ft3157

High Speed SPDT Analog Switch

Introductions

The ft3157 is a low on-resistance high speed single-pole/dual-throw (SPDT) analog switch.

The ft3157 operates from a 1.65V to 5.5V power supply. It features high-bandwith (250MHz) and low on-resistance (4Ω Typ).

The break-before-make select circuitry prevents disruption of signals on the B Port due to both switches temporarily being enabled during select pin switching.

The ft3157 is manufactured in SC70-6 (2.0mm x 2.1mm) package.

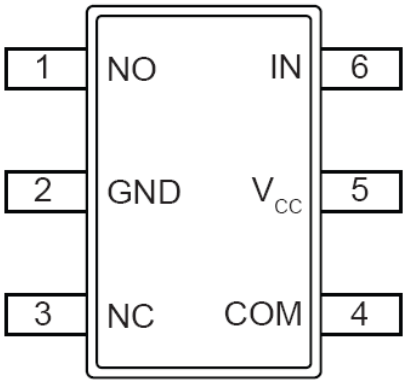
Applications

- Mobile phone
- Personal Digital Assistant (PDA)
- MP3 player
- Battery-Operated equipment

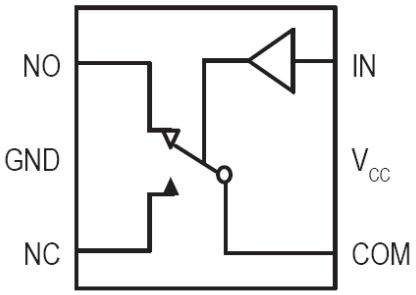
Specifications

- Operation voltage: 1.65V to 5.5V
- Low on-resistance: 4 Ω @ 4.5V (Typ)
- Power down control pin
- Break-Before-Make switching
- 250MHz @ -3dB bandwidth
- Fast switching times
  - t_{ON} 20ns
  - t_{OFF} 15ns
- Rail-to-rail signal handling
- High off-isolation: -52dB at 10MHz

Pinout Diagram



Block Diagram



Function Table

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

Pin Descriptions

Name	PIN	Description
NO	1	Normally-open terminal
GND	2	Ground
NC	3	Normally-closed terminal
COM	4	Common terminal
V_{CC}	5	Power supply
IN	6	Digital control pin to connect the COM terminal to the NO or NC terminals

Absolute Maximum Ratings

Supply Voltage (V_{CC}) -0.3V to +6.0V

Analog, Digital Voltage (V_S) -0.3V to (V_{CC}+ 0.30V)

Continuous Current B0, B1 and A ±150mA

Peak Current B0, B1 and A ±200mA

Junction Temperature under Bias (T_J) 150°C

Junction Lead Temperature(T_L,Soldering,10s)260°C

Storage Temperature Range -65°C to +150°C

ESD (HBM) 2000V

Operation Ratings

Operating Voltage (V_{CC}) 1.65V to 5.5V

Control Input Voltage (V_{IN}) 0V to V_{CC}

Switch Input Voltage (V_{IN}) 0V to V_{CC}

Output Voltage (V_{OUT}) 0V to V_{CC}

Operating Temperature (T_A) -40°C to +85°C

Thermal Resistance (θJA) 350ºC/W

Electrical Characteristics

Note: The following electrical characteristics state DC and AC electrical specifications under particular test conditions which guarantee specific performance limits. But note that specifications are not guaranteed for parameters where no limit is given. The typical value however, is a good indication of device performance.

Electrical Characteristics

Power Requirements							
V_{CC}	Power supply range		-40°C to +85°C	1.65		5.5	V
I_{CC}	Power supply current	V_{CC} =5.5V, V_{IN} =0V or V_{CC}	-40°C to +85°C			4	μA

V_{CC}=4.5V to 5.5V, V_{IH}=2.0V, V_{IL}=0.8V, T_A=-40°C to +85°C, Typ values are at V_{CC}=5.0V, T_A=25°C, unless otherwise noted

