RTS5169

USB 2.0 SD/MMC/MS/MSPRO/xD-Picture & Smart Card / SIM Card Reader

DATASHEET

Rev 1.2
30th Apr 2009

Realtek Semiconductor Corp.
No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan
Tel.: +886-3-578-0211. Fax: +886-3-577-6047
www.realtek.com.tw

COPYRIGHT

All rights reserved. No part of this document may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language in any form or by any means without the written permission of Realtek Semiconductor Corp.

DISCLAIMER

Realtek provides this document “as is”, without warranty of any kind, neither expressed nor implied, including, but not limited to, the particular purpose. Realtek may make improvements and/or changes in this document or in the product described in this document at any time. This document could include technical inaccuracies or typographical errors.

TRADEMARKS

Realtek is a trademark of Realtek Semiconductor Corporation. Other names mentioned in this document are trademarks/registered trademarks of their respective owners.

USING THIS DOCUMENT

This document is intended for the hardware and software engineer’s general information on the Realtek RTS5169 USB2.0 card reader.

Though every effort has been made to ensure that this document is current and accurate, more information may have become available subsequent to the production of this guide. In that event, please contact your Realtek representative for additional information that may help in the development process.

REVISION HISTORY

Revision	Release Date	Summary
0.9	2007/05/2	
0.91	2007/5/11	Add MS/MSPRO information
0.92	2007/05/14	Add Smart Card information
1.0	2008/6/12	Modify electrical characteristic
1.1	2008/12/25	1. Change the Part No. of Ordering information to RTS5169-VEC-GR 2. Support pure Smart Card Reader mode
1.2	2009/4/30	Support xD-Picture card

Table of Contents

1. General Description 1
2. Features 1
3. Block Diagram 3
4. Pin Assignments 4
5. Pin Descriptions 5
6. Card Power Switch 8
7. Electrical Characteristics 9
8. Mechanical Dimensions 10
9. Ordering Information 12

1. General Description

The RTS5169 is a high performance USB 2.0 compliant card-reader that supports SD/MMC cards, MS/MSPRO cards, xD-Picture cards and Smart Card/SIM cards. RTS5169 integrates USB 2.0 transceiver, MCU, DC-DC regulators and memory card access unit into a single chip. The supported SD/MMC series memory cards are Secure Digital ™ (SD), Multi-Media Card ™ (MMC), MicroSD, SDHC, MiniSD, RS-MMC, Mobile-MMC and MMC-Micro. The supported MS/MSPRO series memory cards are Memory Stick ™ (MS), Memory Stick Pro ™ (MS-Pro) and M2. The supported xD-Picture series memory cards are Type M, Type M+ and Type H.

Smart Card reader will be a must to the personal computers and Notebooks in the near future. The RTS5169 is an innovation that integrates the traditional flash memory card reader with smart card reader into one USB device. This integration can support the end user to access memory cards and smart card at the same time, which brings the end users great facility and reduces the BOM cost greatly.

SIM Card Reader with SIM editor AP can easily help users to backup/restore the phonebook of SIM Card to/from the PC. This integration can support users to access MicroSD and SIM at the same time.

