ft3157

Low-Ohmic Single-Pole Double-Throw Analog Switch

GENERAL DESCRIPTION

The ft3157 is a low on-resistance high speed single-pole dual-throw (SPDT) analog switch suitable for use as an analog or digital 2:1 multiplexer/demultiplexer. It has a digital select input (IN), two independent inputs or outputs (NO and NC) and a common input or output (COM). Schmitt-trigger action at the digital input makes the circuit tolerant to slower input rise and fall times.

The ft3157 operates from a 1.65V to 5.5V power supply and features high-bandwidth (250MHz) and low on-resistance (4Ω). It also features a break-before-make switching to prevent disruption of signals due to both switches temporarily being enabled during switching.

The ft3157 is available in SC70-6L (2.0mm x2.1mm) package.

APPLICATIONS

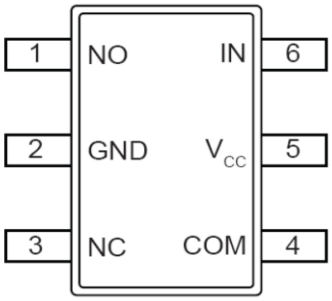
- Mobile phones
- Portable digital assistant (PDA)
- Portable devices

FEATURES

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

SC70-6L

PIN CONFIGURATION



FUNCTION TABLE

LOGIC	NO	NC
0	OFF	NO
1	ON	OFF

PIN DESCRIPTION

NAME	PIN	DESCRIPTION
NO	1	Normal-open terminal
GND	2	Ground
NC	3	Normal-close terminal
COM	4	Common terminal
Vcc	5	Power supply
IN	6	Digital control pin to connect the COM terminal to the NO or NC terminal

ORDERING INFORMATION

PART NUMBER	TEMPERATURE RANGE	PACKAGE
ft3157	-40°C to +85°C	SC70-6L

ABSOLUTE MAXIMUM RATINGS

PARAMETER	VALUE
Supply voltage, Vcc	-0.3V to +6.0 V
Analog, digital voltage (Vs)	-0.3V to Vcc+0.3V
Continuous current B0, B1, and A	±150mA
Peak current B0, B1, and A	±200mA
Junction temperature under bias (TJ)	150°C
Junction lead temperature (TL, Soldering,10s)	260°C
Storage temperature range	-65°C to +150°C
ESD (HBM)	2000V

Note: Stresses beyond those listed under absolute maximun ratings may cause permanent damage to the device. These are stress ratings only,and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied.Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

PACKAGE DISSIPATION RATINGS

PACKAGE	θ_{JC}	θ_{JA}	UNIT
SC70-6L		350	°C/W

RECOMMENDED OPERATING CONDITIONS

PARAMETER	MIN	TYP	MAX	UNIT
Supply voltage, Vcc	1.65		5.5	V
Ambient temperature, T_A	-40		85	°C
Thermal, θ_{JA}		350		ºC/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.

PARAMETER	TEMPERATURE RANGE	MIN	TYP	MAX	UNIT
Supply voltage, Vcc	-40° C to +85° C	1.65		5.5	V
Supply current, Icc	-40° C to +85° C		0.1		μA

VCC=4.5V to 5.5V, VIH=2.0V, VIL=0.4V, TA=-40°C to +85°C, typical values are at VCC=5.0V, TA=25°C, unless otherwise noted

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNIT
ANALOG SWITCH							
V_{NO}, V_{NC}, V_{COM}	Analog signal range			0		Vcc	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 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	
$I_{NC(OFF)}$, $I_{NO(OFF)}$	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

SYMBOL	PARAMETER	CONDITIONS			MIN	TYP	MAX	UNIT
t_D	Break-before -make time delay	V_{NO} or V_{NC} =1.5V, V_{IH} =1.5V, V_{IL} =0V, R_L =300 Ω, CL=35pF, Test circuit 3	25° C			8		ns
O_{ISO}	Off isolation	V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2}=3V, RL =300 Ω, C_L=35pF, Test circuit 4	f=10MHz	25° C		-52		dB
			f=1MHz	25° C		-72		
BW	-3dB bandwidth	Signal=0dBm, R_L =50 Ω, C_L=5pF, Test circuit 5	25° C			250		MHz
CNC(OFF), CNO(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

VCC=2.7V to 3.6V, VIH=1.6V, VIL=0.3V, TA=-40°C to +85°C, typical values are at VCC=3.0V, TA=25°C, unless otherwise noted

