GSR2406

2.4 GHz Front End Module for Bluetooth Applications

Product Description

The GSR2406 is a high-performance, fully integrated RF front-end module (FEM) designed for Zigbee technology, Thread, and Bluetooth (including low energy) applications.

The GSR2406 is designed for ease of use and maximum flexibility. The device provides a power amplifier, low-noise amplifier, low-loss bypass path, transmit/receive switches, and controls compatible with 1.8 V to 3.6 V levels.

The RF blocks operate over a wide supply voltage range from 1.8V to 5 V that allows the GSR2406 to be used in battery powered applications over a wide spectrum of the battery discharge curve.

The device is provided in a compact, 12-pin1.9 x1.9 mm small package. Pin map is shown in Figure 1. A functional block diagram is shown in Figure 2.

Pin Map

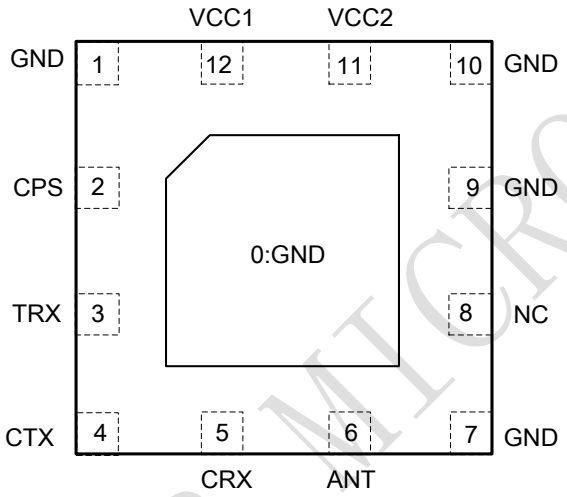


Figure 1 GSR2406 Pin Map (Top View)

Functional Block Diagram

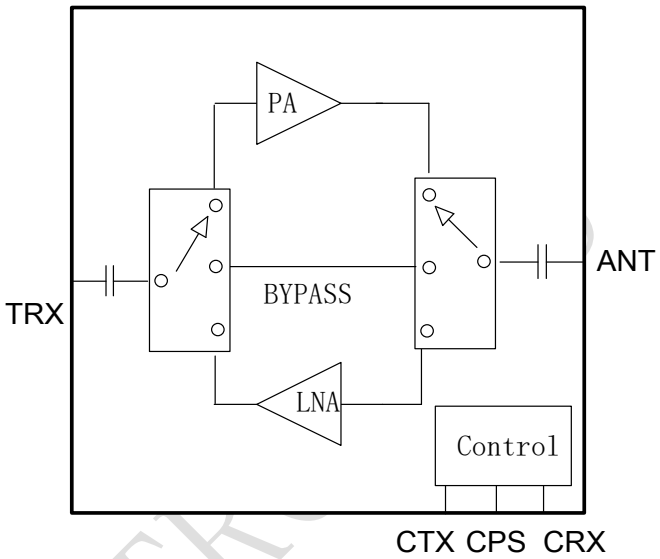


Figure 2 Block Diagram

Key Features

- Integrated PA with +14.5 dBm output power
- Integrated bypass path
- 1.8 dB LNA Noise Figure
- Single-ended transmit/receive interface
- Supply voltage range: 1.8V to 5 V
- Sleep mode current: < 1 μA typical
- No external bias resistor is required

Applications

- In-home appliances
- Smart thermostats
- Range extender
- Wireless audio
- Internet of Things (IoT) devices

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Pin Description

Pin	Name	Description
1	GND	Ground
2	CPS	Bypass mode control input
3	TRX	Connect to 50 Ω transceiver
4	CTX	Transmit mode control input
5	CRX	Receive mode control input
6	ANT	Connect to 50 Ω antenna
7	GND	Ground
8	NC	No connection
9	GND	Ground
10	GND	Ground
11	VCC2	Connect to positive power supply
12	VCC1	Connect to positive power supply
0	GND	Ground

