DUAL ULTRA-LOW R_{ON} DPDT ANALOG SWITCH

QFN-16(3x3)

■ DESCRIPTION

The UTC **UAS6699** is a dual independent ultra-low R_{ON} DPDT analog switch.

The UTC **UAS6699** can handle a balanced microphone/speaker/ring-tone generator in a monophone mode. This device is designed for low operating voltage, high current switching of speaker output for cell phone applications. It can switch a balanced stereo output.

The UTC **UAS6699** contains a break-before-make feature.

■ FEATURES

* Low Static Power
* Maximum Breakdown Voltage: 4.6V
* Single Supply Operation 1.65V to 3.6V V_{CC}

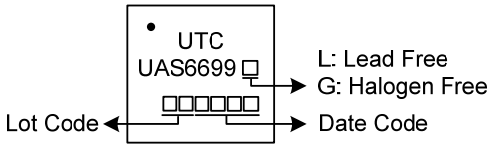
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
UAS6699L-Q16-3030-R	UAS6699G-Q16-3030-R	QFN-16(3×3)	Tape Reel

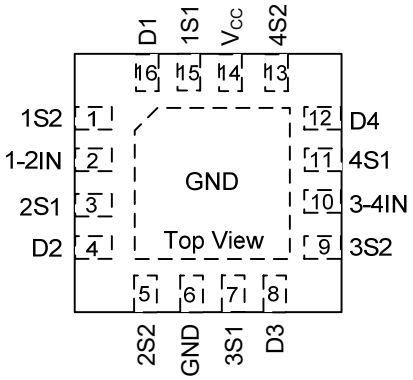
UAS6699G-Q16-3030-R
- (1)Packing Type
- (2)Package Type
- (3)Green Package

(1) R: Tape Reel
(2) Q16-3030: QFN-16(3×3)
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ PIN CONFIGURATION



■ PIN DESCRIPTION

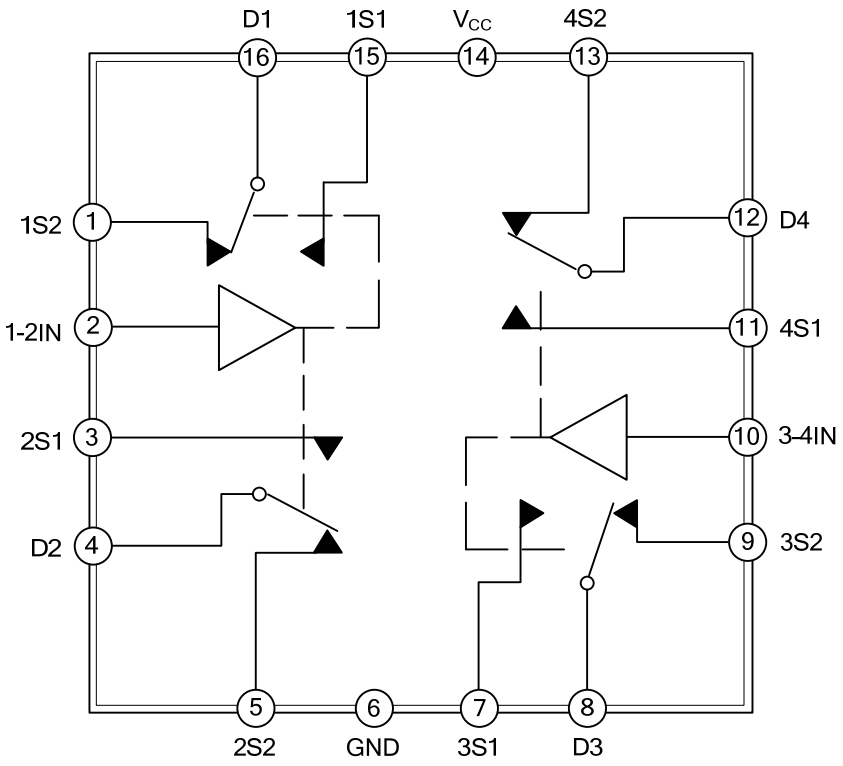
PIN NO.	PIN NAME	DESCRIPTION
1	1S2	Independent Channel
2	1-2IN	Control
3	2S1	Independent Channel
4	D2	Common Channel
5	2S2	Independent Channel
6	GND	Ground (V)
7	3S1	Independent Channel
8	D3	Common Channel
9	3S2	Independent Channel
10	3-4IN	Control
11	4S1	Independent Channel
12	D4	Common Channel
13	4S2	Independent Channel
14	V_{CC}	Positive Supply Voltage
15	1S1	Independent Channel
16	D1	Common Channel