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNIT
ANALOG SWITCH							
V_{NO}, V_{NC}, V_{COM}	Analog signal range			0		Vcc	V
R_{ON}	On-resistance	V_{CC} = 4.5V, V_{NO} or V_{NC} =3.5V, I_{COM} = -10mA, Test circuit 1	25° C		8	16	Ω
			-40° C to +85° C			18	
Δ R_{ON}	On-resistance 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		6	8	Ω
			-40° C to +85° C			12	
$I_{NC(OFF)}$, $I_{NO(OFF)}$	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	1.5			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 5.5V	-40° C to +85° C			1	μA

DYNAMIC CHARACTERISTICS							
SYMBOL	**PARAMETER**	**CONDITIONS**			**MIN**	**TYP**	**MAX**	**UNIT**
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			25		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			20		ns
t_D	Break-before -make time delay	V_{NO} or V_{NC} =1.5V, V_{IH} =1.5V, V_{IL} =0V, R_L =300 Ω, CL=35pF, Test circuit 3	25° C			10		ns
O_{ISO}	Off isolation	V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2}=3V, RL =300 Ω, C_L=35pF, Test circuit 4	f=10MHz	25° C		-52		dB
			f=1MHz	25° C		-72		
BW	-3dB bandwidth	Signal=0dBm, R_L =50 Ω, C_L=5pF, Test circuit 5	25° C			250		MHz
CNC(OFF), CNO(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

TYPICAL PERFORMANCE CHARACTERISTICS

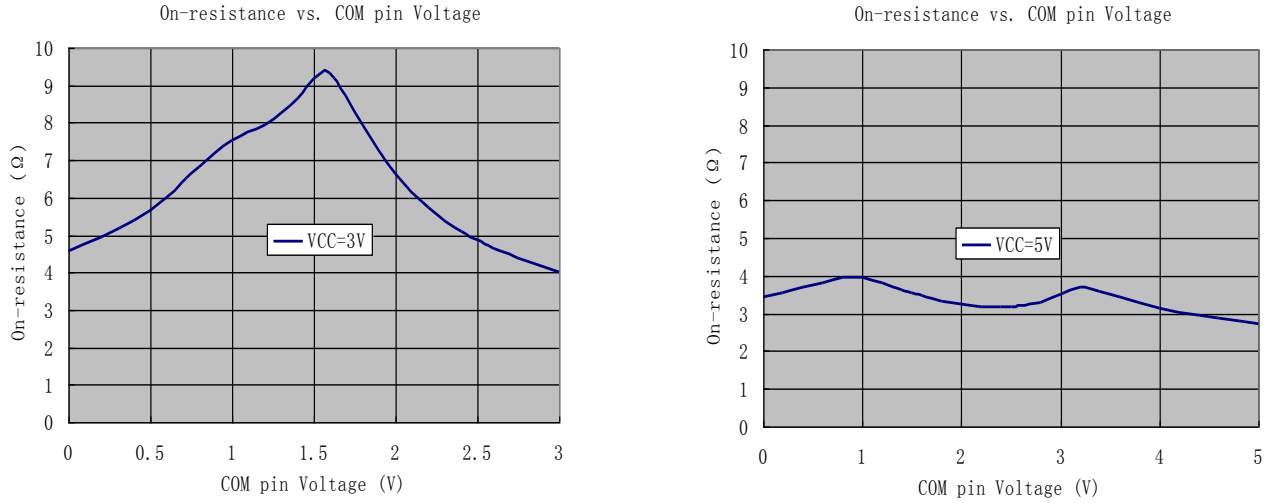
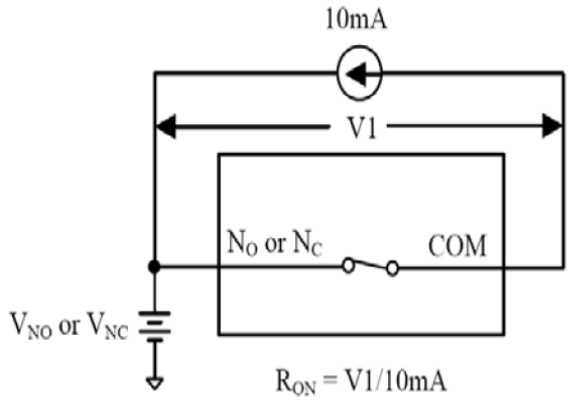
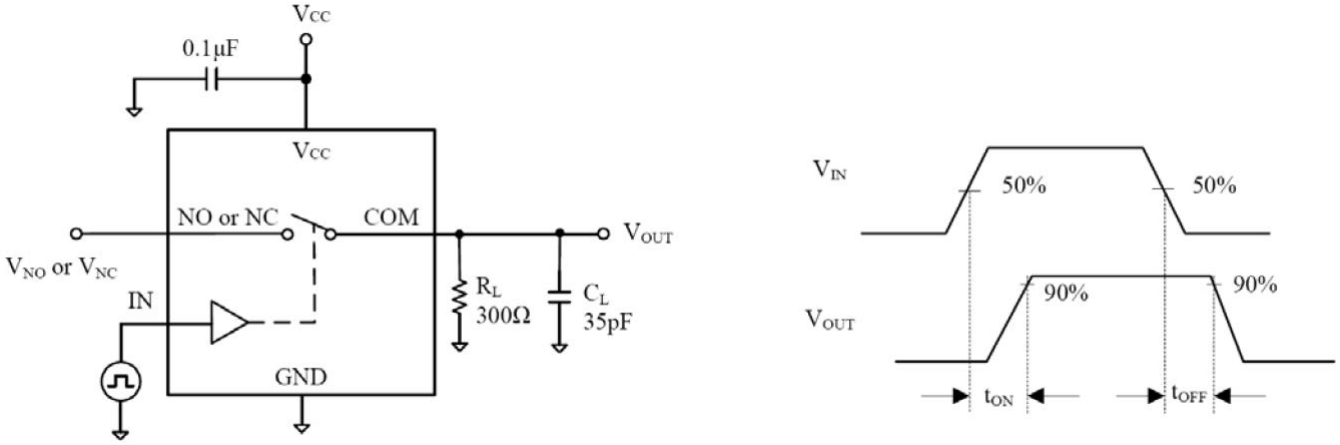


