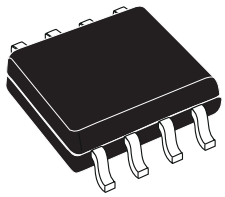
STMPS2242, STMPS2252 STMPS2262, STMPS2272

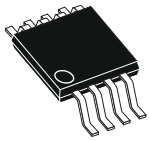
Enhanced dual-channel power switches

Features

- 100 mΩ high-side MOSFET switch
- 500 mA/1000 mA continuous current per channel
- Thermal protection
- Independent short-circuit protection with overcurrent logic output
- Operating range from 2.7 V to 5.5 V
- CMOS and TTL compatible inputs
- 2.5 ms typical rise time
- Undervoltage lockout
- 13 µA maximum standby supply current
- Ambient temperature range: -40 °C to 85 °C
- 8 kV ESD protection
- Reverse current protection
- Fault blanking



SO-8



MSOP8

Description

The STMPS2242/2252/2262/2272 power distribution switches are intended for applications where heavy capacitive loads and short-circuits are likely to be encountered. These devices incorporate 100 mΩ MOSFET high-side power switches for power distribution systems that require multiple power switches in a single package.

Each switch is controlled by an independent logic enable input. When the output load exceeds the current limit threshold or a short is present, these devices limit the output current to a safe level by switching into a constant current mode, pulling the overcurrent (OCx) logic output low. When continuous heavy overloads and short-circuits increase the power dissipation in the switch, causing the junction temperature to rise, a thermal protection circuit shuts off the switch to prevent damage. Recovery from a thermal shutdown is automatic once the device has cooled sufficiently. Internal circuitry ensures the switch remains off until valid input voltage is present.

Table 1. Device summary

Order code		Current limit (mA)	Enable	Packing
SO-8	MSOP8(1)			
STMPS2242MTR	STMPS2242TTR	500	Active low	Tape and reel
STMPS2252MTR	STMPS2252TTR	500	Active high	Tape and reel
STMPS2262MTR	STMPS2262TTR	1000	Active low	Tape and reel
STMPS2272MTR	STMPS2272TTR	1000	Active high	Tape and reel

