Single/Quad Drivers for GaAs FET Switches and Attenuators

SWD-109/119

V2.00

Features

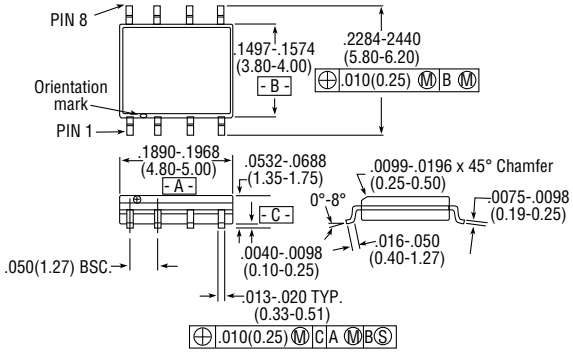
- High Speed CMOS Technology
- Single Channel (SWD-109)
- Quad Channel (SWD-119)
- Positive Voltage Control
- Low Power Dissipation
- Low Cost Plastic SOIC Package[3]

Description

The SWD-109 is a single channel driver used to translate TTL control inputs into gate control voltages for GaAs FET microwave switches and attenuators. High speed analog CMOS technology is utilized to achieve low power dissipation at moderate to high speeds, encompassing most microwave switching applications. The output HIGH level is optionally 0 to +2.0V (relative to GND) to optimize the intermodulation products of the control devices at low frequencies.

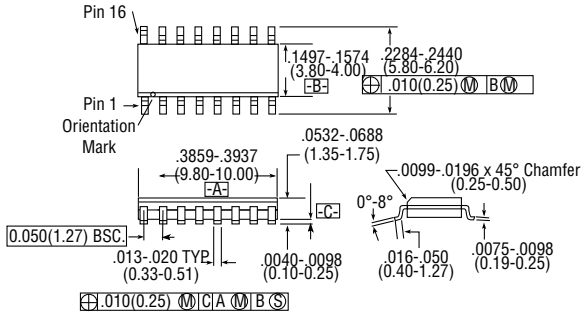
The SWD-119 is a quad channel driver with performance similiar to the single channel version.

SO-8 (SWD-109)



SOIC 8 Lead outline dimensions
Narrow body .150
(All dimensions per JEDEC No. MS-012-AA, Issue C)

SO-16 (SWD-119)



SOIC 16 lead outline dimensions
Narrow body .150
(All dimensions per JEDEC No. MS-012-AC, Issue C)
Dimensions in ( ) are in mm.

Unless Otherwise Noted : .xxx = ± 0.010 (.xx =± 0.25)
.xx = ± 0.02 (.x = ± 0.5)

Guaranteed Operating Ranges

Symbol	Parameter[1]	Unit	Min.	Typ.	Max.
V_{CC}	Positive DC Supply Voltage	V	4.5	5.0	5.5
V_{EE}	Negative DC Supply Voltage	V	-8.5	-5.5	-4.5
V_{OPT}[2]	Optional DC Output Supply Voltage	V	0	1.0	2.0
V_{OPT}-V_{EE}	Negative Supply Voltage Range	V	4.5	6.5	8.5
V_{CC}-V_{EE}	Positive to Negative Supply Range	V	9.0	10.0	14.0
T_A	Operating Ambient Temperature	°C	-40	+25	+85
I_{OH}	DC Output Current - HIGH	mA			-1.0
I_{OL}	DC Output Current - LOW	mA			1.0
T_{rise}, T_{fall}	Maximum Input Rise or Fall Time	ns			500

Note 1: All voltages are relative to GND Note 2: See note on following page Note 3: Tape and reel packaging available. Contact factory.