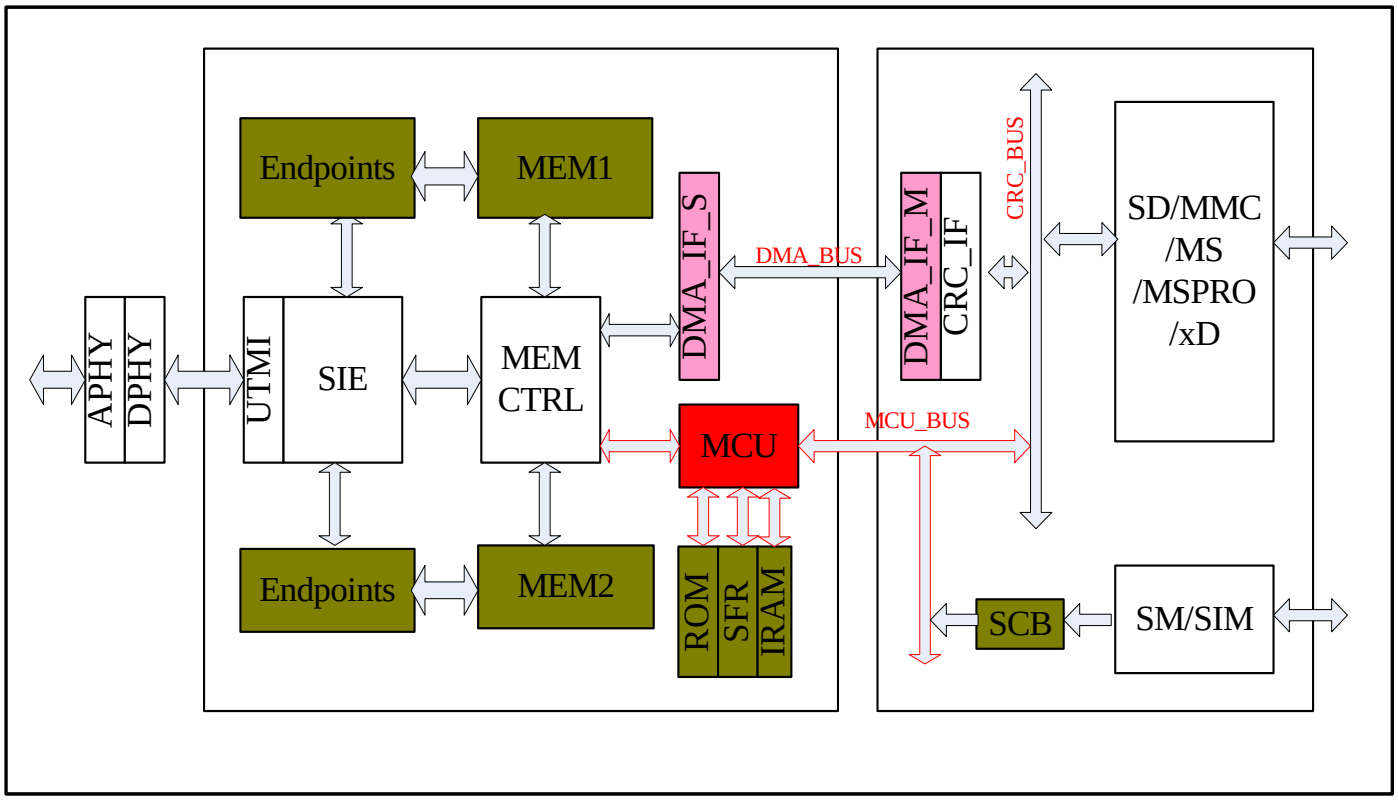
The RTS5169 integrates 5V-to-3.3V, 5V-to-3V and 3.3V-to-1.8V regulators, MOSFET switches, and could dramatically reduce the system BOM cost.

