

GENERAL DESCRIPTION

The SGM4561 is used for load switch and level translation of the signal in the application of HDMI interface. Also, it can be used for the applications of logical level shifting for HDMI interface, and it contains a 5.0V load switch to protect hot-insertion of HDMI interface. The load switch can support 200mA of load current.

The level translator integrated on the SGM4561 can boost the input signal which is powered by 1.6V to translate 1.8V, 2.8V or 3.3V logical level to 5.0V logical level used by HDMI interface. The SGM4561 has a low operating current of typically 100µA.

The SGM4561 is available in a Green MSOP-10 package. It operates over an ambient temperature range of -40°C to +85°C.

FEATURES

- **HDMI Interface Load Switch: 5.0V at 200mA**
- **5.0V to 5.5V Input Voltage Range for Load Switch**
- **1.6V to 5.5V Controller Side Logical Level Voltage Range**
- **Fast Rising Time for the Signals**
- **Built-In Fault Protection Circuitry**
- **Level Translators from 1.8V, 2.8V or 3.3V to 5.0V**
- **Low Supply Voltage**
- **-40°C to +85°C Operating Temperature Range**
- **Available in a Green MSOP-10 Package**

APPLICATIONS

HDMI Interface

TYPICAL APPLICATION

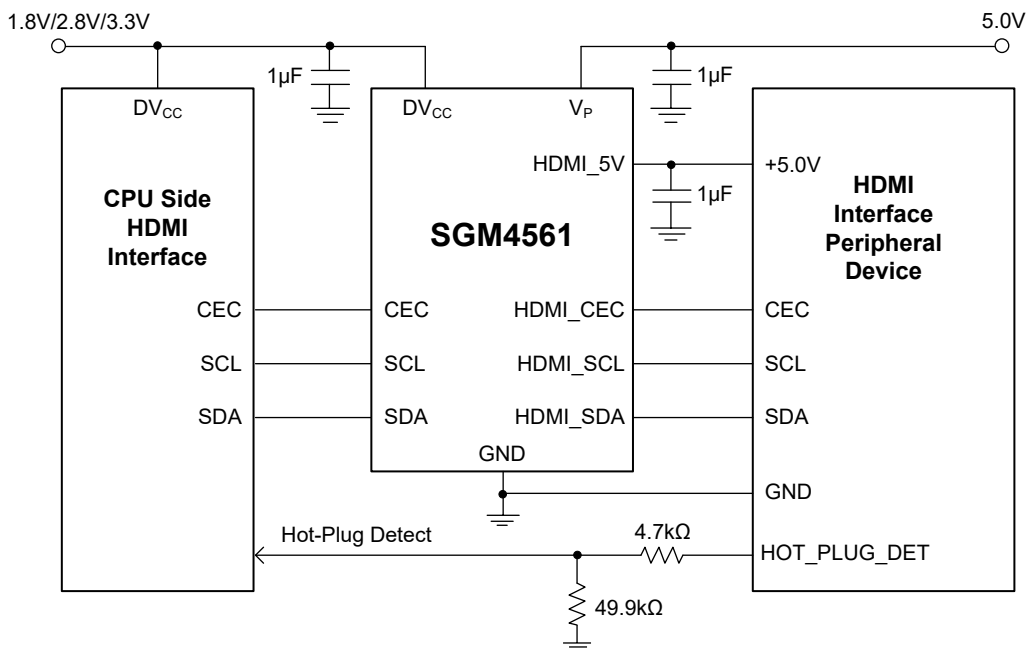


Figure 1. Typical Application Circuit

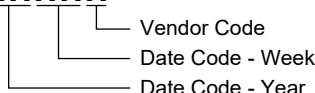
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4561	MSOP-10	-40°C to +85°C	SGM4561YMS10G/TR	SGM4561 YMS10 XXXXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

XXXXX



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

Voltage Range (with Respect to GND)

- V_P, DV_{CC} -0.3V to 6V
- HDMI_5V -0.3V to V_P + 0.3V
- CEC, SCL, SDA -0.3V to DV_{CC}+0.3V
- HDMI_CEC, HDMI_SCL, HDMI_SDA to GND -0.3V to HDMI_5V + 0.3V
- Package Thermal Resistance
- MSOP-10, θ_{JA} 230°C/W
- Junction Temperature +150°C
- Storage Temperature Range -65°C to +150°C
- Lead Temperature (Soldering, 10s) +260°C
- ESD Susceptibility
- HBM 4000V
- MM 400V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range -40°C to +85°C

