



GENERAL DESCRIPTION

The WT6621 is a dual integrated power switch optimized for self-powered and bus-powered Universal Serial Bus (USB) applications. Few external components are necessary to satisfy USB requirements. With independent enable and error flag functions, the WT6621 can ease control the supplied power conditions of USB down stream; each switch channel can supplies up to 500mA to downstream devices; the switch low on-resistance meets USB voltage drop requirements; fault current is limited to typically 750mA, and a flag output is available to indicate fault conditions to the local USB controller. Additional features include thermal shutdown to prevent switch failure from high-current loads, undervoltage lockout (UVLO) to ensure there is a valid input voltage present, and 3.3V and 5V logic compatible enable inputs.

FEATURES

- * Compliant to USB specifications
- * Max. Continuous load current: 500mA
- * 140mΩ maximum on-resistance per channel.
- * 110uA typical on-state supply current
- * 1uA typical off-state supply current
- * Enable input is compatible with both 3V and 5V Logic
- * Logic Over current output
- * Undervoltage lockout
- * Short Circuit Protection
- * Thermal Shutdown
- * Active-high or active-low enable versions
- * 12KV output, 6KV input ESD protection.
- * Packages: 8pin SOIC and 8pin DIP

Applications

- * USB host and Self-power hubs
- * USB bus-powered hub
- * General purpose power switch applications

E-Tech Electronics Ltd.

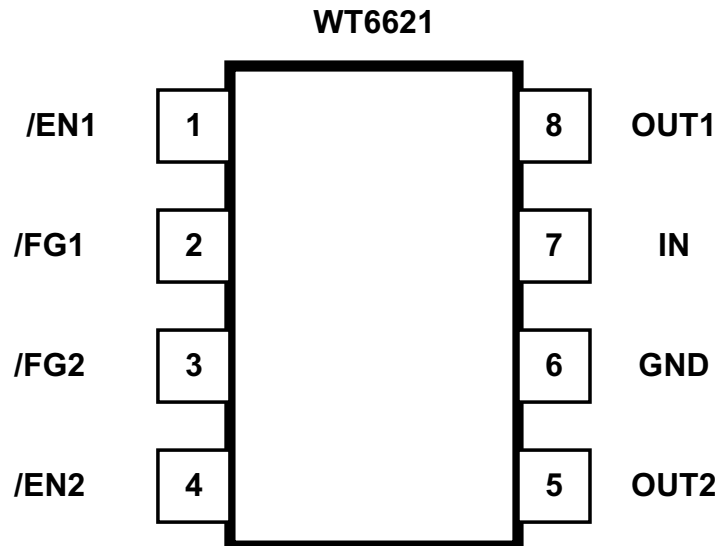
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PIN ASSIGNMENT