Absolute Maximum Ratings

Parameter	Conditions	Rating
DC Supply Voltage		-0.3 to +6 V
Control Voltage (CTX,CRX,CPS)		-0.3 to +3.6 V
Storage Temperature		-40 to 150 ℃
Junction Temperature		Max 150 ℃
Transmit Input Power at TRX	ANT connect 50 Ω Load	+15 dBm
Receive RF Input Power at ANT	RX connect 50 Ω Load	+15 dBm
Bypass RF Input Power at ANT	RX connect 50 Ω Load	25 dBm

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

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Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Operating Frequency	2400	-	2485	MHz
DC Supply Voltage	1.7	3.3	5.25	V
Control Voltage – High	1.7	-	3.6	V
Control Voltage – Low	0	-	0.2	V
Operating temperature	-40	25	105	℃
CTX=3.3V Current		35		uA
CRX = 3.3V Current		110		uA
CPS= 3.3V Current		0.5		uA

Logic Truth Table

Mode	CTX	CRX	CPS
Sleep mode	0	0	0
Receive (RX) mode	0	1	0
Transmit (TX) mode	1	0	0
Bypass mode	0	0	1

Note: Any other state not listed in the table above are not permitted.

Electrical Specifications

Parameter	Conditions	Min	Typ	Max	Units
Transmit Mode	Unless otherwise noted: VCC1, VCC2=3.3 V, Temp=+25ºC, CTX=3.3 V, CRX=CPS=0 V				
Frequency range		2400		2483.5	MHz
Small signal gain	Pin = -20 dBm		13		dB
Saturated output power	Pin = 2.5 dBm		14.5		dBm
Out of Band Gain	f = 5000 ~ 6000 MHz		-25		dB
TRX Port Return Loss			-15		dB
ANT Port Return Loss			-8		dB
Quiescent Current	RF OFF		4.0		mA
Operating Current	Pout=10 dBm, CW		14		mA
	Pout=13 dBm, CW		18		mA
	Pout=14.5 dBm, CW		21		mA
2nd Harmonics	Pout= 13 dBm BT BR 1DH5 PRBS9		-15		dBm/MHz
3rd Harmonics	Pout= 13 dBm BT BR 1DH5 PRBS9		-30		dBm/MHz
Switching Time	From 50% of TXEN edge to 90% of final RF output power		100		nS
Stability	CW, Pin=2 dBm, 0.1 GHz to 20 GHz, load VSWR= 6:1	All non-harmonically related outputs< -42 dBm/MHz			