2. Features

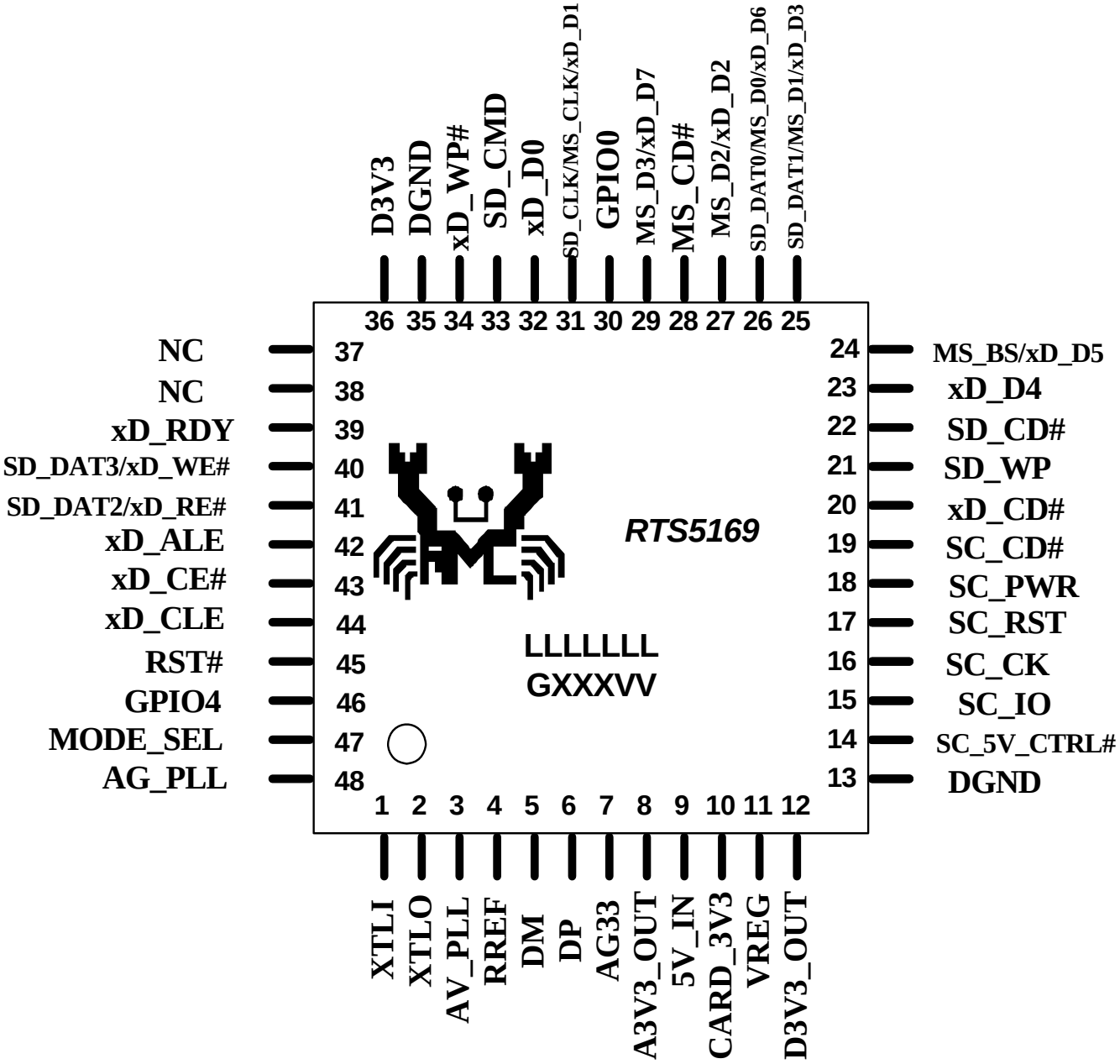
- Compliant with USB Specification 2.0 Full-Speed and High-Speed transfer mode.
- Compliant with USB Mass Storage Class Bulk only Transport Specification Rev. 1.0
- Compliant with USB CCID Transport Specification Rev1.1
- Support USB bus power operation
- Support several endpoints:
  - -Control endpoint
  - -Mass Storage Bulk Out endpoint
  - -Mass Storage Bulk IN endpoint
  - -CCID Interrupt IN endpoint
  - -CCID Bulk Out endpoint
  - -CCID Bulk IN endpoint
- Supports the following memory card interfaces:
  - -Secure Digital ™ (SD), MultiMediaCard ™ (MMC), Mini-SD, Micro-SD (T-flash), RS-MMC, Mobile-MMC and MMC-micro
  - -Memory Stick ™ (MS), Memory Stick PRO™ (MS-PRO), MS Duo, MS-PRO Duo and Micro-MS (M2)
- Supports hardware CRC (Cyclic Redundancy Check) function
- Supports SD version **2.0**
- Support MMC version **4.2**
- Supports MS-PRO **v1.02**
- Supports MS **v1.43**
- Supports xD-Picture **v1.2**
- Integrated Fast 8051 microprocessor