1. MSOP8 is also known as TSSOP8.

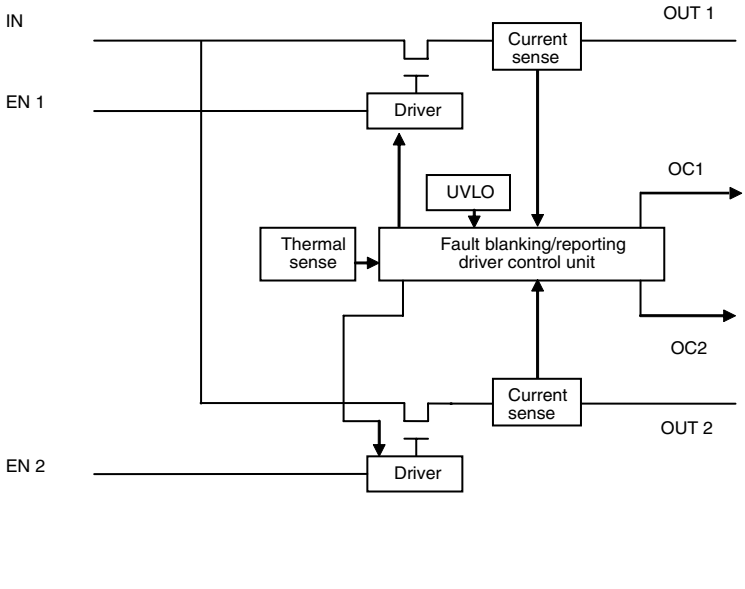
Contents

List of tables

List of figures

1 Block diagram

Figure 1. Block diagram



2 Pin descriptions

Figure 2. Pinout

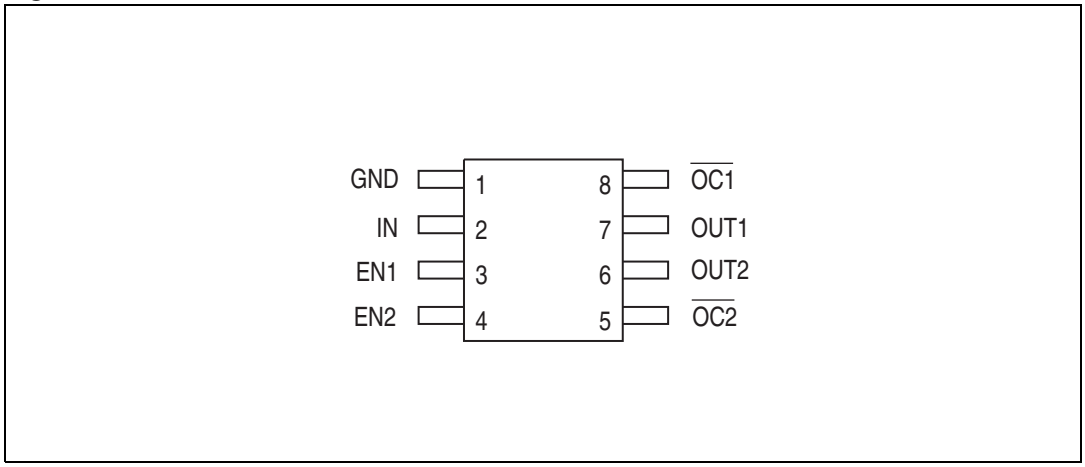


Table 2. Pin descriptions

Pin number	Name	Type	Function
1	GND	—	Ground
2	IN	—	V_{CC} input, 2.7 - 5.5 V
3	$\overline{EN1}$/EN1	I	Channel 1 active low (STMPS2242 and STMPS2262) or active high (STMPS2252 and STMPS2272) enable
4	$\overline{EN2}$/EN2	I	Channel 2 active low (STMPS2242 and STMPS2262) or active high (STMPS2252 and STMPS2272) enable
5	$\overline{OC2}$	O	Open drain output for fault indication of channel 2
6	OUT2	—	Output of channel 2
7	OUT1	—	Output of channel 1
8	$\overline{OC1}$	O	Open drain output for fault indication of channel 1

3 Functional description

3.1 Fault blanking

The STMPS devices feature a 10 ms fault blanking. Fault blanking allows current-limit faults, including momentary short-circuit faults that occur when hot-swapping a capacitive load, and also ensures that no fault is issued during power-up. When a load transient causes the device to enter current limit, an internal counter starts. If the load fault persists beyond the 10 ms fault-blanking timeout, the FAULT output asserts “low”. Load-transient faults less than 10 ms (typ.) do not cause a FAULT output assertion. Only current-limit faults have fault-blanking. Die overtemperature faults and input voltage drops below the UVLO threshold cause an immediate fault output.

3.2 Overcurrent/overtemperature protection

In overcurrent or short-circuit condition, the switch limits the current at 500 mA for STMPS2242/STMPS2252 and 1000 mA for STMPS2262/STMPS2272. If the temperature of the die goes above the limit value, the switch turns OFF.

3.3 Reverse current blocking

When the switch is OFF, or when the STMPS device is not powered (V_{CC}=0 V), the switch behaves as a Hi-Z at the output pin, ensuring that no reverse current will flow into the device when V_I<V_O.

Note: In the case where the switch is ON, and a voltage higher than V_I is applied to the OUT pin, a reverse current will occur.

3.4 UVLO

When the input voltage drops below the threshold value, the power switch turns OFF to prevent improper operation due to low voltage.

4 Maximum rating

Stressing the device above the rating listed in the absolute maximum ratings table may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those indicated in the operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

4.1 Absolute maximum rating

Table 3. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_I	Input voltage range	–0.3 – 6.0	V
V_O	Output voltage range	–0.3 – (V_I +0.3)	V
V_{IENx}	EN input voltage range	–0.3 – 6.0	V
I_O	Continuous output current	Internally limited	
ESD	ESD protection level	8	kV
T_J	Junction operating temperature	–40 to 125	°C
T_{STG}	Storage temperature	–55 to 150	°C
T_R	Thermal resistance (MSOP8)	220	°C/W
T_R	Thermal resistance (SO-8)	160	°C/W