Symbol	Parameter	Conditions	Temp	Min	Typ	Max	Units
Analog Switch							
V_{NO}, V_{NC}, V_{COM}	Analog Signal Range		-40°C to +85°C	0		V_{CC}	V
R_{ON}	On-resistance	V_{CC} = 4.5V, V_{NO} or V_{NC} =3.5V, I_{COM} = -10mA, Test circuit 1	25°C		4	8	Ω
			-40°C to +85°C			14	
ΔR_{ON}	On-resistance match between channels	V_{CC} = 4.5V, V_{NO} or V_{NC} =3.5V, I_{COM} = -10mA, Test circuit 1	25°C		0.15	0.3	Ω
			-40°C to +85°C			0.4	
$R_{FLAT(ON)}$	On-resistance flatness	V_{CC} = 4.5V, V_{NO} or V_{NC} =1.0V, 2.0V, 3.0V, I_{COM} = -10mA, Test circuit 1	25°C		1	2	Ω
			-40°C to +85°C			3	

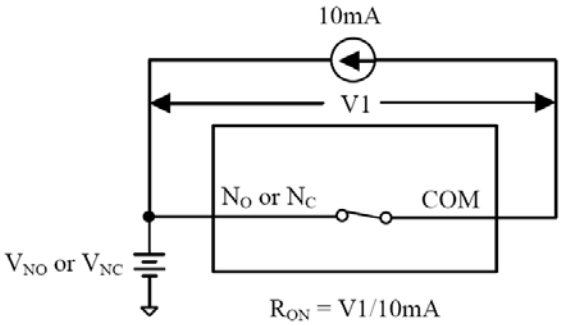
Symbol	Parameter	Conditions	Temp	Min	Typ	Max	Units
$I_{NC(OFF)}$, $I_{NO(OFF)}$	Source OFF leakage current	V_{CC} = 5.5V, V_{NO} or V_{NC} =1.0V, 4.5V, V_{COM} =4.5V, 1.0V	-40°C to +85°C			1	μA
$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	Channel ON leakage current	V_{CC} = 5.5V, V_{NO} or V_{NC} =1.0V, 4.5V, V_{COM} =1.0V, 4.5V, or floating	-40°C to +85°C			1	μA
Digital Inputs							
V_{INH}	Input high voltage		-40°C to +85°C	1.6			V
V_{INL}	Input low voltage		-40°C to +85°C			0.4	V
I_{IN}	Input leakage current	V_{CC} = 5.5V, V_{IN} =0V or 5.5V	-40°C to +85°C			1	μA
Dynamic Characteristics							
t_{ON}	Turn-on time	V_{NO} or V_{NC} =3.0V, V_{IH} =1.5V, V_{IL} =0V, R_L =300 Ω, C_L=35pF, Test circuit 2	25°C		20		ns
t_{OFF}	Turn-off time	V_{NO} or V_{NC} =3.0V, V_{IH} =1.5V, V_{IL} =0V, R_L =300 Ω, C_L=35pF, Test circuit 2	25°C		15		ns
t_D	Break-before-make time delay	V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} =3V, R_L =300 Ω, C_L=35pF, Test circuit 3	25°C		8		ns
O_{ISO}	Off isolation	R_L =50 Ω, C_L=5pF, Signal=0dBm, Test circuit4 f=10 MHz	25°C		-52		dB
		f=1M Hz	25°C		-72		dB
BW	-3dB bandwidth	Signal=0dBm, R_L =50 Ω, C_L=5pF, Test circuit5	25°C		250		MHz
$C_{NC(OFF)}$, $C_{NO(OFF)}$	Source OFF capacitance	f=1MHz	25°C		5		pF
$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$	Channel ON capacitance	f=1MHz	25°C		15		pF

V_{CC}=2.7V to 3.6V, V_{IH}=1.4V, V_{IL}=0.5V, T_A=-40°C to +85°C, Typ values are at V_{CC}=3.0V, T_A=25°C, unless otherwise noted