Figure 1: On-resistance vs. COM-pin Volatge

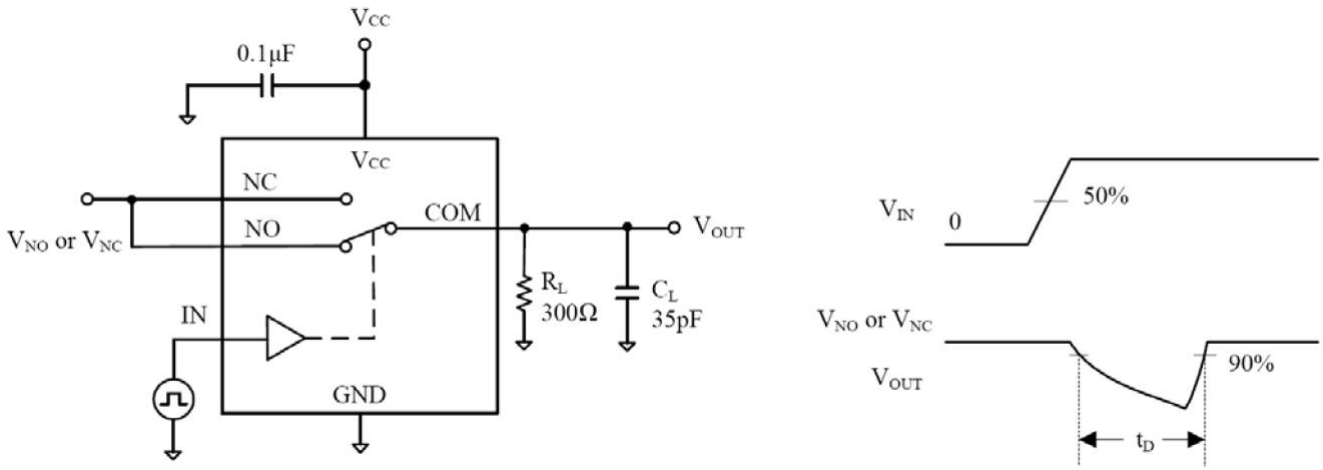
TEST CIRCUITS



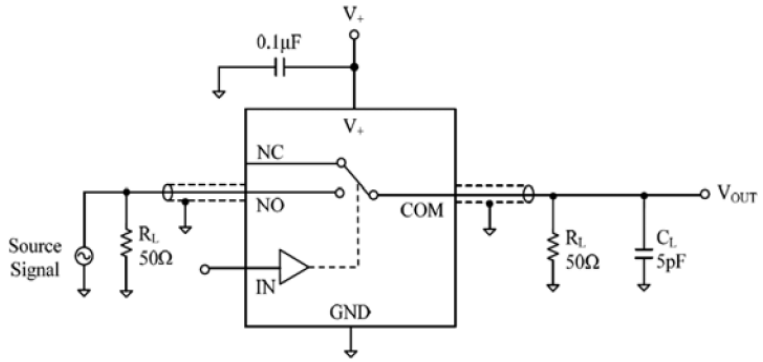
Test Circuit 1. On resistance



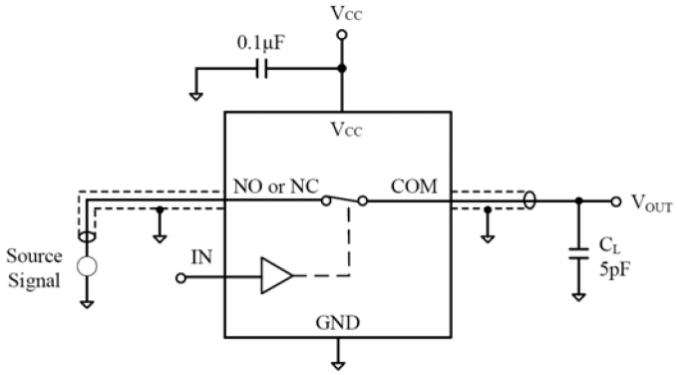
Test Circuit 2. Switch Times