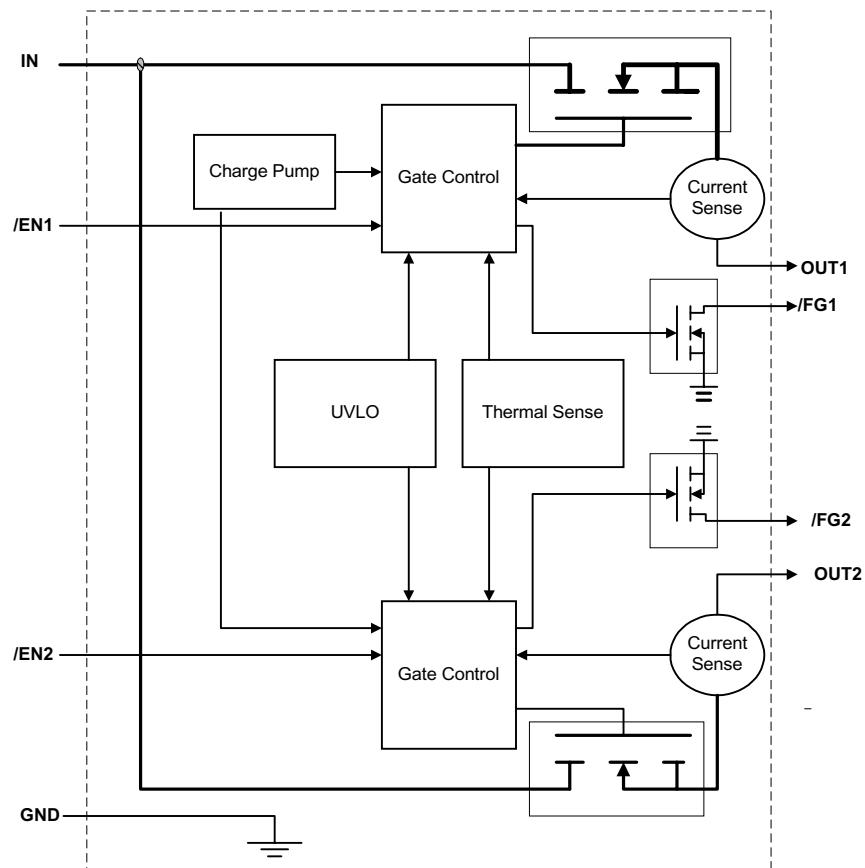
PIN DESCRIPTIONS

Pin Number	Pin Name	I/O	Function Descriptions
1	/EN1	I	Enable input: Logic Compatible input to turns the power switch on. (-NX Active Low, -PX active High)
2	/FG1	O	Fault Flag: Logic output, open drain output. /FG1 is asserted active low to indicate Overcurrent, UVLO, and Thermal Shutdown.
3	/FG2	O	Fault Flag: Logic output, open drain output. /FG2 is asserted active low to indicate Overcurrent, UVLO, and Thermal Shutdown.
4	/EN2	I	Enable input: Logic Compatible input to turns the power switch on. (-NX Active Low, -PX active High)
5	OUT2	O	Power Switch output
6	GND		Ground
7	IN	I	Supply Input
8	OUT1	O	Power Switch output

Package and Ordering Information

Part Number	Enable (/EN)	Package
WT6621-SL	Active Low	8-pin SOIC
WT6621-DL	Active Low	8-pin DIP
WT6621-SH	Active High	8-pin SOIC
WT6621-DH	Active High	8-pin DIP

Block Diagram



FUNCTIONAL DESCRIPTION

The WT6621 is a dual power switches with active low (or active high) enable inputs. Fault conditions; such as Overcurrent, UVLO, and Thermal Shutdown; turns off or inhibit turn on the output power switch, and activate the open drain transistor to sink current and asserts an error flag.

Power Switch

The Power Switch is a CMOS power switch with a maximum on-state resistance of $140\text{m}\Omega$ ($V_{i(IN)}=5\text{V}$, IN (input) is the power supply connection to the drain of the switch and OUT (output) is the source of the switch to be connected to the load.

Charge Pump

The charge pump supplies power to the gate control circuit and provides the necessary voltage to the gate of the CMOS power switch.

Thermal Shutdown

Thermal Shutdown circuit shuts off the output of the power switch and the fault flag(/FG) is asserted when the die temperature rise to approximately 135°C . Approximate 30°C of Hysteresis prevents the switch from turning on until the die temperature drops to approximately 115°C .

Current Limit Induced Thermal Shutdown

Internal circuitry increases the output of the CMOS Power Switch on-resistance until the series combination of the CMOS Power Switch on-resistance and the load impedance limit current to typically 750mA. The increase in power dissipation, in most cases, will cause the WT6621 to go into thermal shutdown, disabling affected channels. When this is undesirable, thermal shutdown can be avoided by externally responding to the fault and disabling the current limited channel before the shutdown temperature is reached. The delay between the flag indication of a current limit fault and thermal shutdown will vary with ambient temperature, board layout, and load impedance, but is typically several hundred milliseconds. The USB controller must therefore recognize a fault and disable the appropriate channel within this time.