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Absolute Maximum Ratings

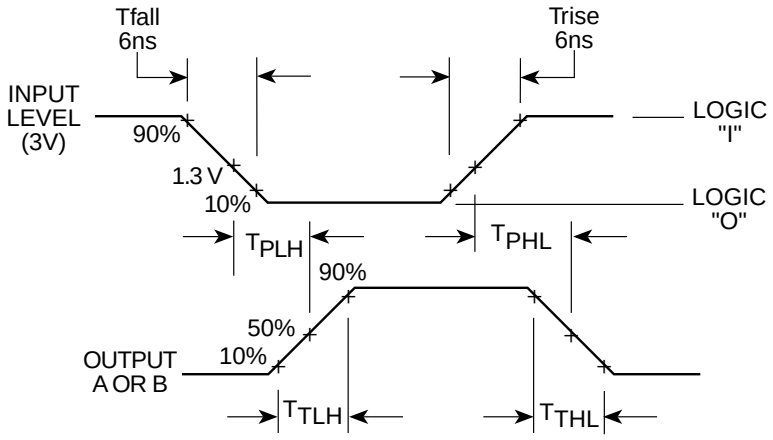
Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Positive DC Supply Voltage	-0.5	5.5	V
V_{EE}	Negative DC Supply Voltage	-9.0	0.5	V
V_{OPT}	Optional DC Output Supply Voltage	-0.5	2.0	V
V_{OPT} - V_{EE}	Output to Negative Supply Voltage Range	-0.5	9.0	V
V_{CC} - V_{EE}	Positive to Negative Supply Range	-0.5	14.5	V
V_I	DC Input Voltage	-0.5	V_{CC} + 0.5	V
I_I	DC Input Current	-25	25	mA
V_O	DC Output Voltage	V_{EE} - 0.5	V_{OPT} + 0.5	V
V_O	DC Output Current	-25	25	mA
T_{STG}	Storage Temperature	-65	150	°C

All voltage are referenced to GND. All inputs and outputs incorporate latch-up protection structures.

DC Characteristics Over Guaranteed Operating Range

Symbol	Parameter	Test Conditions		Units	Limits		
					Min.	Typ.	Max.
V_{IH}	Input HIGH Voltage	Guaranteed HIGH Input Voltage		V	2.0	1.5	
V_{IL}	Input LOW Voltage	Guaranteed LOW Input Voltage		V		1.5	0.8
V_{OH}	Output HIGH Voltage	I_{OH} = -1 mA	V_{EE} = Max	V	V_{OPT} - 0.1		
V_{OL}	Output LOW Voltage	I_{OL} = 1 mA	V_{EE} = Max	V			V_{EE} + 0.1
I_{IN}	Input Leakage Current	V_{IN} = V_{CC} or GND	V_{EE} = Min	µA	-1.0	0	1.0
I_{CC}	Quiescent Supply Current	V_{CC} = Max V_{OPT} = Min or Max	V_{EE} = Min V_{IN} = V_{CC} or GND	µA			100
ΔI_{CC}	Additional Supply Current, per TTL Input pin	V_{CC} = Max	V_{IN} = V_{CC} - 2.1 V	mA			1.0

Switching Waveforms



2. V_{OPT} is grounded for most applications. To improve the intermodulation performance and the 1dB compression point of GaAs control devices at low frequencies, V_{OPT} can be increased to between 1.0 and 2.0V. The nonlinear characteristics of the GaAs control devices will approximate performance at 500 MHz. It should be noted that the control currents on the GaAs MMICs will increase when positive controls are applied.

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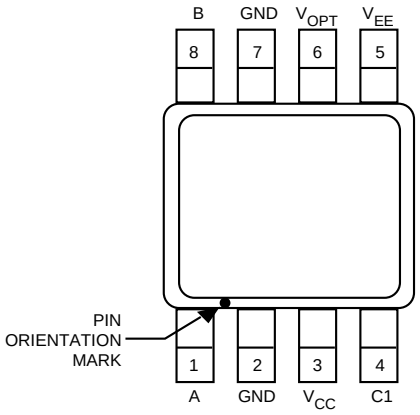
Truth Table for Single Driver (SWD-109)

Input	Outputs	
C1	A	B
Logic "0"	V_{EE}	V_{OPT}
Logic "1"	V_{OPT}	V_{EE}

Ordering Information

Part No.	Package
SWD-109 PIN	SOIC 8 Lead
SWD-109TR	Forward Tape and Reel
SWD-109RTR	Reverse Tape and Reel

Functional Schematic (SWD-109)



AC Characteristics Over Guaranteed Operating Range[4] (SWD - 109)