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

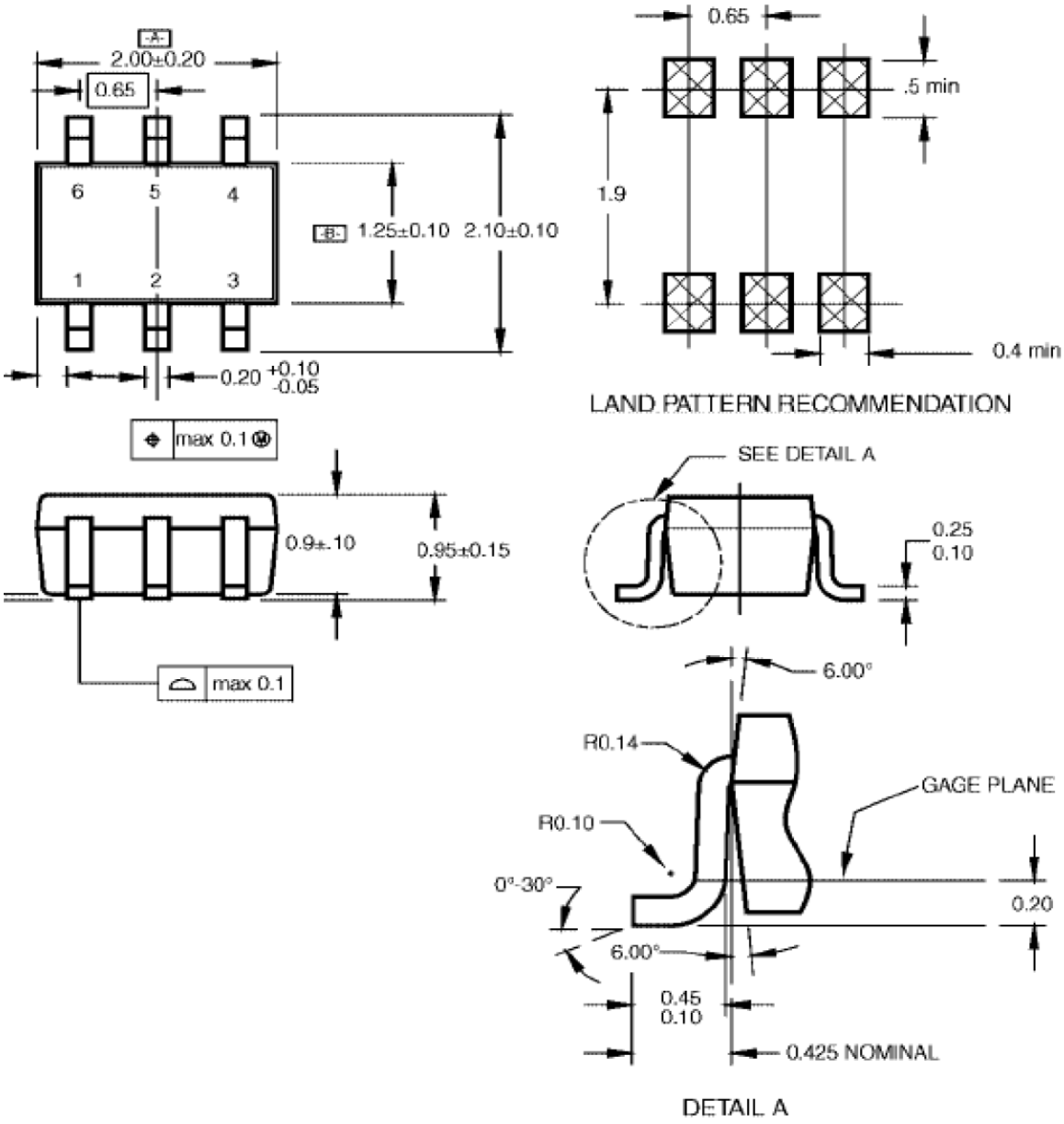


Test Circuit 4. Off-Isolation



Test Circuit 5. -3dB Bandwidth

PHYSICAL DIMENSIONS



Unit: millimeters.

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