Undervoltage Lockout

UVLO(Undervoltage lockout) circuit prevents the output of power switch from turning on until input voltage (IN) exceeds **2.5V** typical. After the switch turns on, UVLO shuts off the output of power switch and the fault flag(/FG) is asserted if the input voltage drops below **2.3V**.

Current Sensing and Limiting

As an overload or short circuit is encountered, the current sense circuit sends a signal to the gate control. Then gate control circuit in turn reduces the gate voltage and drives the power switch into a constant current mode.

Switch Enabled into Short Circuit: If a switch is powered on or enabled into a heavy load or short-circuit, the switch immediately goes into a constant-current mode, reducing the output voltage. The fault flag goes low until the load is reduced.

Short Circuit Applied to Output: When a heavy load is applied, a large transient current may flow until the current limit circuitry will respond. Once this occurs, the device limits current to less than the short-circuit current limit specification.

Current-Limit Response: The WT6621 current-limit profile exhibits a small foldback effect of approximately 500mA. Once this current-limit threshold is exceeded the device enters constant-current mode. This constant current is specified as the short circuit current limit in the Electrical Characteristics table. It is important to note that the WT6621 will deliver load current up to the current-limit threshold which is typically 0.75A.



WT6621

Dual USB Power Control Switch

Fault Flag

The fault flag (/FG) is active low for one or more of the following fault conditions: undervoltage, overload or short circuit, or thermal shutdown. /FG pin is capable of sinking a 10mA load.

Absolute Maximum Ratings

Supply voltage(V _{in})	+6.0V
Output voltage(V _o)	+6.0V
Output current(I _o)	internally limited
Fault Flag voltage(V _{FG})	+6.0V
Fault Flag current(I _{FG})	50mA
Control Input(V _{EN})	-0.3V to 12V
Storage Temperature(T _s)	-65°C to +150°C
Lead Temperature(Soldering 5 sec.)	260°C

Operating Ratings

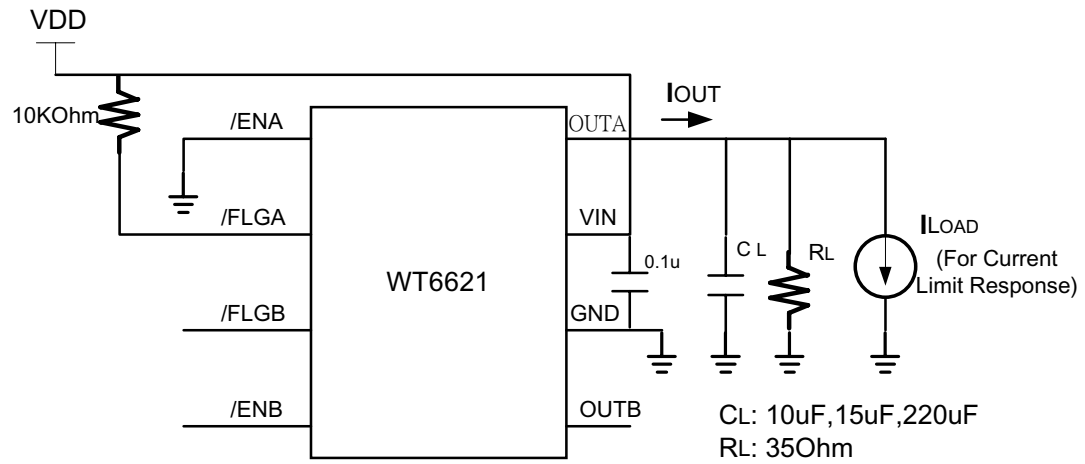
Supply voltage(V _{IN})	+4V to +5.5V
Ambient Operating Temperature(T _A)	-40°C to +85°C
Supply Voltage (V _{IN})	+3V to 5.5V
Continuous output current, I _o	0.6A Max.