4.2 Recommended operating conditions

Table 4. Recommended operating conditions

Symbol	Parameter	Value			Unit
		Min	Typ	Max	
V_I	Input voltage	2.7	5.0	5.5	V
V_O	Output voltage	0	5.0	5.5	V
I_O (STMPS2242 STMPS2252)	Continuous output current	0	-	500	mA
I_O (STMPS2262 STMPS2272)	Continuous output current	0	-	1000	mA

5 Electrical specifications

Table 5. Electrical characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min	Typ	Max	
Rds(on)	Static drain source ON state resistance	V_I = 2.7 V T_J = 25°C		120	160	mΩ
		V_I = 5.0 V T_J = 25°C;		105	115	mΩ
Rds(on)	Static drain source ON state resistance	V_I = 2.7 V -40 < T_J < 125°C			200	mΩ
		V_I = 5.0 V -40 < T_J < 125°C			140	
t_r	Output rise time (STMPS2242,STMPS2252)	V_I = 5.0 V R_{LOAD} = 10 Ω C_{LOAD} = 1 µF	0.05		2	ms
	Output rise time (STMPS2262,STMPS2272)	V_I = 5.0 V R_{LOAD} = 10 Ω C_{LOAD} = 1 µF	0.05		2	ms
t_f	Output fall time (STMPS2242,STMPS2252)	V_I = 5.0 V R_{LOAD} = 10 Ω C_{LOAD} = 1 µF	0.05		2	ms
	Output fall time (STMPS2262,STMPS2272	V_I = 5.0 V R_{LOAD} = 10 Ω C_{LOAD} = 1 µF	0.05		2	ms

Table 6. Current limit characteristics
(V_I = 5.5 V, I_O = rated current, T_J = 25°C, unless otherwise specified)

Symbol	Parameter	Test condition	Value			Unit
			Min	Typ	Max	
I_{OS} (STMPS2242 STMPS2252)	Short circuit output current	V_I = 5 V OUT connected to GND through 10 mΩ load, device enabled into short circuit	0.6	0.8	1.0	A
I_{OS} (STMPS2262 STMPS2272)			1.1	1.6	2.0	A

Table 7. Supply current characteristics
(V_I = 5.5 V, I_O = rated current, T_J = 25°C, unless otherwise specified)

Symbol	Parameter	Test condition	Value			Unit
			Min	Typ	Max	
I_{off}	Switch turned off	No load Switch is off		9	14	µA
		No load Switch is off -40 < T_J < 125°C			16	
I_{on}	Switch turned on	No load Switch is on		50	70	µA
		No load Switch is on -40 < T_J < 125°C			85	
$I_{leakage}$	Output leakage current (1)	$I_{off\ (grounded\ output)}$ - $I_{off\ (floating\ output)}$		1	2	µA
		$I_{off\ (grounded\ output)}$ - $I_{off\ (floating\ output)}$ -40 < T_J < 125°C		1	6	
$I_{reverse}$	Reversed leakage current	Switch is off V_I < V_O, Output connected to 5.5 V, 25°C		1	2	µA
		Switch is off V_I < V_O Output connected to 5.5 V, 125°C		1	10	

1. $I_{leakage} = I_{off\text{-}ground} - I_{off}$, where $I_{off\text{-}ground}$ = current into IN when switch is off and output is grounded

Table 8. Thermal characteristics
(V_I = 5.5 V, I_O = rated current, T_J = 25°C, unless otherwise specified)

Symbol	Parameter	Test condition	Value			Unit
			Min	Typ	Max	
T1	Thermal shutdown threshold		135			°C
T2	Recovery from thermal shutdown		125			°C
Hysteresis				10		°C

Table 9. UVLO characteristics
(V_I = 5.5 V, I_O = rated current, T_J = 25°C, unless otherwise specified)

Symbol	Parameter	Test condition	Value			Unit
			Min	Typ	Max	
V_{UVLO}	Undervoltage lockout threshold		2.0		2.5	V
Hysteresis				75		mV

Table 10. OCx pin characteristics
(V_I = 5.5 V, I_O = rated current, T_J = 25°C, unless otherwise specified)

Symbol	Parameter	Test condition	Value			Unit
			Min	Typ	Max	
OC blanking	OCx assertion and de-assertion		4	8	15	ms
V_O	Output low voltage	I_O = 5 mA	–	–	0.4	V
I_{off}	Off current	V_{OC} = 2.7 V, 5.5 V (No OC condition)	–	–	1.0	µA