■ TRUTH TABLE

IN	S1	S2
H	ON	OFF (Note 1)
L	OFF (Note 1)	ON

Note: High impedance.

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, unless otherwise specified) (Note)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Positive DC Supply Voltage	V_{CC}		-0.5 ~ 4.6	V
Analog Input Voltage (V_{NO}, V_{NC}, or V_{COM})	V_{IS}		$-0.5 \le V_{IS} \le V_{CC}$	V
Digital Select Input Voltage	V_{IN}		$-0.5 \le V_I \le +4.6$	V
Continuous DC Current from COM to NC/NO	I_{anl1}		±300	mA
Peak Current from COM to NC/NO, 10 Duty Cycle (Note 1)	$I_{anl-pk\ 1}$		±500	mA
Continuous DC Current into COM/NO/NC with respect to V_{CC} or GND	I_{clmp}		±100	mA
Input Rise or Fall Time, SELECT	t_r, t_f	V_{CC} = 1.6V~2.7V	0 ~ 20	ns/V
		V_{CC} = 3.0V~3.6V	0 ~ 10	ns/V

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Defined as 10% ON, 90% off duty cycle.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
DC Supply Voltage	V_{CC}		1.65		3.6	V
Digital Select Input Voltage	V_{IN}		GND		V_{CC}	V
Analog Input Voltage (NC, NO, COM)	V_{IS}		GND		V_{CC}	V
Operating Temperature Range	T_A		-40		+125	°C
Input Rise or Fall Time, SELECT	t_r, t_f	V_{CC} = 1.6V~2.7V	0		20	ns
		V_{CC} = 3.0V~3.6V	0		10	ns/V

■ DC CHARACTERISTICS – DIGITAL SECTION (Voltages Referenced to GND)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Minimum High-Level Input Voltage, Select Inputs	V_{IH}	V_{CC}= 1.8V	1.2			V
		V_{CC}= 2.5V	1.7			V
		V_{CC}= 3.6V	2.2			V
Maximum Low-Level Input Voltage, Select Inputs	V_{IL}	V_{CC}= 1.8V			0.4	V
		V_{CC}= 2.5V			0.5	V
		V_{CC}= 3.6V			0.7	V
Maximum Input Leakage Current, Select Inputs	I_{IN}	V_{IN} = V_{CC} or GND, V_{CC}= 3.6V			±1.0	μA
Power Off Leakage Current	I_{OFF}	V_{IN} = V_{CC} or GND, V_{CC}= 0V			±2.0	μA
Maximum Quiescent Supply Current (Note 1)	I_{CC}	Select and V_{IS} = V_{CC} or GND, V_{CC}= 1.65V~3.6V			2.0	μA

■ DC ELECTRICAL CHARACTERISTICS – ANALOG SECTION

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
NC/NO On-Resistance (Note 2)	R_{ON}	$V_{IN} \le V_{IL}$ or $V_{IN} \ge V_{IH}$ V_{IS} = GND to V_{CC} $I_{INI} \le 100$ mA	V_{CC}= 2.5V			2.75	Ω
			V_{CC}= 3.0V			2.75	Ω
			V_{CC}= 3.6V			2.7	Ω
NC/NO On-Resistance Flatness (Note 2, 4)	R_{FLAT}	I_{COM} =100mA V_{IS} = 0 to V_{CC}	V_{CC}= 2.5V			0.15	Ω
			V_{CC}= 3.0V			0.15	Ω
			V_{CC}= 3.6V			0.15	Ω
On-Resistance Match Between Channels (Note 2 , 3)	$\triangle R_{ON}$	V_{IS} = 1.3V; I_{COM} =-100mA	V_{CC}= 2.5V			0.06	Ω
		V_{IS} = 1.5V; I_{COM} =-100mA	V_{CC}= 3.0V			0.05	Ω
		V_{IS} = 1.8V; I_{COM} =-100mA	V_{CC}= 3.6V			0.05	Ω
NC or NO Off Leakage Current (Note 2)	$I_{NC(OFF)}$ $I_{NO(OFF)}$	V_{IN} = V_{IL} or V_{IH} V_{NO} or V_{NC} = 0.3V V_{COM} = 3.3V, V_{CC}= 3.6V		-10		10	nA
COM ON Leakage Current (Note 2)	$I_{COM(ON)}$	V_{IN} = V_{IL} or V_{IH} V_{NO} 0.3V or 3.3V with V_{NC} floating or V_{NC} 0.3V or 3.3V with V_{NO} floating V_{COM} = 0.3V or 3.3V, V_{CC}= 3.6V		-100		100	nA