- Support the following Asynchronous and synchronous smart cards interface
  - Based on ISO7816 implementation, T=0 and T=1 asynchronous card,
  - EMV2000 (EMV 4.1) compatible
  - Support PC Smart Card industry standard: PC/SC1.0; PC/SC 2.0
  - Support 2-wire, 3-wire or I2C Interface synchronous card
    - Atmel: AT88sc1608, AT88sc153
    - Atmel: AT24c128, AT24c256
    - ST: M14C16, M14C04
    - Siemens 2-wire link protocol: sle4432/42
    - Siemens serial 3-wire bus: sle4418/28
  - Configurable hardware auto error detection
  - Card Voltage: 5V, 3V, 1.8V
- Support CCID Linux driver working on Kernel 2.4.x and 2.6.x
  - ✓ Redhat: Fedora Core (1 ~ 6), Redhat 9, Redhat Enterprise Edition (3, 4)
  - ✓ Novell: SuSE 10, SuSE 10.1, Open SUSE 10.2
  - ✓ Ubuntu: Ubuntu 6.06, Ubuntu 6.10
  - ✓ Mandriva: Mandrake 10.2, Mandriva 2006, Mandriva 2007
  - ✓ Debian: Debian 3.1
- 12MHz crystal oscillator with integrated PLL
- On chip 5V to 3.3V regulator
- On chip 5V to 3V regulator
- On chip 3.3V to 1.8V regulator
- On chip MOSFET components for direct power control of memory card
- Supports Spread Spectrum Clock (SSC) for SD/MMC and MS/MSPRO to reduce EMI effect
- Support pure Smart Card Reader mode
- 48 pins LQFP package capability for one-LUN Memory Card Reader and SIM Card

3. Block Diagram



4. Pin Assignments



5. Pin Descriptions

5.1 USB Transceiver

Name	Type	I/O Type	Pin No.	Definition
DP	I/O	I/O-U	6	USB D+ signal
DM	I/O	I/O-U	5	USB D- signal
RREF	N/A	I/O-U	4	Connect external resistor (6.25K ± 1%) to GND
				Total: 3 Pins

5.2 System Interface

Name	Type	I/O Type	Pin No.	Definition
XTLI	I	CLK	1	Crystal oscillator input (12 MHz). Also can be used as external clock input
XTLO	O	CLK	2	Crystal oscillator output (12Mhz)
RST#	I	IOSH	45	System reset
MODE_SEL	I	I	47	Used for Mode Selection
GPIO0	I/O	IOH	30	General purpose input/output
GPIO4	I/O	IOH	46	General purpose input/output
				Total: 6 Pins

5.3 Secure Digital & MultiMedia Card Interface

Name	Type	I/O Type	Pin No.	Definition
SD_DAT [3:0]	I/O	IOH	40,41, 25,26	SD/MMC Data Signals
SD_CMD	I/O	IOH	33	Serial protocol command and response signal
SD_CLK	O	O	31	Serial protocol clock signal
SD_WP	I	I	21	Write Protect switch signal
SD_CD#	I	IH	22	SD/MMC Card Detect
				Total: 8 Pins

5.4 Memory Stick & Memory Stick Pro Card Interface

Name	Type	I/O Type	Pin No.	Definition
MS_CD#	I	IH	28	MS/MSPRO Card Detect
MS_BS	O	O	24	Bus State signal
MS_D [3:0]	I/O	IOL	29,27, 25,26	MS/MSPRO Data signals
MS_CLK	O	O	31	Serial Clock signal
				Total: 7 Pins

5.5 Smart Card & SIM Card Interface

Name	Type	I/O Type	Pin No.	Definition
SC_CK	O	O	16	Smart Card Clock
SC_IO	I/O	IOL	15	Smart Card Data I/O signal
SC_5V_CTRL	O	O	14	Power Control signal for external MOSFET
SC_RST	O	O	17	Smart Card Reset signal
SC_CD#	I	IH	19	Smart Card Detect
				Total: 5 Pins