Table 11. ENx pin characteristics
(V_I = 5.5 V, I_O = rated current, T_J = 25°C, unless otherwise specified)

Symbol	Parameter	Test condition	Value			Unit
			Min	Typ	Max	
V_{IH}	High level input voltage	V_I = 2.7 V to 5.5 V	2.0	–	–	V
V_{IL}	Low level input voltage	V_I = 4.5 V to 5.5 V	–	–	0.8	V
		V_I = 2.7 V to 4.5 V	–	–	0.4	V
I_I	Input current	V_{IENx} = 0 V or V_I	-0.5	–	0.5	µA
t_{on}	Turn ON time(1)	R_{LOAD} = 10 Ω C_{LOAD} = 100 µF	–	–	5	ms
t_{off}	Turn OFF time (1)	R_{LOAD} = 10 Ω C_{LOAD} = 100 µF	–	–	10	ms

1. Not tested in production, specified by design.

6 Typical operating characteristics

6.1 STMPS2242, STMPS2252 characteristics

The waveforms and characteristics shown in this section pertain to the STMPS2252 device. The STMPS2242 is expected to have the same characteristics with inverted EN input function. All measurements are at ambient temperature 25 °C.

6.1.1 Turn-on/off characteristics for V_I = 3 V, R_{LOAD} = 6 Ω

Figure 3. Turn-on for C_{LOAD} = 1 µF

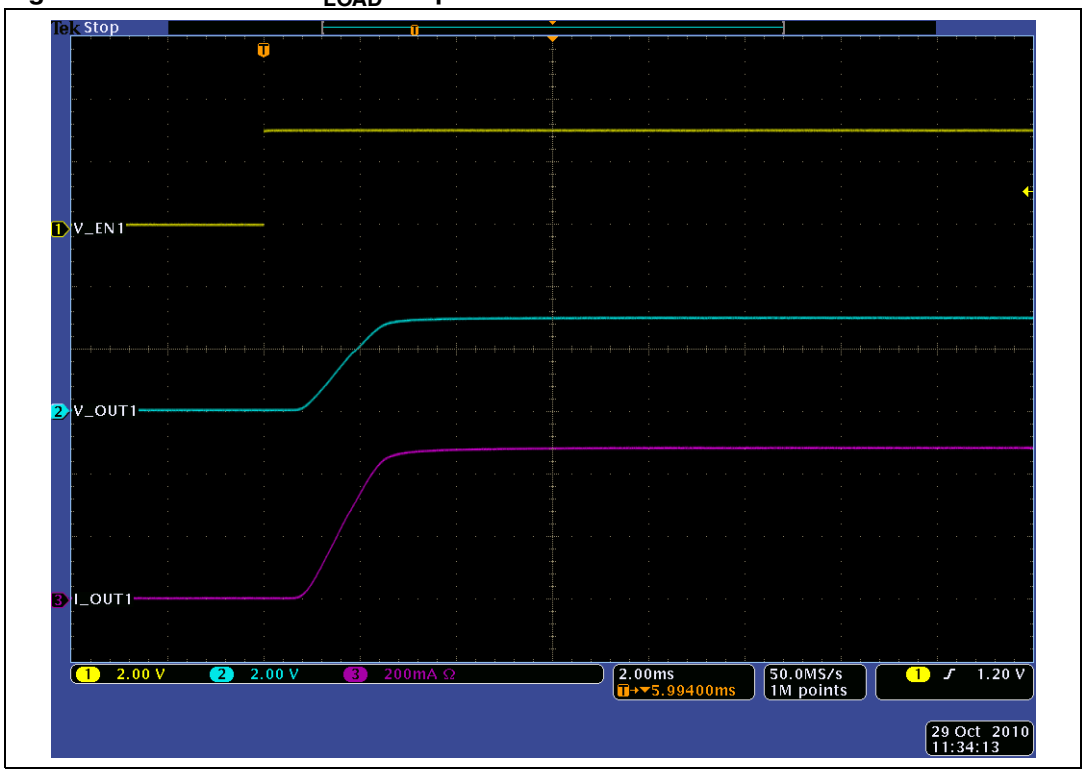