ELECTRICAL CHARACTERISTICS

V_{IN}=5.0V ± 5% , T_a=25 °C)

Parameter	Condition	Min	Typ	Max	Units
Supply Current	Switch off, Open load		0.75	2	uA
	Switch on, Open load		110	150	uA
Enable Input Treshold voltage	Low to high transition		2.1	2.4	V
	High to low transition	0.8	1.6		V
Enable Input current	V _{EN} = 0 to 5.5V			1	uA
Switch Reistnce	V _{IN} = 5V, I _{out} =500mA		100	140	mOhm
Output Turn on delay	RL=10 Ohm each Output		0.5		ms
Output Turn on Rise Time	RL=10 Ohm each Output		1		ms
Output Turn off Delay	RL=10 Ohm each Output		1	20	us
Output Turn off Fall Time	RL=10 Ohm each Output		1	20	us
Continous Load Current	Each output	500			mA
Short Circuit Current Limit	Each output, V _{out} = 4.0V	0.5	0.75	1.25	A
Current limit threshold	Ramp Load applied to V _{out} <4.0V		0.75	1.25	A
Overtemperature Shutdown Threshold	T _j increasing		135		C
	T _j decreasing		115		C
UVLO Threshold	V _{IN} increasing		2.5		V
	V _{IN} dcreasing		2.3		V

Functional characterisitcs test circuit

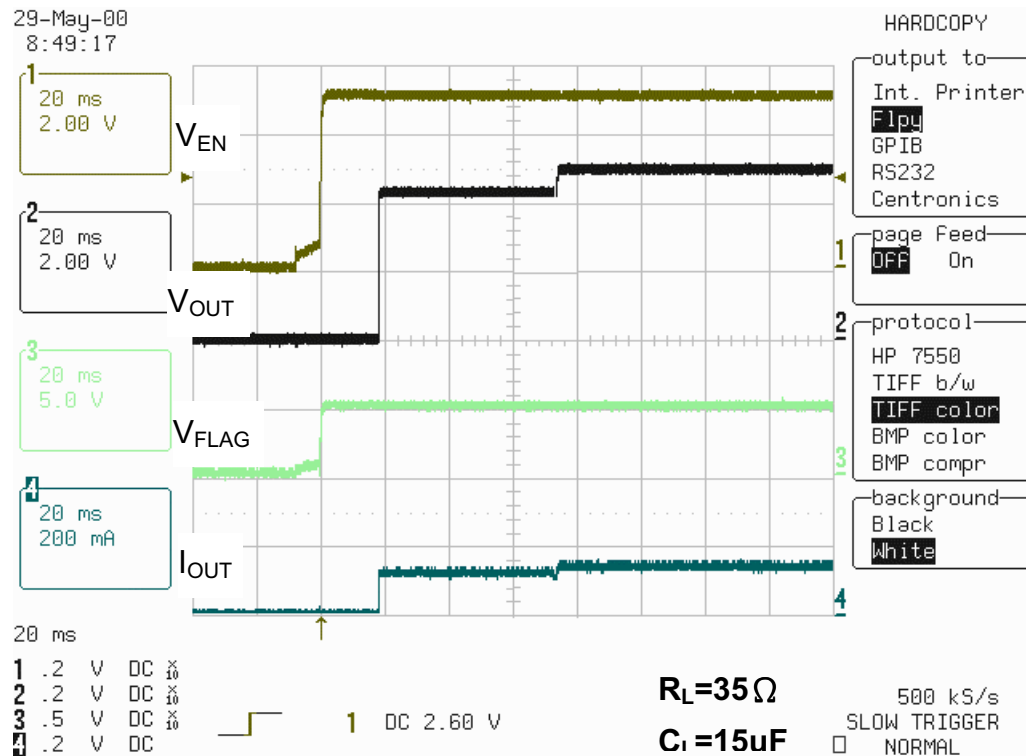


Input voltage response characteristics

Test circuit : WT6621 Functional Characterisitcs Test circuit

Test equipment:

- Test power supply : Agilent E3631A
- Test scope:LeCory LC564A
- Test electronic load: Zentech 2600A