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Ruggedness	CW, Pin= 3 dBm, load VSWR 10:1	No damage			
Transmit Mode	Unless otherwise noted: VCC1, VCC2=1.8 V, Temp=+25ºC, CTX=1.8 V, CRX=CPS=0 V				
Frequency range		2400		2483.5	MHz
Small signal gain	Pin = -5 dBm		12		dB
Saturated output power	Pin = 1.5 dBm		10		dBm
Out of Band Gain	f = 5000 ~ 6000 MHz		-30		dB
TRX Port Return Loss			11		dB
ANT Port Return Loss			7		dB
Quiescent Current	RF OFF		1.0		mA
Operating Current	Pout=6 dBm, CW		10		mA
	Pout=8 dBm, CW		12		mA
	Pout=10 dBm, CW		16		mA
2nd Harmonics	Pout= 10 dBm BT BR 1DH5 PRBS9		-25		dBm/MHz
3rd Harmonics	Pout= 10 dBm BT BR 1DH5 PRBS9		-25		dBm/MHz
Switching Time	From 50% of TXEN edge to 90% of final RF output power		100		nS
Stability	CW, Pin=2 dBm, 0.1 GHz to 20 GHz, load VSWR= 6:1	All non-harmonically related outputs< -42 dBm/MHz			
Ruggedness	CW, Pin= 3 dBm, load VSWR 10:1	No damage			
Receive (LNA)Mode	Unless otherwise noted: VCC1, VCC2=3.3 V, Temp=+25ºC, CRX=3.3 V, CTX=CPS=0 V				
Receive gain			13		dB
IP_{1dB}	Input 1 dB Compression Point		3		dBm
ANT Port Return Loss	input Port Return Loss		-8		dB
TRX Port Return Loss			-15		dB
Quiescent Current			4		mA
Receive noise figure	NF		1.8		dB
Receive (LNA)Mode	Unless otherwise noted: VCC1, VCC2=1.8 V, Temp=+25ºC, CRX=1.8 V, CTX=CPS=0 V				
Receive gain			9		dB
IP_{1dB}	Input 1 dB Compression Point		2		dBm
ANT Port Return Loss	input Port Return Loss		4.5		dB
TRX Port Return Loss			10		dB
Quiescent Current			1.5		mA
Receive noise figure	NF		2.8		dB
Receive (Bypass)Mode	Unless otherwise noted: VCC1, VCC2=3.3 V, Temp=+25ºC, CPS=3.3 V, CTX=CRX=0 V				
Bypass gain			-1.2		dB
$IP_{0.1dB}$	Input 0.1 dB Compression Point		23		dBm
TRX Port Return Loss			15		dB
ANT Port Return Loss			15		dB
Quiescent Current			0.5		uA