Figure 4. Turn-on for C_{LOAD} = 100 µF

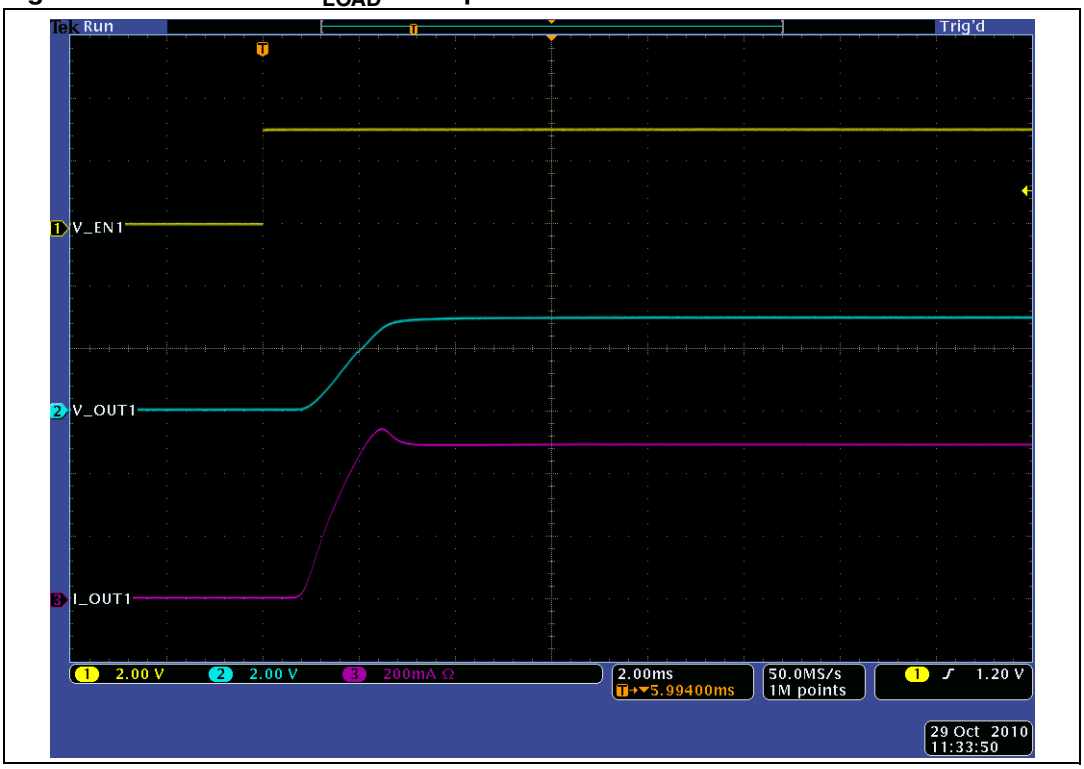


Figure 5. Turn-on for C_{LOAD} = 470 µF

Figure 6. Turn-off for C_{LOAD} = 1 µF

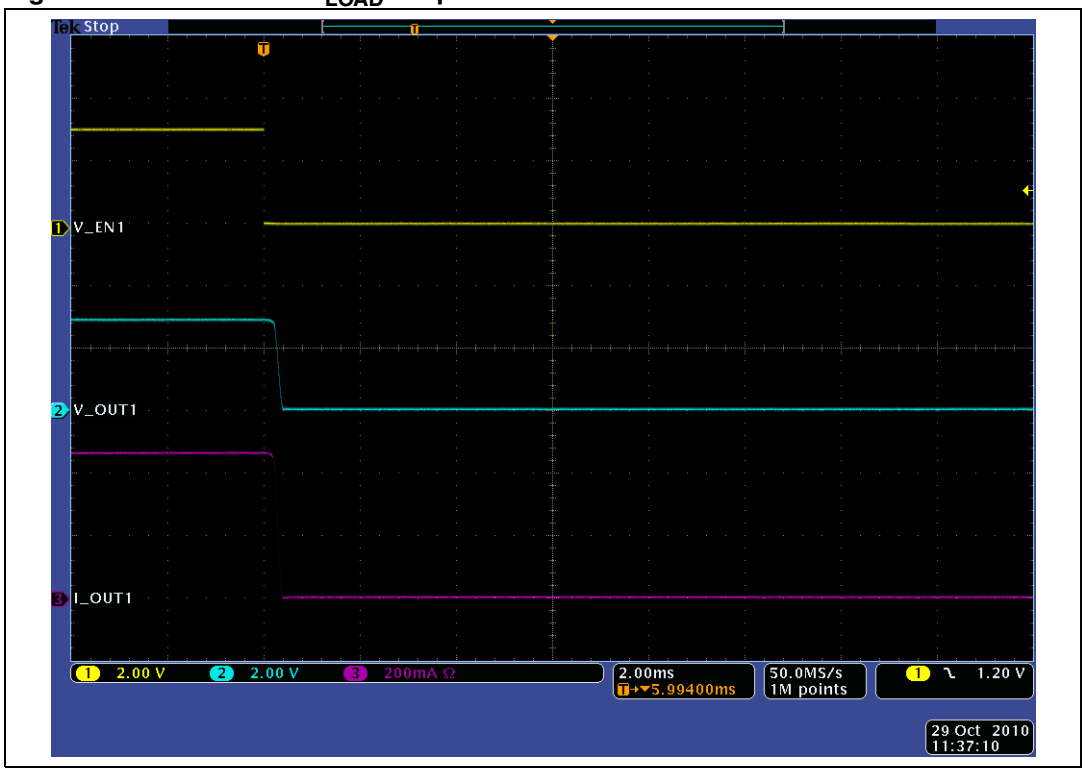


Figure 7. Turn-off for C_{LOAD} = 100 µF

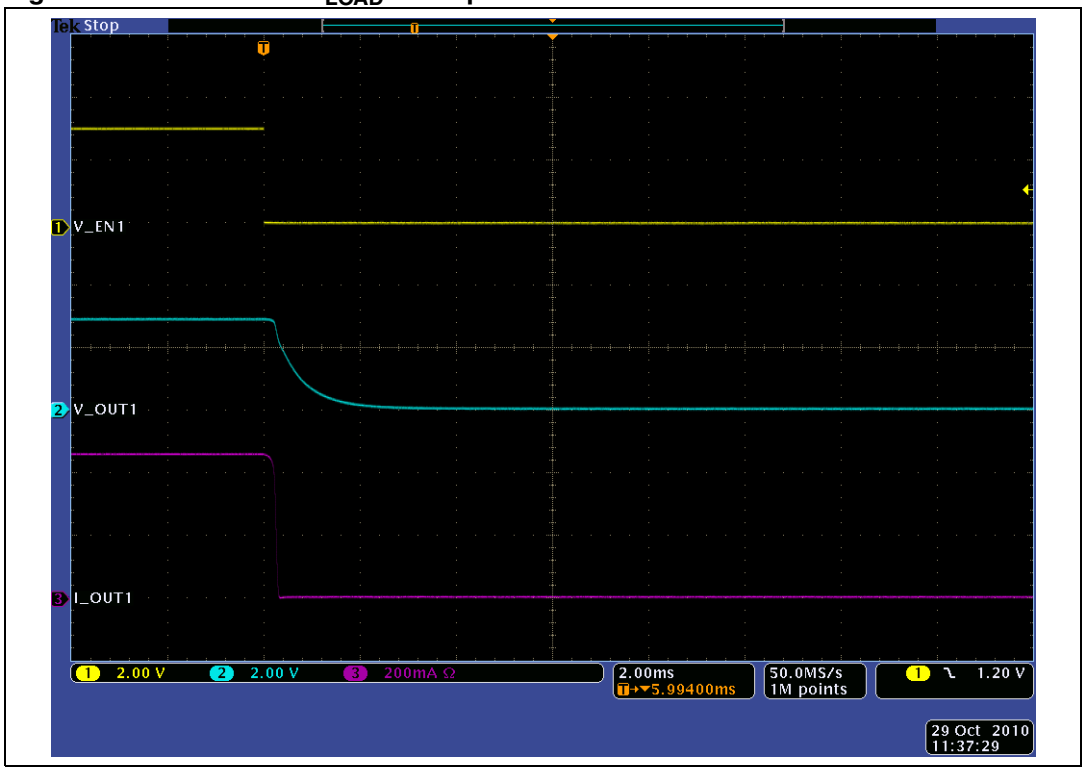
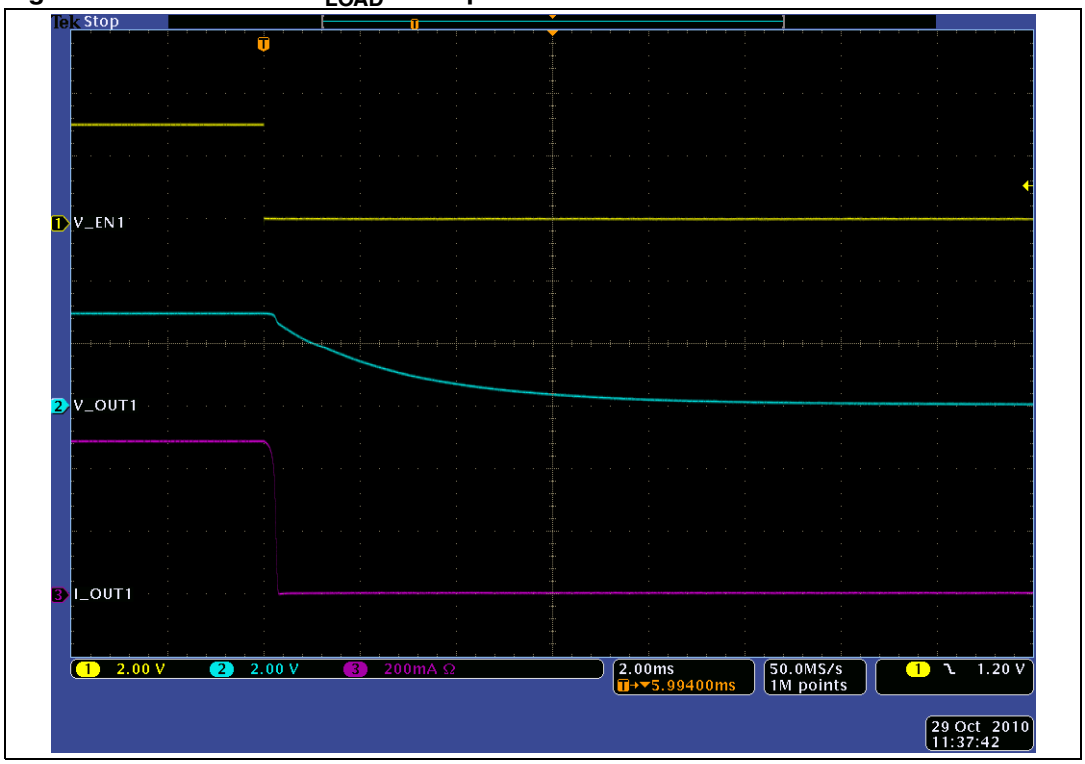