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Guaranteed by design. Resistance measurements do not include test circuit or package resistance.
3. $\triangle R_{ON} = R_{ON(MAX)} - R_{ON(MIN)}$ between nS1 or nS2.
4. Flatness is defined as the difference between the maximum and minimum value of on-resistance as measured over the specified analog signal ranges.

■ AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f$ = 3.0 ns)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Turn-On Time	t_{ON}	R_L = 50Ω, C_L = 35pF (Figures 3 and 4), V_{CC}= 2.3V~3.6V, V_{IS} = 1.5V			70	ns
Turn-Off Time	t_{OFF}	R_L = 50Ω, C_L = 35pF (Figures 3 and 4) V_{CC}= 2.3V~3.6V, V_{IS} = 1.5V			50	ns
Minimum Break-Before-Make Time	t_{BBM}	V_{IS} = 3.0V, R_L = 50Ω, C_L = 35pF,V_{CC}= 3.0V (Figure 2)	30			ns
Control Pin Input Capacitance	C_{IN}	V_{CC} = 3.6V		2.5		pF
SN Port Capacitance	C_{SN}	V_{CC} = 3.6V		55		pF
D Port Capacitance When Switch is Enabled	C_D	V_{CC} = 3.6V		175		pF

■ ADDITIONAL APPLICATION CHARACTERISTICS (Voltages Referenced to GND Unless Noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Maximum On-Channel -3dB Bandwidth or Minimum Frequency Response	BW	V_{IN} centered between V_{CC} and GND (Figure 5), V_{CC}= 1.65V~3.6V		20		MHz
Maximum Feed-through On Loss	V_{ONL}	V_{IN}= 0dBm @ 100kHz to 50MHz V_{IN} centered between V_{CC} and GND (Figure 5) V_{CC}= 1.65V~3.6V		-0.06		dB
Off-Channel Isolation	V_{ISO}	f = 100kHz; V_{IS}= 1V RMS; C_L= 5pF V_{IN} centered between V_{CC} and GND(Figure 5) V_{CC}= 1.65V~3.6V		-62		dB
Charge Injection Select Input to Common I/O	Q	V_{IN}= V_{CC} to GND, R_{IS}= 0Ω, C_L= 1nF Q=C_L x $\triangle V_{OUT}$ (Figure 6),V_{CC}= 1.65V~3.6V		50		pC
Total Harmonic Distortion THD + Noise	THD	F_{IS}= 20Hz to 20kHz, R_L= R_{gen} = 600Ω, C_L= 50pF V_{IS}= 2 V_{PP}, V_{CC}= 3.6V		0.01		%
Channel-to-Channel Crosstalk	VCT	f = 100 kHz; V_{IS}= 1V RMS, C_L= 5 pF, R_L= 50Ω, V_{IN} centered between V_{CC} and GND (Figure 5), V_{CC}= 1.65V~3.6V		-62		dB