5.6 xD-Picture Card Interface

Name	Type	I/O Type	Pin No.	Definition
xD_CD#	I	IH	20	xD-Picture Card Detect
xD_D [7:0]	I/O	IOL	29,26,24 ,23,25, 27,31, 32	xD-Picture Data signals
xD_ALE	O	O	42	Address Latch Enable
xD_CE#	O	O	43	Card Enable
xD_CLE	O	O	44	Command Latch Enable
xD_RE#	O	O	41	Read Enable
xD_WE#	O	O	40	Write Enable
xD_RDY	I	I	39	Ready/Busy Signal
xD_WP#	I	IH	34	Electrical Write Protect
				Total: 16 Pins

5.7 Power & Ground

Name	Type	I/O Type	Pin No.	Definition
AG_PLL	Power	Ground	48	Analog PLL Ground
AV_PLL	Power	Power	3	Power for PLL
AG33	Power	Ground	7	Analog ground
A3V3_OUT	Power	Power	8	Analog 3.3V output from internal regulator
5V_IN	Power	Power	9	5V Input
CARD_3V3	Power	Power	10	Power to SD/MMC and MS/MSPRO Card
VREG	Power	Power	11	Regulated supply voltage from internal regulator; supplies internal digital circuits. An external capacitance should be connected
D3V3_OUT	Power	Power	12	Digital 3.3V output from internal regulator
DGND	Power	Ground	13,35	Digital Ground
SC_PWR	Power	Power	18	Power to Smart Card
D3V3	Power	Power	36	Digital 3.3V Power
				Total: 12 Pins

5.8 I/O Type Description

I/O Type	Description
O	Output
I	Input
IH	Input with internal pull-high
IL	Input with internal pull-down
IO	Input / Output
IOL	Input / Output with internal pull-down
IOH	Input / Output with internal pull-up
IOSH	Input / Output with Schmitt trigger
IO-U	USB related IO
CLK	Clock related IO

6. Card Power Switch

RTS5169 integrates all regulators and MOSFET components to supply and switch power for cards.

1. The maximum range of the MOSFET output current

- SD/MMC card: 200mA
- SIM card: 60mA
- MS/MSPRO card: 220mA

2. The maximum range of the 5V regulator is 550mA

7. Electrical Characteristics

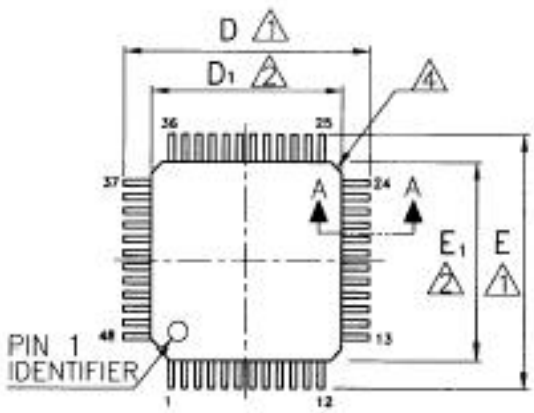
7.1 Absolute Maximum Ratings

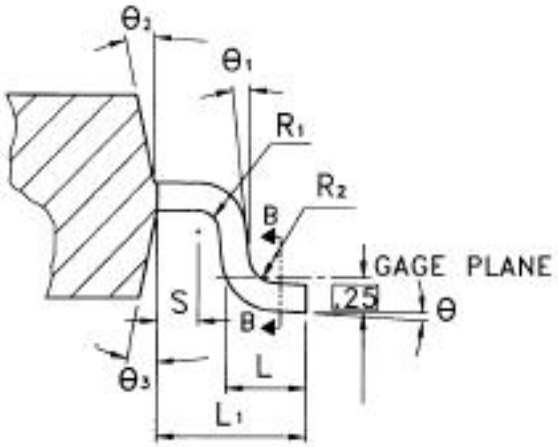
Parameter	Rating
Supply Voltage	–0.5V to +5.5V electrical characteristics
Operating Temperature	0°C to +70°C
Latchup Current	200mA
Electrostatic Discharge	4kV