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

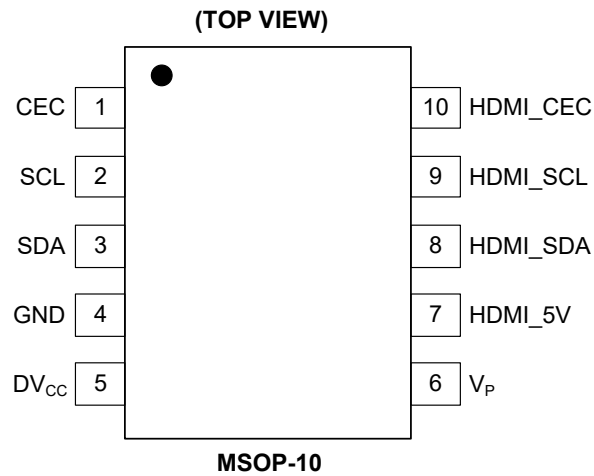
ESD SENSITIVITY CAUTION

This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

PIN CONFIGURATION



PIN DESCRIPTION

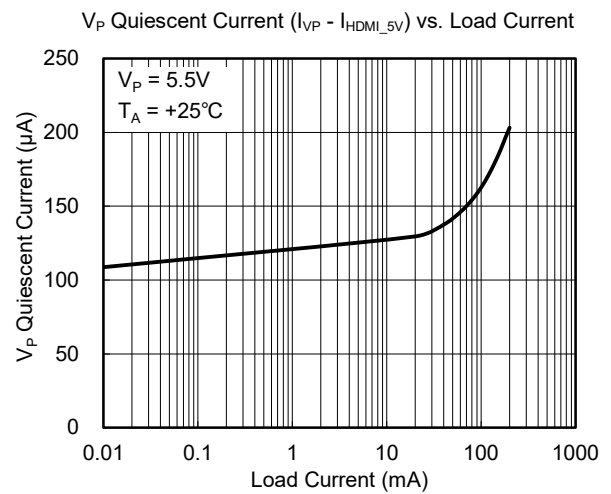
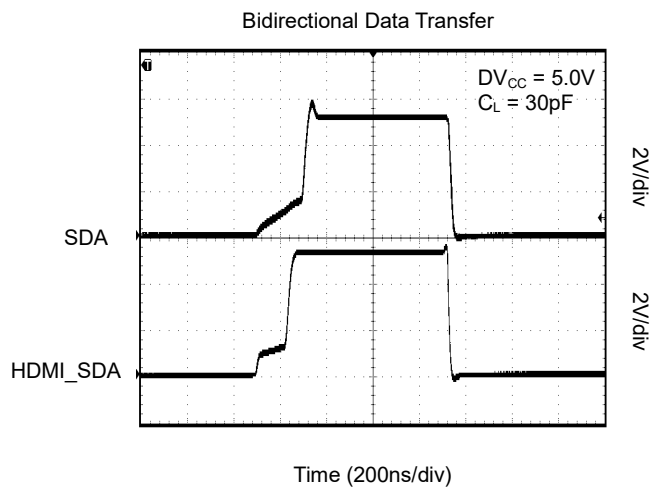
PIN	NAME	FUNCTION
1	CEC	CEC Pin. Connect to CEC signal of HDMI interface at CPU side.
2	SCL	Clock Pin. Connect to SCL signal of HDMI interface at CPU side.
3	SDA	Bidirectional Data Input/Output Pin. Connect to SDA signal of HDMI interface at CPU side.
4	GND	Ground.
5	DV _{CC}	Supply Voltage for the CPU Side I/O Pins (CEC, SCL, SDA). When below 1.2V, the HDMI_5V supply is disabled. Bypass with a 1μF ceramic capacitor to GND.
6	V _P	Load Switch Power Supply Input Pin. It can be operated between 5.0V and 5.5V for normal operation. Bypass with a 1μF ceramic capacitor to GND.
7	HDMI_5V	Load Switch Output Pin. It is recommended to use a 1μF ceramic capacitor to ensure stability. This ceramic capacitor should be placed as close as possible to HDMI_5V pin.
8	HDMI_SDA	Data Input/Output at HDMI Interface Side.
9	HDMI_SCL	SCL Pin at HDMI Interface Side. Careful board layout of SCL pin is necessary for fast rising and falling edges.
10	HDMI_CEC	CEC Pin at HDMI Interface Side.