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Evaluation Board Schematic

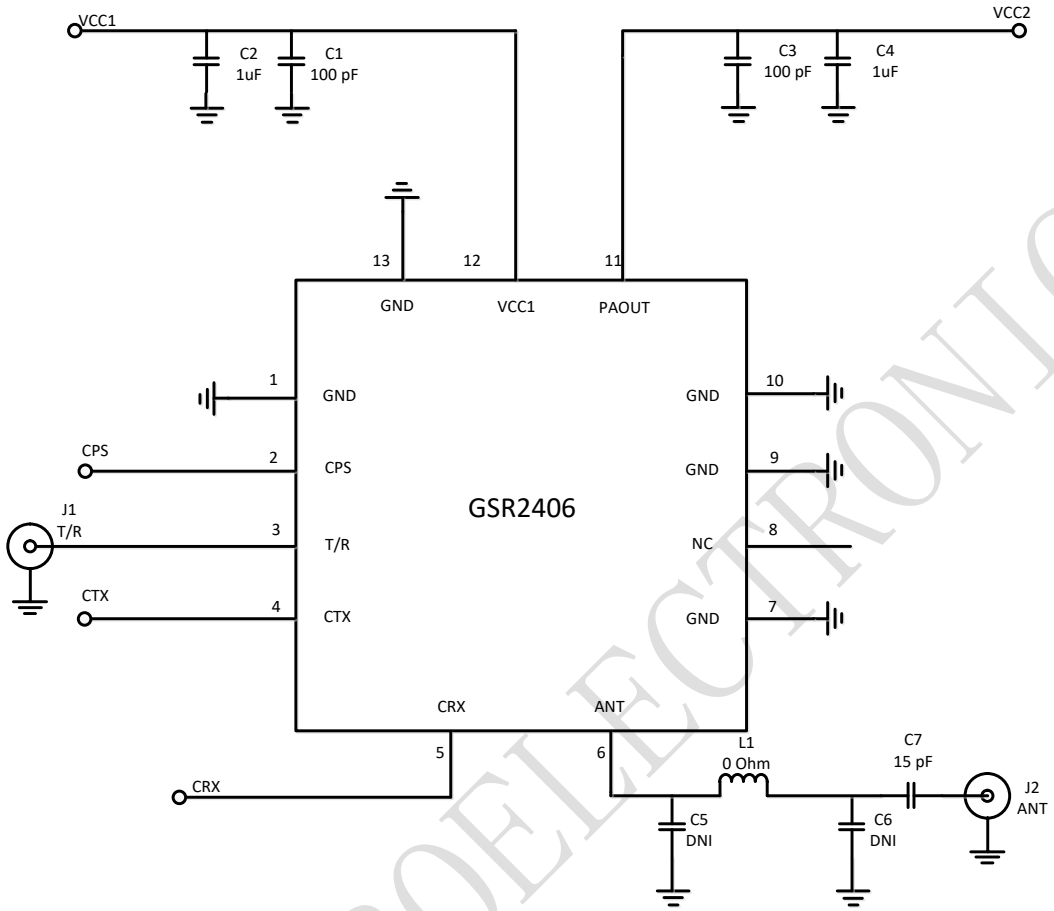


Figure 3 GSR2406 Application Schematic

Part Marking

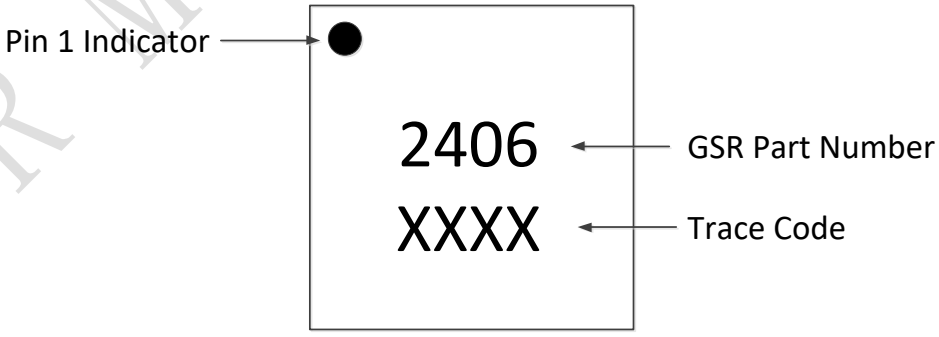


Figure 4 GSR2406 Marking

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Package Outline

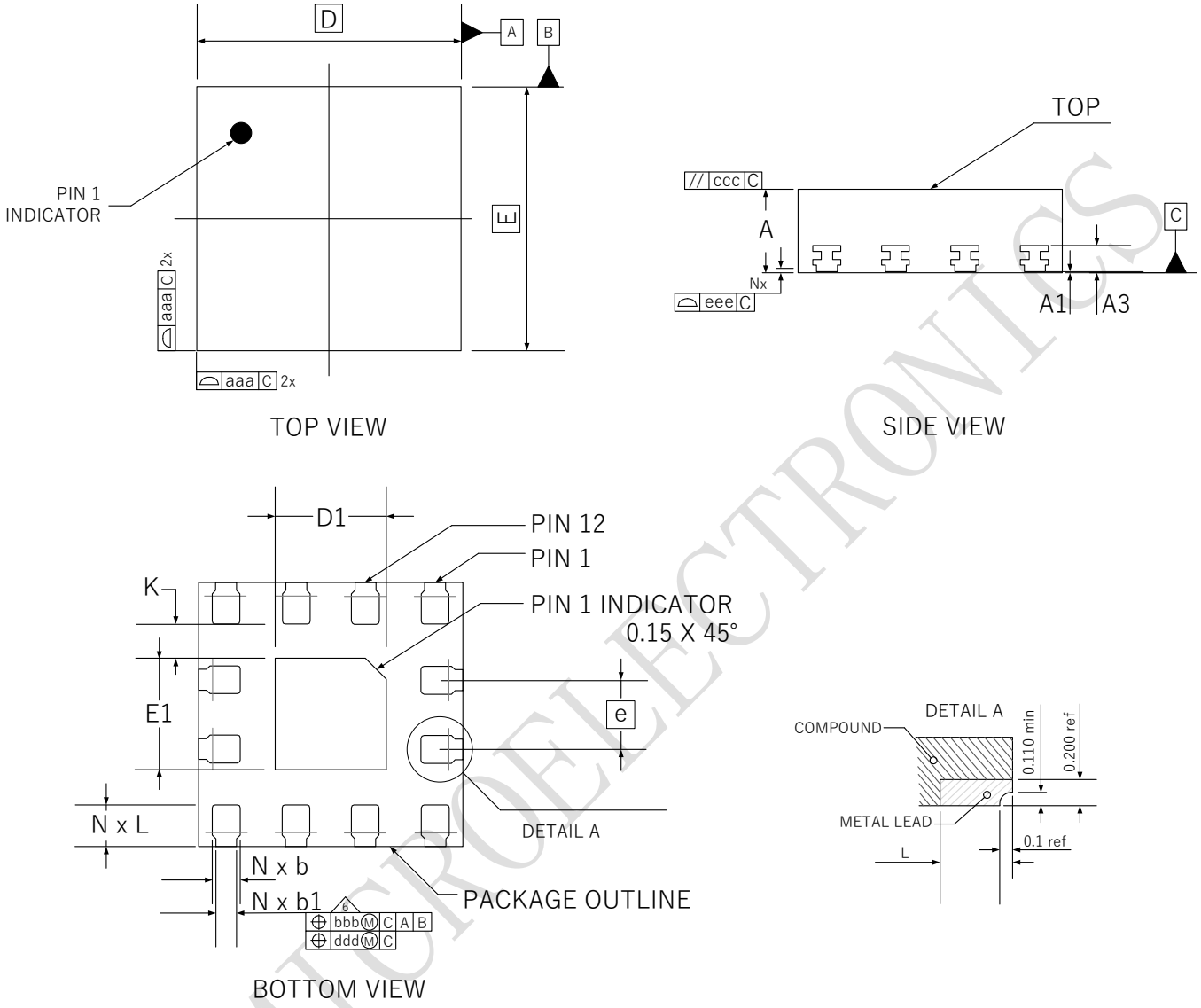


Figure 4 GSR2406 Package Outline

NOTE:

1. Dimensioning and tolerancing conform to ASME Y14.5-2009.
2. All dimensions are in millimeters.
3. N is the total number of terminals.
4. The location of the marked terminal #1 identifier is within the hatched area.
5. ND and NE refer to the number of terminals on each D and E side respectively.
6. Dimension b applies to the metalized terminal and is measured between 0.15mm and 0.30mm from the terminal tip. If the terminal has a radius on the other end of it, dimension b should not be measured in that radius area.
7. Coplanarity applies to the terminals and all other bottom surface metallization.

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Dimension Table				
	MINIMUM	NOMINAL	MAXIMUM	NOTE
A	0.6	0.65	0.7	
A1	-0.01		0.05	
A3		0.20 Ref.		
b	0.15	0.2	0.25	
b1	0.10	0.15	0.25	
D	1.90 BSC			
E	1.90 BSC			
D1	0.7	0.8	0.9	
E1	0.7	0.8	0.9	
e	0.50 BSC			
L	0.2	0.3	0.4	
k	0.2			
aaa	0.05			
bbb	0.10			
ccc	0.10			
ddd	0.05			
eee	0.08			
N	12			
ND	4			
NE	2			