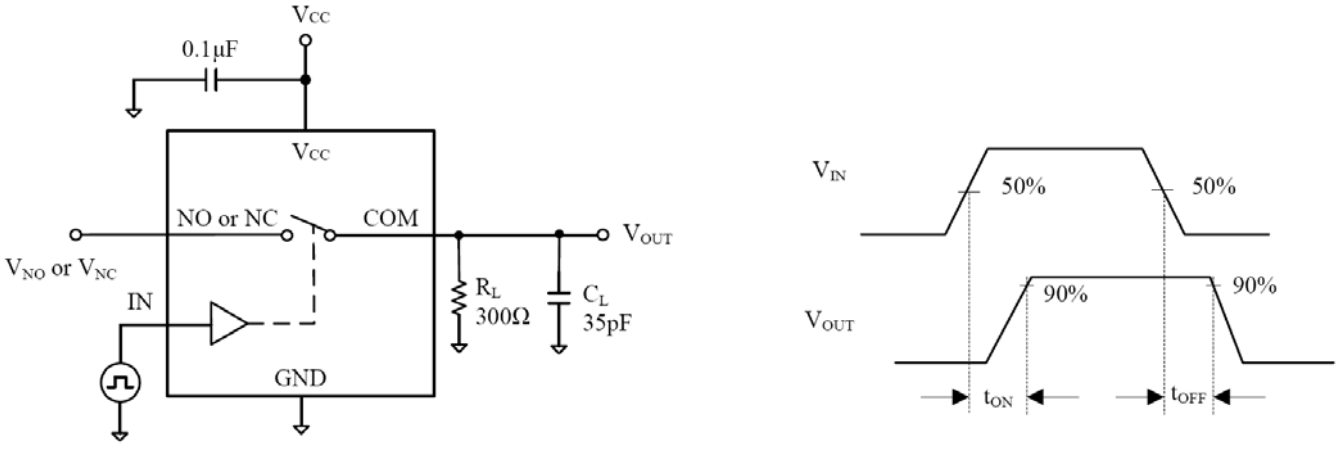
Symbol	Parameter	Conditions	Temp	Min	Typ	Max	Units
Analog Switch							
V_{NO}, V_{NC}, V_{COM}	Analog Signal Range		-40°C to +85°C	0		V_{CC}	V
R_{ON}	On-resistance	V_{CC} = 2.7V, V_{NO} or V_{NC} =1.5V, I_{COM} = -10mA, Test circuit 1	25°C		8	16	Ω
			-40°C to +85°C			18	
ΔR_{ON}	On-resistance match between channels	V_{CC} = 2.7V, V_{NO} or V_{NC} =1.5V, I_{COM} = -10mA, Test circuit 1	25°C		0.15	0.3	Ω
			-40°C to +85°C			0.4	
$R_{FLAT(ON)}$	On-resistance flatness	V_{CC} = 2.7V, V_{NO} or V_{NC} =1.0V, 1.5V, 2.0V, I_{COM} = -10mA, Test circuit 1	25°C		6	8	Ω
			-40°C to +85°C			12	
$I_{NC(OFF)}$, $I_{NO(OFF)}$	Source OFF leakage current	V_{CC} = 3.6V, V_{NO} or V_{NC} =0.3V, 3.3V, V_{COM} =3.3V, 0.3V	-40°C to +85°C			1	μA
$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	Channel ON leakage current	V_{CC} = 3.6V, V_{NO} or V_{NC} =0.3V, 3.3V, V_{COM} =3.3V, 0.3V, or floating	-40°C to +85°C			1	μA
Digital Inputs							
V_{INH}	Input high voltage		-40°C to +85°C	1．3			V
V_{INL}	Input low voltage		-40°C to +85°C			0.3	V
I_{IN}	Input leakage current	V_{CC} = 5.5V, V_{IN} =0V or 3.6V	-40°C to +85°C			1	μA
Dynamic Characteristics							
t_{ON}	Turn-on time	V_{NO} or V_{NC} =1.5V, V_{IH} =1.5V, V_{IL} =0V, R_L =300 Ω, C_L=35pF, Test circuit 2	25°C		25		ns

Symbol	Parameter	Conditions		Temp	Min	Typ	Max	Units
t_{OFF}	Turn-off time	V_{NO} or V_{NC} =1.5V, V_{IH} =1.5V, V_{IL} =0V, R_L =300 Ω, C_L=35pF, Test circuit 2		25°C		20		ns
t_D	Break-before-make time delay	V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} =3V, R_L =300 Ω, C_L=35pF, Test circuit 3		25°C		10		ns
O_{ISO}	Off isolation	R_L =50 Ω, C_L=5pF, Signal=0dBm, Test circuit4	f=10 MHz	25°C		-52		dB
			f=1M Hz	25°C		-72		dB
BW	-3dB bandwidth	Signal=0dBm, R_L =50 Ω, C_L=5pF, Test circuit5		25°C		250		MHz
$C_{NC(OFF)}$, $C_{NO(OFF)}$	Source OFF capacitance	f=1MHz		25°C		6		pF
$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$	Channel ON capacitance	f=1MHz		25°C		16		pF