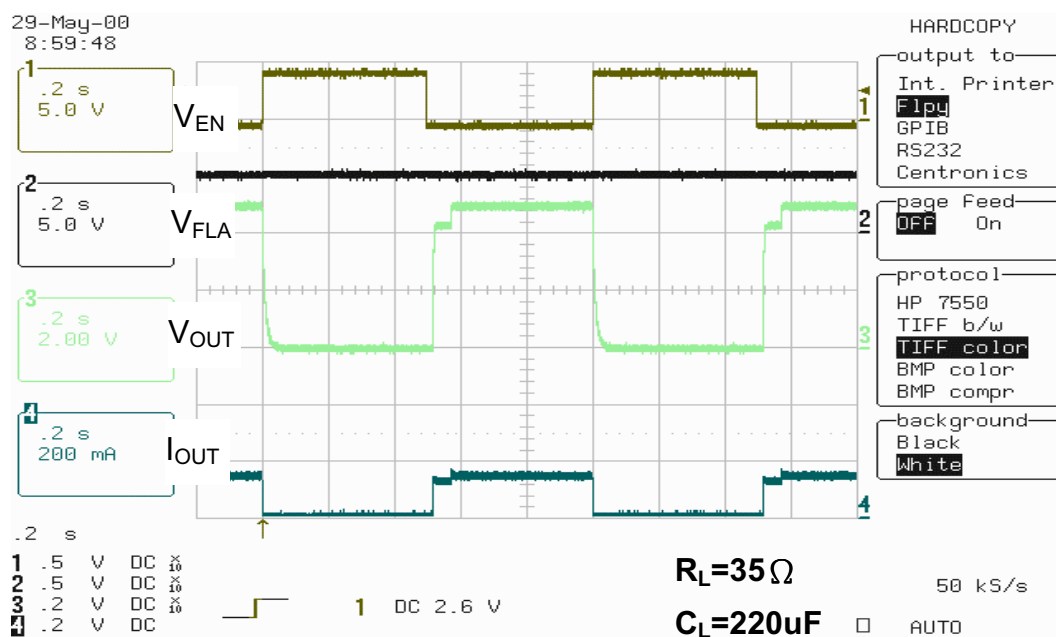
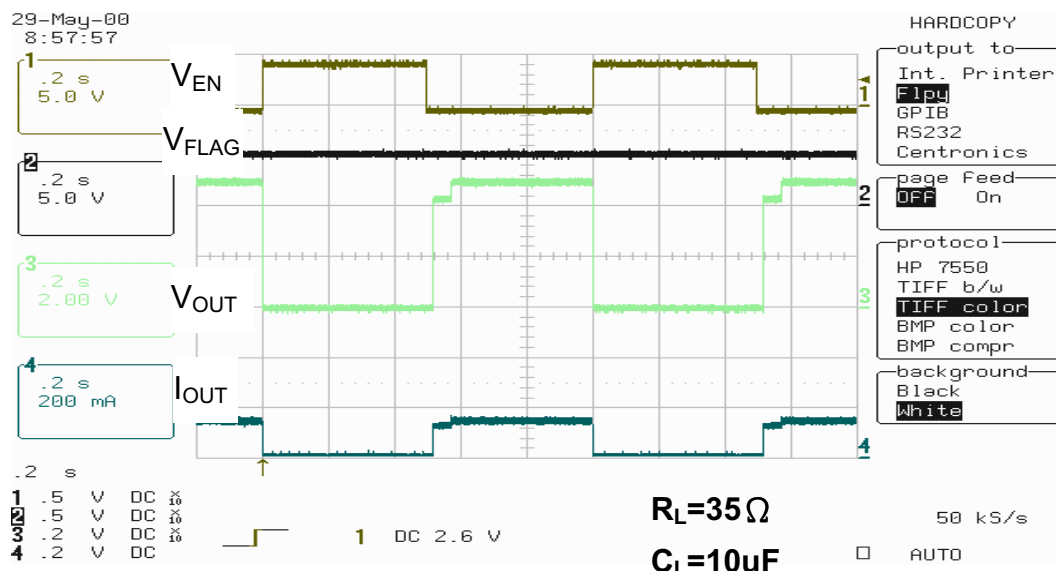
Turn On/Off response characteristics