ELECTRICAL CHARACTERISTICS(V_P = 5.0V, DV_{CC} = 1.8V, T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input Power Supply						
V _P Operating Voltage			5.0		5.5	V
V _P Operating Current		V _P = 5.5V, I _{HDMI_5V} = 0mA		100	195	μA
DV _{CC} Operating Voltage			1.6		5.5	V
DV _{CC} Operating Current				5	10	μA
DV _{CC} Under-Voltage Lockout			0.8	1.0	1.2	V
HDMI_5V Output Voltage		I _{HDMI_5V} = 200mA		4.88		V
		V _P = 5.5V, I _{HDMI_5V} = 0mA to 200mA	4.825	5.0	5.175	
Controller Inputs/Outputs						
Input Voltage Range		SCL, CEC, SDA	0		DV _{CC}	V
High Input Threshold Voltage	V _{IH}	SCL, CEC, T _A = -40°C to +85°C	0.9 × DV _{CC}			V
Low Input Threshold Voltage	V _{IL}	SCL, CEC, T _A = -40°C to +85°C			0.1 × DV _{CC}	V
High-Level Input Current	I _{IH}	SDA	-5		5	μA
Low-Level Input Current	I _{IL}	SDA			1.75	mA
High-Level Output Voltage	V _{OH}	SDA, I _{OH} = 20μA, HDMI_SDA = HDMI_5V	0.9 × DV _{CC}			V
Low-Level Output Voltage	V _{OL}	SDA, I _{OL} = -200μA, HDMI_SDA = 0V			0.2	V
SDA Pull-Up Current		SDA = 1V		200	600	μA
HDMI Logical Inputs/Outputs						
High-Level Output Voltage	V _{OH}	HDMI_SDA, I _{OH} = 20μA, SDA = DV _{CC}	0.9 × HDMI_5V			V
Low-Level Output Voltage	V _{OL}	HDMI_SDA, I _{OL} = -1mA, SDA = 0V			0.3	V
High-Level Output Voltage	V _{OH}	HDMI_SCL, I _{OH} = 20μA	0.9 × HDMI_5V			V
Low-Level Output Voltage	V _{OL}	HDMI_SCL, I _{OL} = -200μA			0.15	V
High-Level Output Voltage	V _{OH}	HDMI_CEC, I _{OH} = 20μA	0.9 × HDMI_5V			V
Low-Level Output Voltage	V _{OL}	HDMI_CEC, I _{OL} = -200μA			0.2	V
HDMI_SDA Pull-Up Current		HDMI_SDA = 1V		400	1000	μA
HDMI Logical Timing Parameters						
HDMI_SCL Rise/Fall Time		Loaded with 30pF (10% to 90%)		3		ns
HDMI_CEC Rise/Fall Time		Loaded with 30pF (10% to 90%)		30		ns
HDMI_SDA Rise/Fall Time		Loaded with 30pF (10% to 90%)		150		ns
SCL Frequency		Loaded with 30pF			10	MHz

TYPICAL PERFORMANCE CHARACTERISTICS

$V_P = 5.0V$, $DV_{CC} = 1.8V$, $T_A = +25^\circ C$, unless otherwise noted.



FUNCTIONAL BLOCK DIAGRAM

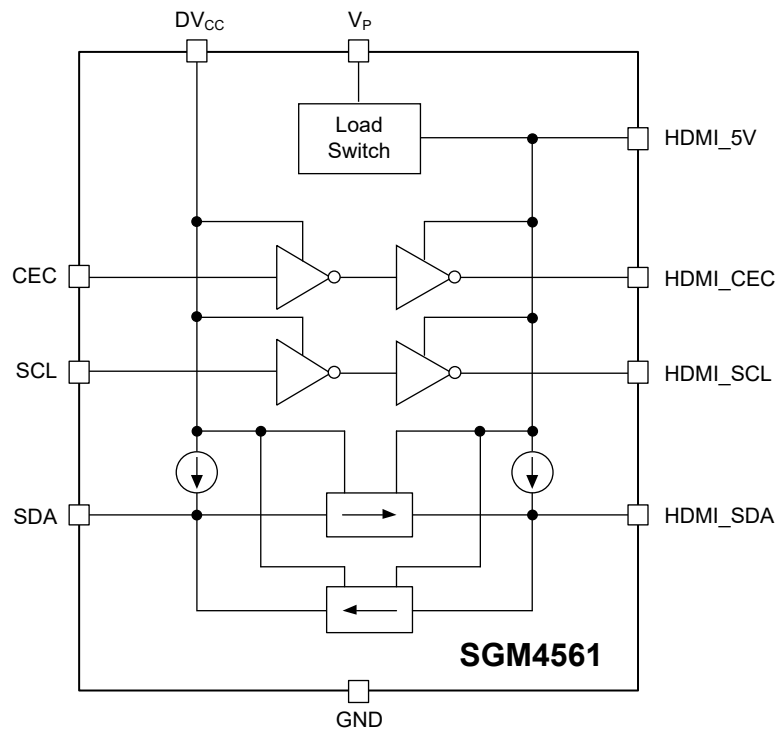


Figure 2. Block Diagram

APPLICATION INFORMATION

Load Switch for HDMI

The SGM4561 features a 200mA current load switch with a 5.0V output. It is recommended that the HDMI_5V output can be connected to a 1µF bypass capacitor and the V_P can be connected to a 1µF bypass ceramic capacitor.