■ INPUT EQUIVALENT CIRCUIT

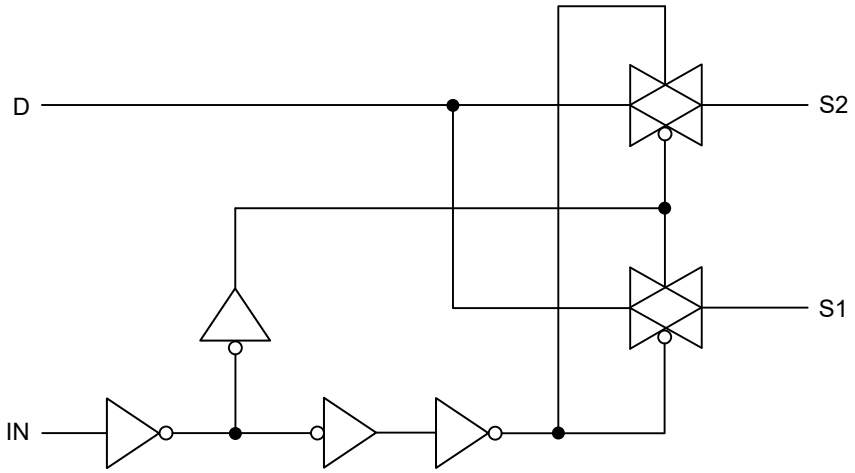


Figure 1. Input Equivalent Circuit

■ PARAMETER MEASUREMENT INFORMATION

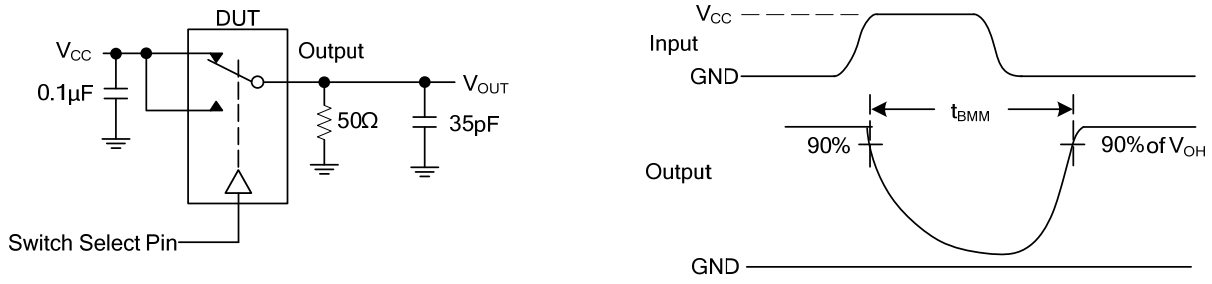


Figure 2. t_{BBM} (Time Break-Before-Make)