Test circuit : WT6621 Functional Characterisitcs Test circuit

Test equipment:

- Test power supply : Agilent E3631A
- Test scope:LeCory LC564A
- Test function generator : HP 33120A

NOTE : Use function generator to create a square wave signal(1HZ/0V->5V)



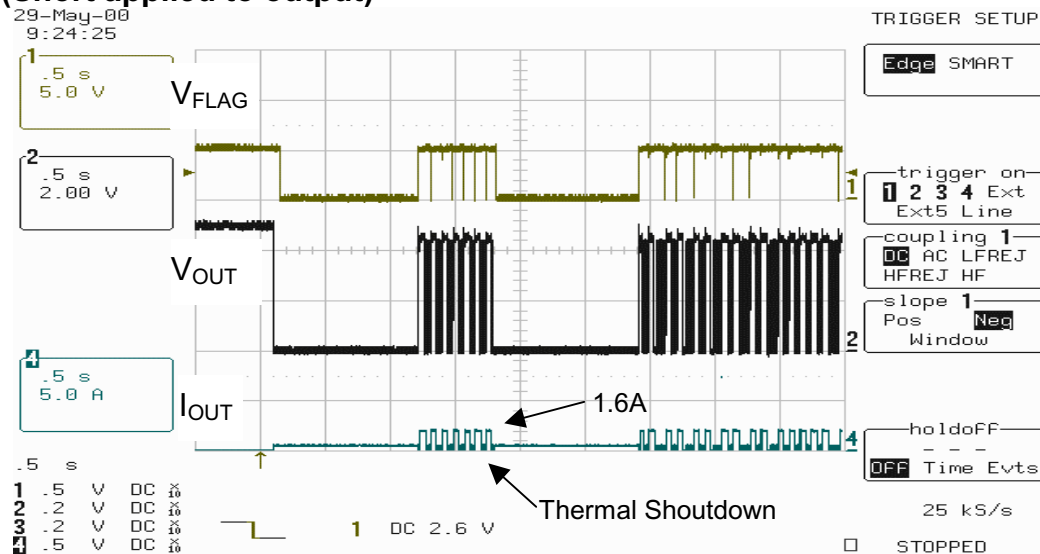
Short-circuit response characteristics

Test equipment:

- Test power supply : Agilent E3631A
- Test scope: LeCory LC564A
- Test DC electronic load : Zentech 2600A