Level Translators

The SGM4561 supports level translators that allow low voltage controllers to interface with the peripheral HDMI device. The HDMI_SCL and HDMI_CEC lines are level shifted from the controller supply (GND to DV_{CC}) to the HDMI interface peripheral supply (GND to HDMI_5V). The bidirectional channel is level shifted to the appropriate HDMI_5V voltage at the HDMI_SDA pin.

Pull-Up Current Sources

The pull-up current sources with low static current for SDA and HDMI_SDA pins can make sure that the rise time of the associated pins enhances dramatically. If the bidirectional mode is disabled, the node will be charged by the start-up current.

Fault Detection

The internal circuitry can limit the current flow in a short-circuit condition for the pins of HDMI_5V, HDMI_SDA and HDMI_CEC. Before the output of the SGM4561 is reduced, the typical supply current of HDMI_5V is 300mA.

The capability of the current driving of the output stage can be significantly decreased by HDMI_SCL pin in order to tolerate any faults. Once the internal circuitry detects the fault, it cannot decrease the current capability of the output stage until the fault detection delay is elapsed. If the fault is removed, SGM4561 will be permitted to detect the reduced current.

ESD Protection

A good PCB layout is important for the protection of ESD. Also, the GND pin of the SGM4561 should be connected directly to the plane of GND. The capacitors which are used to bypass the HDMI_5V pin should be located as close as possible to this pin and tied to the GND plane directly.

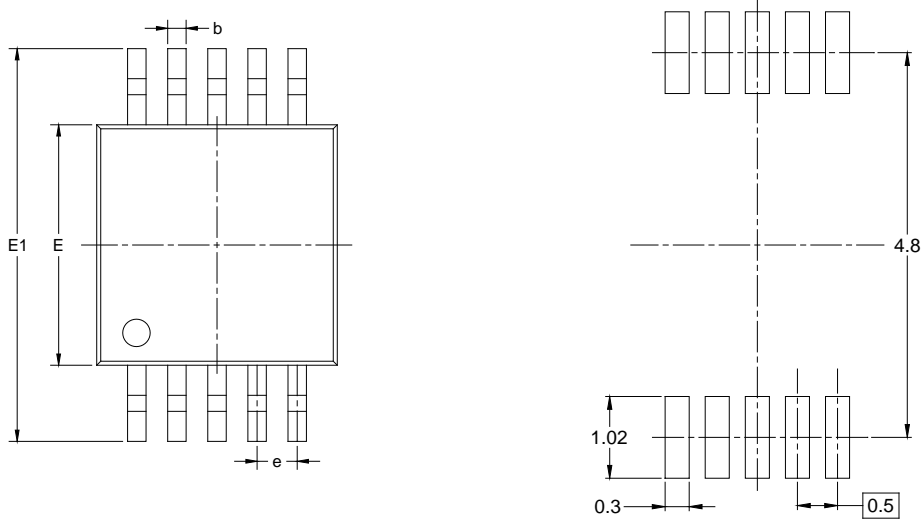
REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

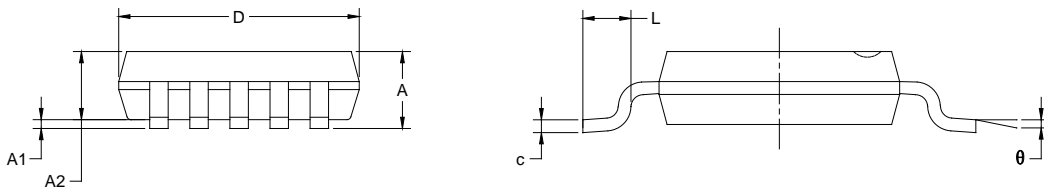
Changes from Original (DECEMBER 2013) to REV.A	Page
Changed from product preview to production data.....	All

PACKAGE OUTLINE DIMENSIONS

MSOP-10



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.500 BSC		0.020 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
MSOP-10	13"	12.4	5.20	3.30	1.20	4.0	8.0	2.0	12.0	Q1

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PACKAGE INFORMATION

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13"	386	280	370	5

DD0002