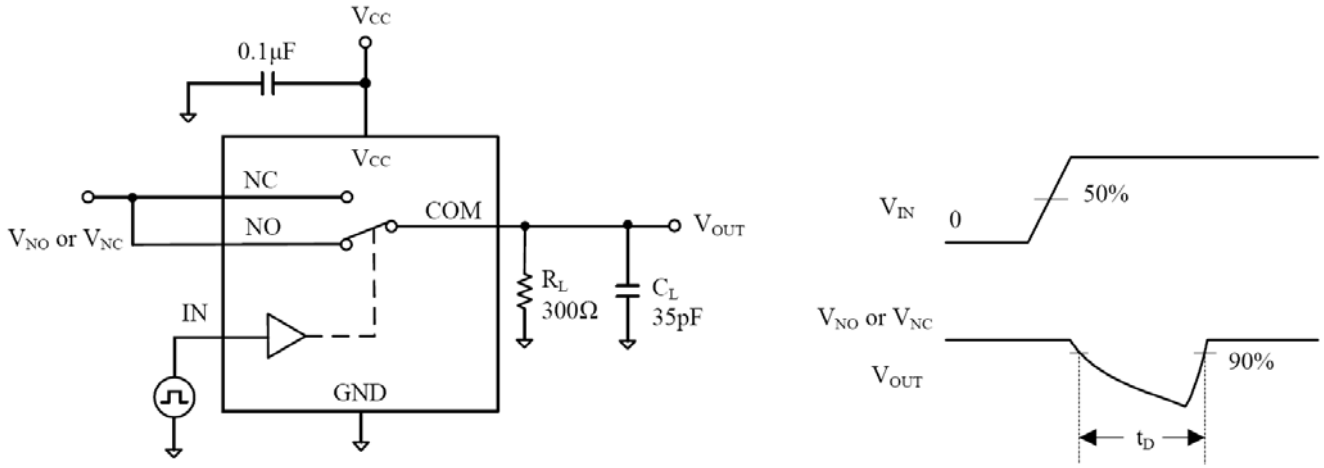
Test Circuits



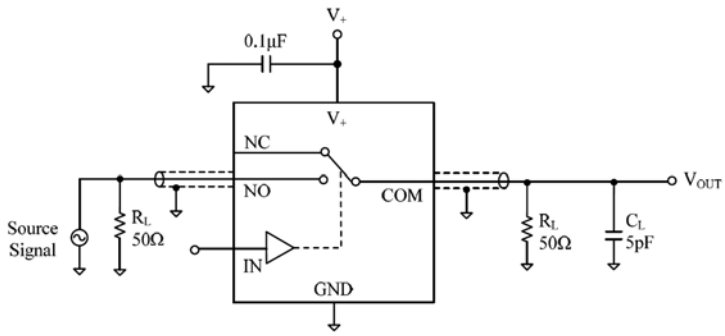
Test Circuit 1. On resistance



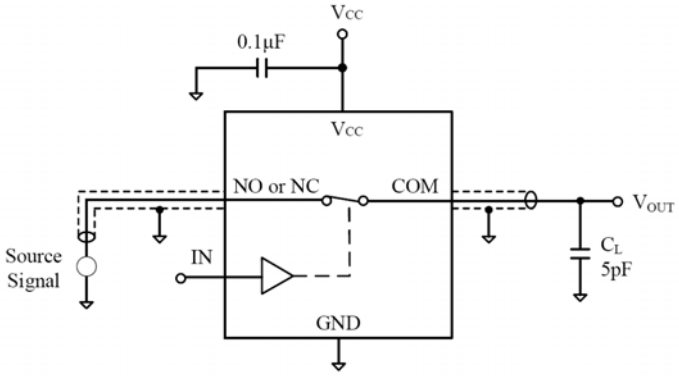
Test Circuit 2. Switch Times