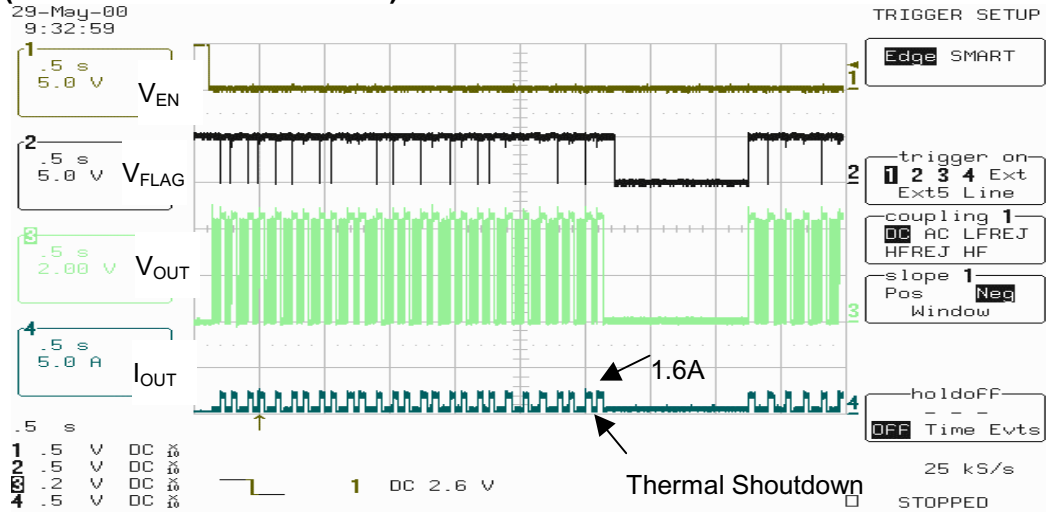
Short-circuit response

(Short applied to output)



Short-circuit response

(Enable into Short Circuit)



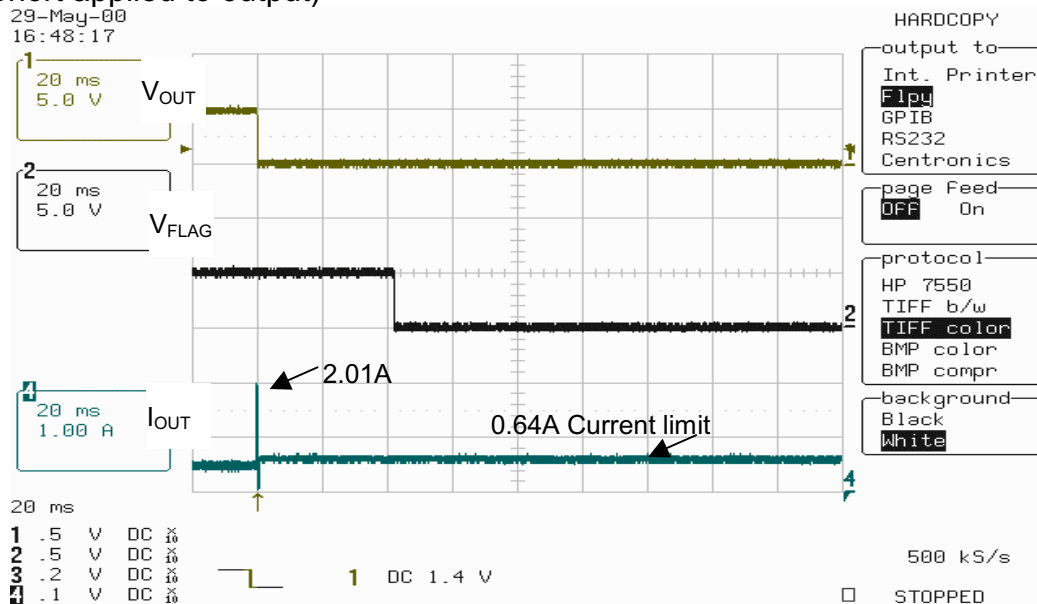
Short-circuit transient response characteristics

Test equipment:

- Test power supply : Agilent E3631A
- Test scope: LeCory LC564A
- Test DC electronic load : Zentech 2600A