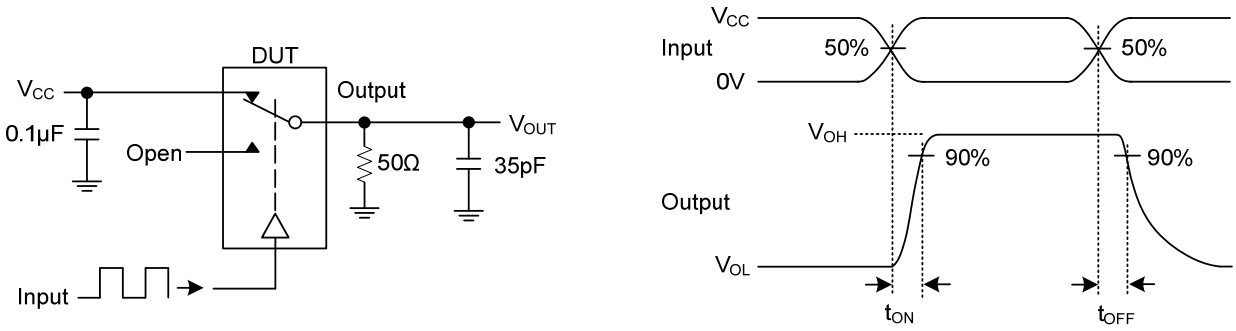


Figure 3. t_{ON}/t_{OFF}

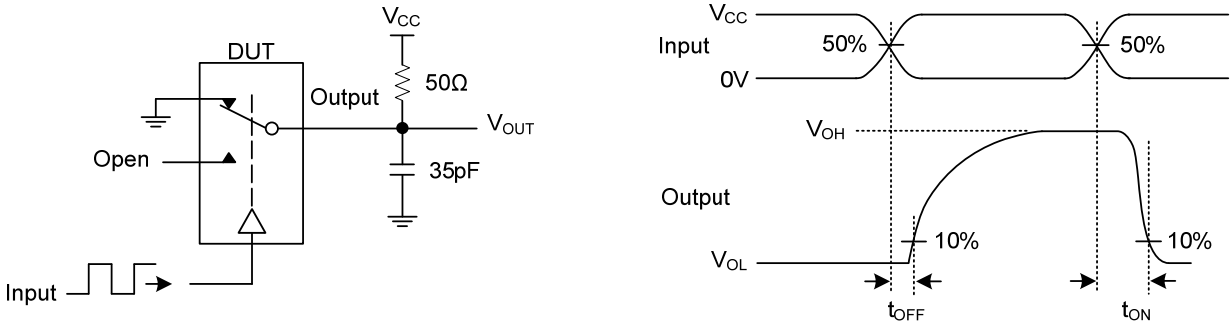
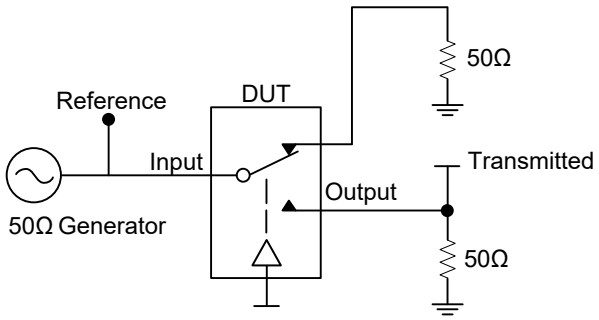


Figure 4. t_{ON}/t_{OFF}

■ PARAMETER MEASUREMENT INFORMATION (Cont.)



Channel switch control/s test socket is normalized. Off isolation is measured across an off channel. On loss is the bandwidth of an On switch. V_{ISO}, Bandwidth and V_{ONL} are independent of the input signal direction.

V_{ISO} = Off Channel Isolation = 20 Log $\left(\frac{V_{OUT}}{V_{IN}}\right)$ for V_{IN} at 100 kHz

V_{ONL} = On Channel Loss = 20 Log $\left(\frac{V_{OUT}}{V_{IN}}\right)$ for V_{IN} at 100 kHz to 50 MHz

Bandwidth (BW) = the frequency 3 dB below V_{ONL}
V_{CT} = Use V_{ISO} setup and test to all other switch analog input/outputs terminated with 50Ω

Figure 5. Off Channel Isolation/On Channel Loss (BW)/Crosstalk (On Channel to Off Channel)/V_{ONL}

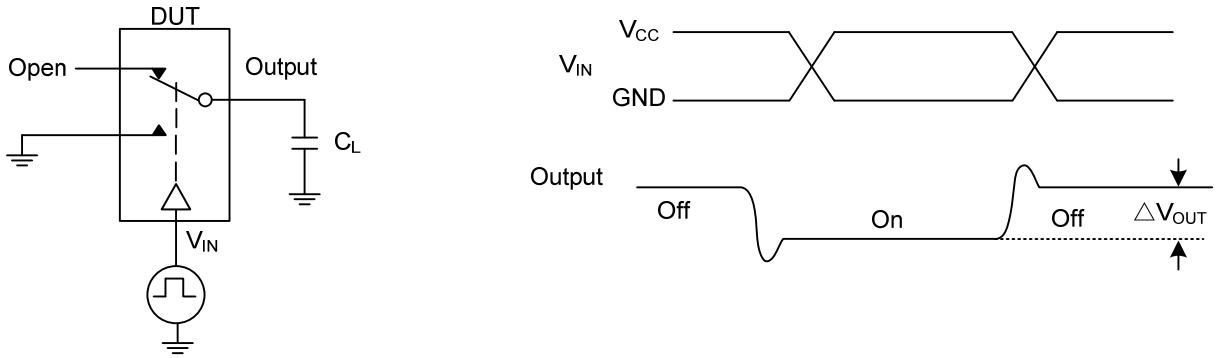


Figure 6. Charge Injection: (Q)