Test Circuit 3. Break-Before-Make Time Delay, t_D

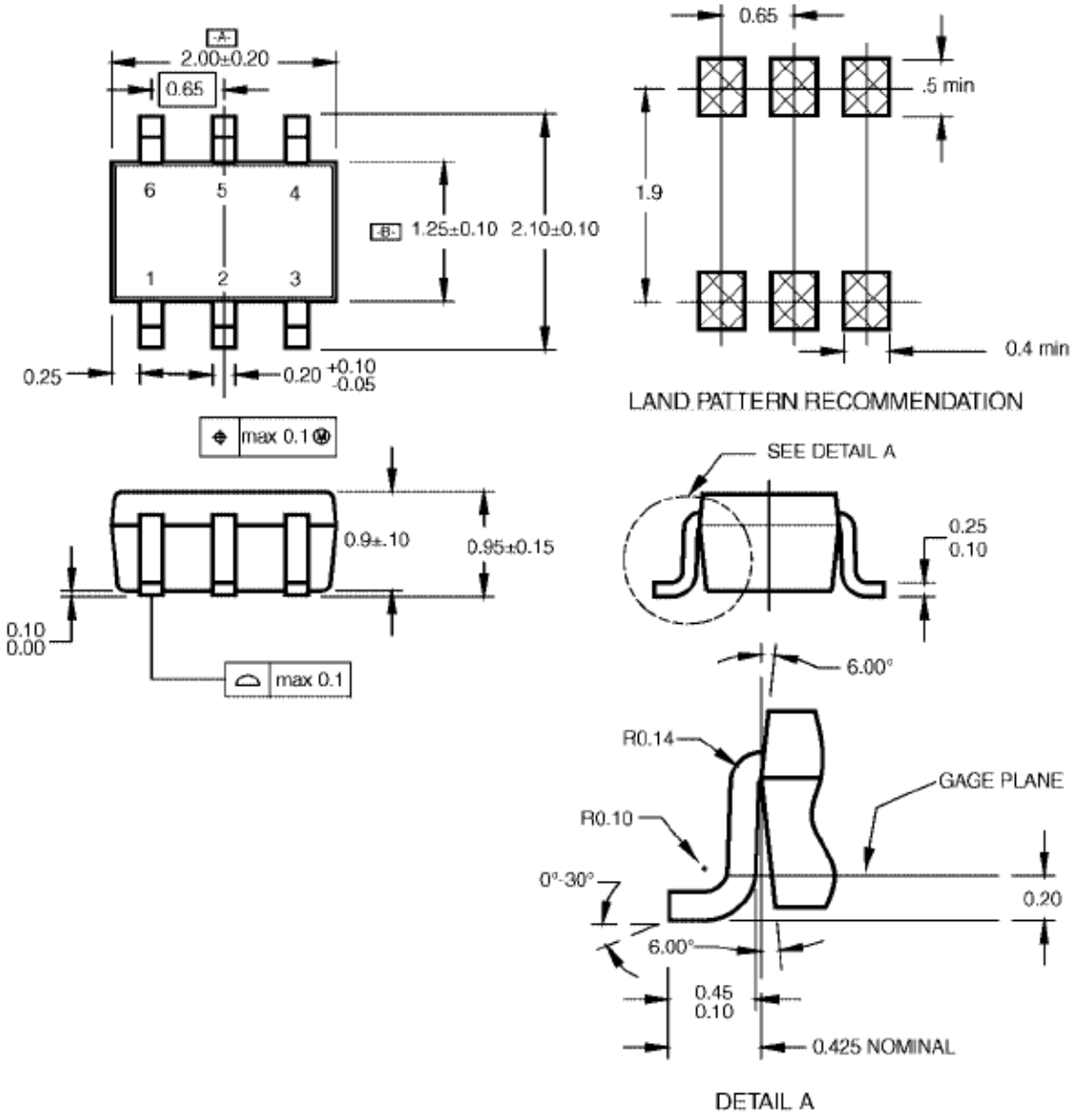


Test Circuit 4. Off Isolation



Test Circuit 5. -3dB Bandwidth

Packaging Details



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