Short circuit transient response

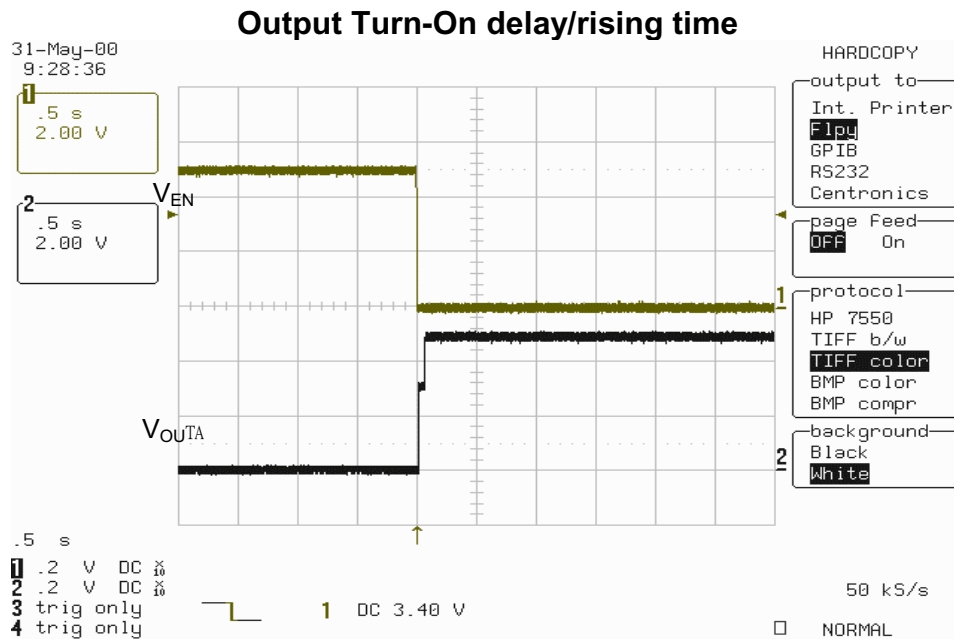
(Short applied to output)



Output Turn-On delay/rising time test

Test equipment:

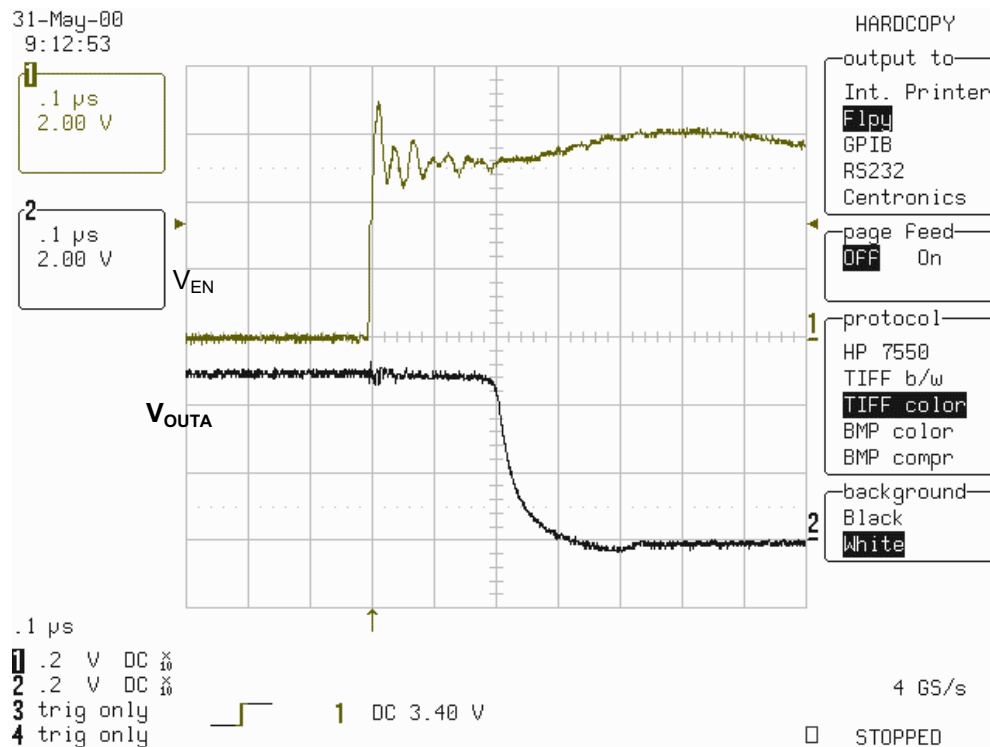
- Test power supply : Agilent E3631A
- Test scope: LeCory LC564A
- Test DC electronic load : Zentech 2600A



Output Turn-Off delay/falling time test

Test equipment:

- Test power supply : Agilent E3631A
- Test scope: LeCory LC564A
- Test DC electronic load : Zentech 2600A



Typical Application Circuit