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PCB Layout Print

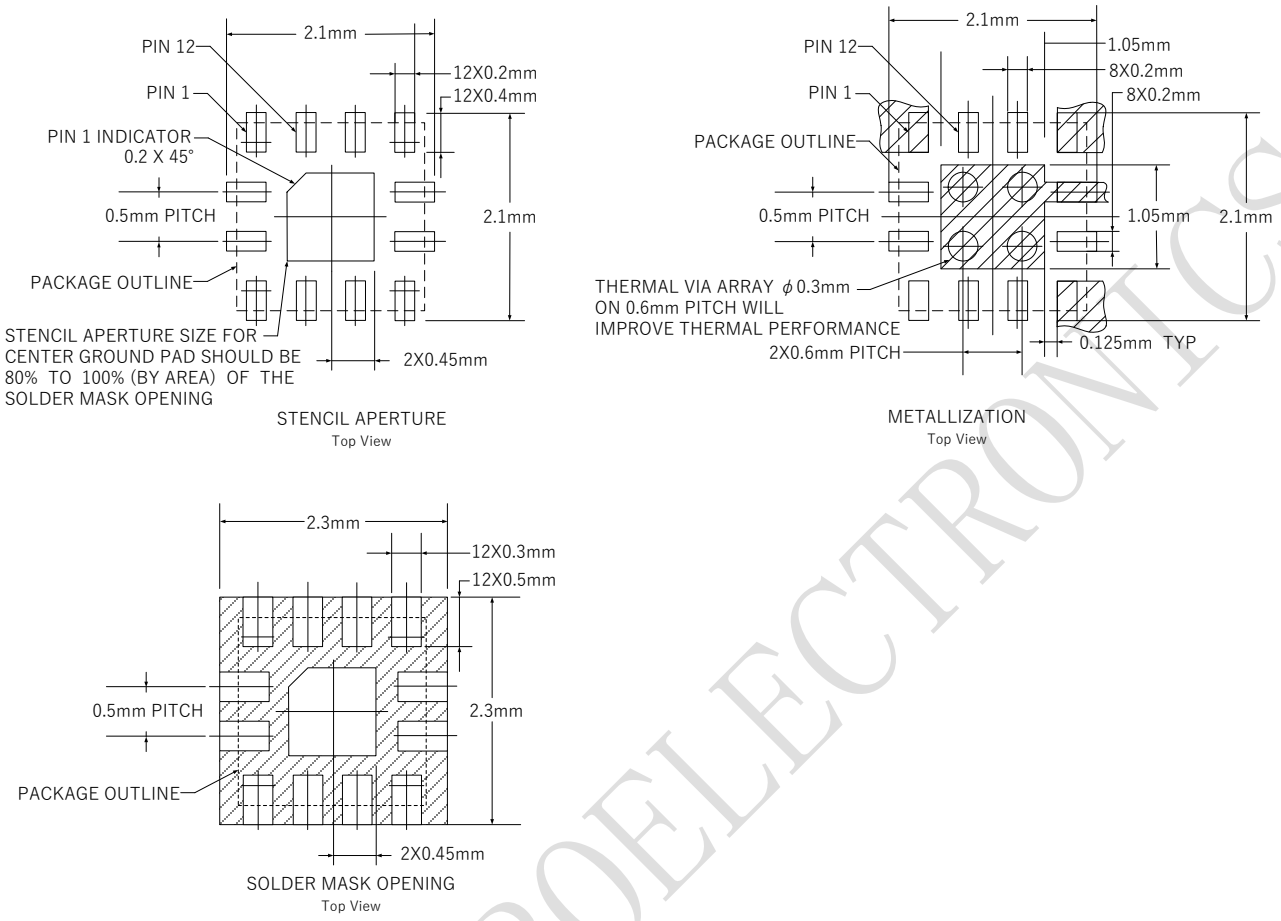


Figure 5 GSR2406 Recommended PCB Footprint

Notes:

1. All dimensions are in millimeters.
2. Unless specified, dimensions are symmetrical about center lines.

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Handling Precautions

Test Model	ESD Rating	Value	Standard
Human Body Model (HBM)	Class 1C	≥ 1000 V	ESDA /JEDEC JS-001-2017
Charged Device Model (CDM)	Class 1C	≥ 1000 V	ESDA /JEDEC JS-002-2018

Caution: Industry-standard ESD precautions should be used at all times.

MLS Rating

MSL Rating	Standard
3	JEDEC Standard IPC/JEDEC J-STD-020

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Version History

Revision	Description
A	Initial release
B	Update: Package Outline and PCB Layout Print
C	Update: Package Outline
D	Update: Supply range & Operating temperature
E	Update: VCC=1.8V electrical Specifications

Contact Information

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