Symbol	Parameter	V_{OPT} - V_{EE}	-55 to +25°C	Max Limits ≤ +85°C	≤ +125°C	Unit
T_{PLH}	Propagation Delay, I to either O	4.5 6.5 8.5	45 44 43	55 54 52	61 59 57	ns
T_{PHL}	Propagation Delay, I to either O	4.5 6.5 8.5	45 43 41	55 52 49	61 57 53	ns
T_{TLH}	Output Rising Transition Time	4.5 6.5 8.5	10.0 9.0 8.0	10.0 9.0 8.0	11.0 9.0 8.0	ns
T_{THL}	Output Falling Transition Time	4.5 6.5 8.5	10.0 9.0 8.0	10.0 9.0 8.0	11.0 9.0 8.0	ns
T_{skew}	Delay Skew, OA to OB	4.5 6.5 8.5	8.0 8.0 7.5	8.5 8.5 8.0	10.0 10.0 9.5	ns
C_{IN}	Input Capacitance	-	10	10	10	pF
C_{PDC}	Power Dissipation Capacitance[5]	-	10	10	10	pF
C_{PDE}	Power Dissipation Capacitance[5]	-	140	140	140	pF

4. V_{CC} = 4.5V, V_{EE} = -4.5V, V_{OPT} = 0V, C_L = 25 pF, Trise, Tfall = 6 ns. These conditions represent the worst case for slow delays.
5. Total Power Dissipation is calculated by the following formula: PD = $V_{CC}{}^2 fC_{PDC} + (V_{OPT} - V_{EE})^2 fC_{PDE}$

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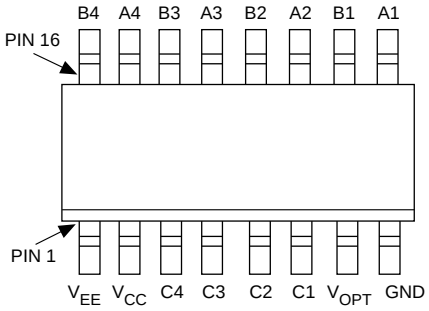
Truth Table for Quad Driver (SWD-119)

Inputs				Outputs							
C4	C3	C2	C1	B4	A4	B3	A3	B2	A2	B1	A1
0	0	0	0	X	Y	X	Y	X	Y	X	Y
0	0	0	1	X	Y	X	Y	X	Y	Y	X
0	0	1	0	X	Y	X	Y	Y	X	X	Y
0	0	1	1	X	Y	X	Y	Y	X	Y	X
0	1	0	0	X	Y	Y	X	X	Y	X	Y
0	1	0	1	X	Y	Y	X	X	Y	Y	X
0	1	1	0	X	Y	Y	X	Y	X	X	Y
0	1	1	1	X	Y	Y	X	Y	X	Y	X
1	0	0	0	Y	X	X	Y	X	Y	X	Y
1	0	0	1	Y	X	X	Y	X	Y	Y	X
1	0	1	0	Y	X	X	Y	Y	X	X	Y
1	0	1	1	Y	X	X	Y	Y	X	Y	X
1	1	0	0	Y	X	Y	X	X	Y	X	Y
1	1	0	1	Y	X	Y	X	X	Y	Y	X
1	1	1	0	Y	X	Y	X	Y	X	X	Y
1	1	1	1	Y	X	Y	X	Y	X	Y	X

Where X = V_{VAR} ,Y = V_{EE}

Functional Schematic (SWD-119)



Ordering Information

Pin No.	Package
SWD-119 PIN	SOIC 8 Lead
SWD-119TR	Forward Tape and Reel
SWD-119RTR	Reverse Tape and Reel

AC Characteristics Over Guaranteed Operating Range[4] (SWD-119)

Symbol	Parameter	V_{OPT} - V_{EE}	Max. Limits			Unit
			-55 to +25°C	≤ +85°C	≤ +125°C	
T_{PLH}	Propagation Delay, I to either O	4.5 6.5 8.5	45 44 43	55 54 52	61 59 57	ns
T_{PHL}	Propagation Delay, I to either O	4.5 6.5 8.5	45 43 41	55 52 49	61 57 53	ns
T_{TLH}	Output Rising Transition Time	4.5 6.5 8.5	10.5 10.0 9.0	11.0 10.0 9.0	12.0 10.0 9.0	ns
T_{THL}	Output Falling Transition Time	4.5 6.5 8.5	10.0 9.0 8.0	10.0 9.0 8.0	11.0 9.0 8.0	ns
T_{skew}	Delay Skew, OA to OB	4.5 6.5 8.5	8.0 8.0 7.5	8.5 8.5 8.0	10.0 10.0 9.5	ns
C_{IN}	Input Capacitance	-	10	10	10	pF
C_{PDC}	Power Dissipation Capacitance[5]		10	10	10	pF
C_{PDE}	Power Dissipation Capacitance[5]	-	140	140	140	pF

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