7.2 DC Characteristics

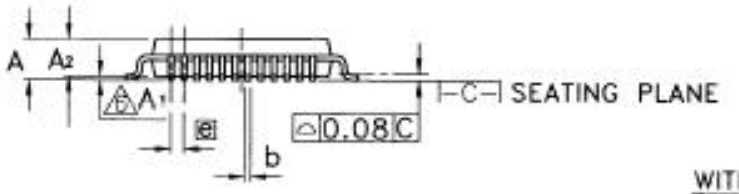
Symbol	Description	Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Supply Voltage		4.5	5	5.5	V
V_{IH}	Input Voltage High		2			V
V_{IL}	Input Voltage Low				0.8	V
V_{OH}	Output Voltage High		3			V
V_{OL}	Output Voltage Low				0.4	V
C_{in}	Input Pin Capacitance				10	pF
I_{DD}	Supply Current	8051 is running @ 24MHz		73		mA
I_{SUS}	Suspend Current	D+ 1.5KΩ resistor is included		365		uA

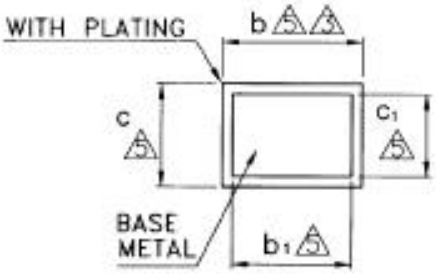
8. Mechanical Dimensions





SECTION A-A





SECTION B-B

NOTE :

1. TO BE DETERMINED AT SEATING PLANE -C- .
2. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. D1 AND E1 ARE MAXIMUM PLASTIC BODY SIZE DIMENSIONS INCLUDING MOLD MISMATCH.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR CAN NOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.
4. EXACT SHAPE OF EACH CORNER IS OPTIONAL.
5. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10 mm AND 0.25 mm FROM THE LEAD TIP.
6. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE BODY.
7. CONTROLLING DIMENSION : MILLIMETER.
8. REFERENCE DOCUMENT : JEDEC MS-026 , BBC.

Symbol	Dimension in mm			Dimension in inch		
	Min	Nom	Max	Min	Nom	Max
A	—	—	1.60	—	—	0.063
A_1	0.05	—	0.15	0.002	—	0.006
A_2	1.35	1.40	1.45	0.053	0.055	0.057
b	0.17	0.22	0.27	0.007	0.009	0.011
b_1	0.17	0.20	0.23	0.007	0.008	0.009
c	0.09	—	0.20	0.004	—	0.008
c_1	0.09	—	0.16	0.004	—	0.006
D	9.00 BSC			0.354 BSC		
D_1	7.00 BSC			0.276 BSC		
E	9.00 BSC			0.354 BSC		
E_1	7.00 BSC			0.276 BSC		
e	0.50 BSC			0.020 BSC		
L	0.45	0.60	0.75	0.018	0.024	0.030
L_1	1.00 REF			0.039 REF		
R_1	0.08	—	—	0.003	—	—
R_2	0.08	—	0.20	0.003	—	0.008
S	0.20	—	—	0.008	—	—
θ	0°	3.5°	7°	0°	3.5°	7°
$θ_1$	0°	—	—	0°	—	—
$θ_2$	12°TYP			12°TYP		
$θ_3$	12°TYP			12°TYP		

9. Ordering Information

Part Number	Description	Status
RTS5169-VEC-GR	LQFP-48 with ‘Green’ package	Available

Realtek Semiconductor Corp.
Headquarters
No. 2, Innovation Road II
Hsinchu Science Park, Hsinchu 300, Taiwan
Tel.: +886-3-578-0211. Fax: +886-3-577-6047
www.realtek.com.tw