7.0 x 5.0 mm
- Frequency Tolerance: "F" for +/- 10 ppm; "G" for +/- 12 ppm; "H" for +/- 15 ppm; "I" for +/- 20 ppm; "2" for +/- 25 ppm; "3" for +/- 50 ppm
- Packaging: "T" for Tape & Reel; Blank for Bulk
- Frequency: 10.00000 to 220.00000 MHz
- Feature Pin: "E" for Output Enable; "S" for Standby
- Voltage Supply: "18" for 1.8 V +/- 5%; "25" for 2.5 V +/- 10%; "33" for 3.3 V +/- 10%
- Swing Select: "N" = Normal, "H" = High

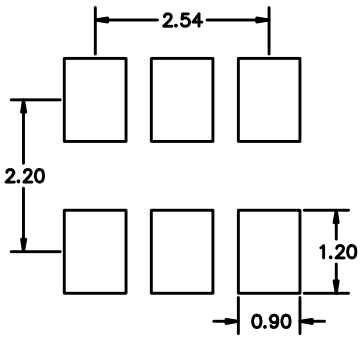
Package Information [1]

Dimension (mm)

5.0 x 3.2 x 0.85mm



Land Pattern[2] (recommended) (mm)



Notes:
1. xxxx top marking denotes manufacturing lot number.
2. A capacitor of value 0.1μF between VDD and GND is recommended

Package Information (continued)[1]

Dimension (mm)

Land Pattern[2] (recommended) (mm)

7.0 x 5.0 x 0.85mm