Figure 8. Turn-off for C_{LOAD} = 470 µF



6.1.2 Turn-on/off characteristics for V_I = 5 V, R_{LOAD} = 10 Ω

Figure 9. Turn-on for C_{LOAD} = 1 µF

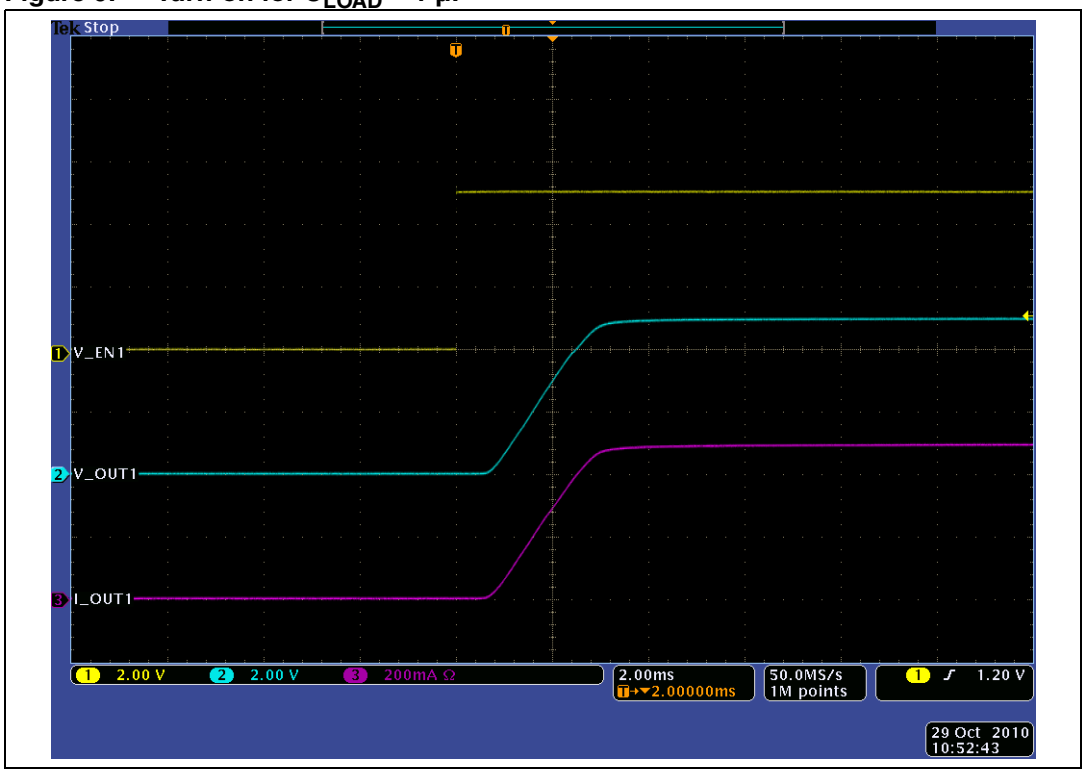


Figure 10. Turn-on for C_{LOAD} = 100 µF

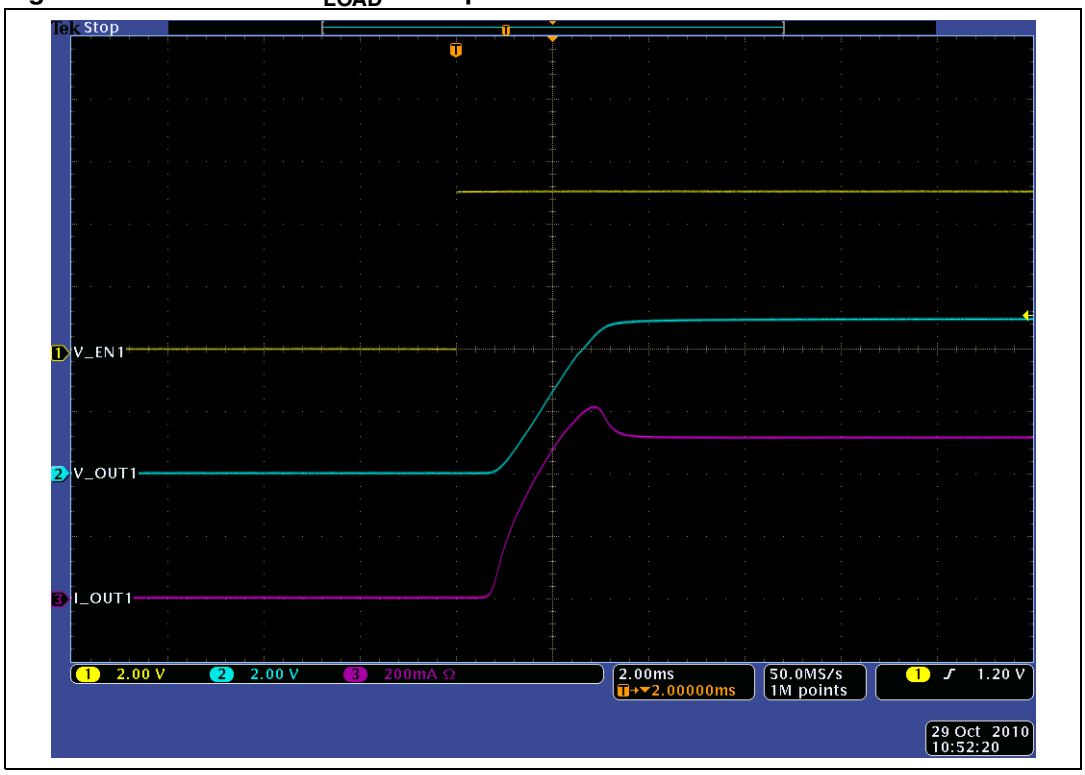


Figure 11. Turn-on for C_{LOAD} = 470 µF

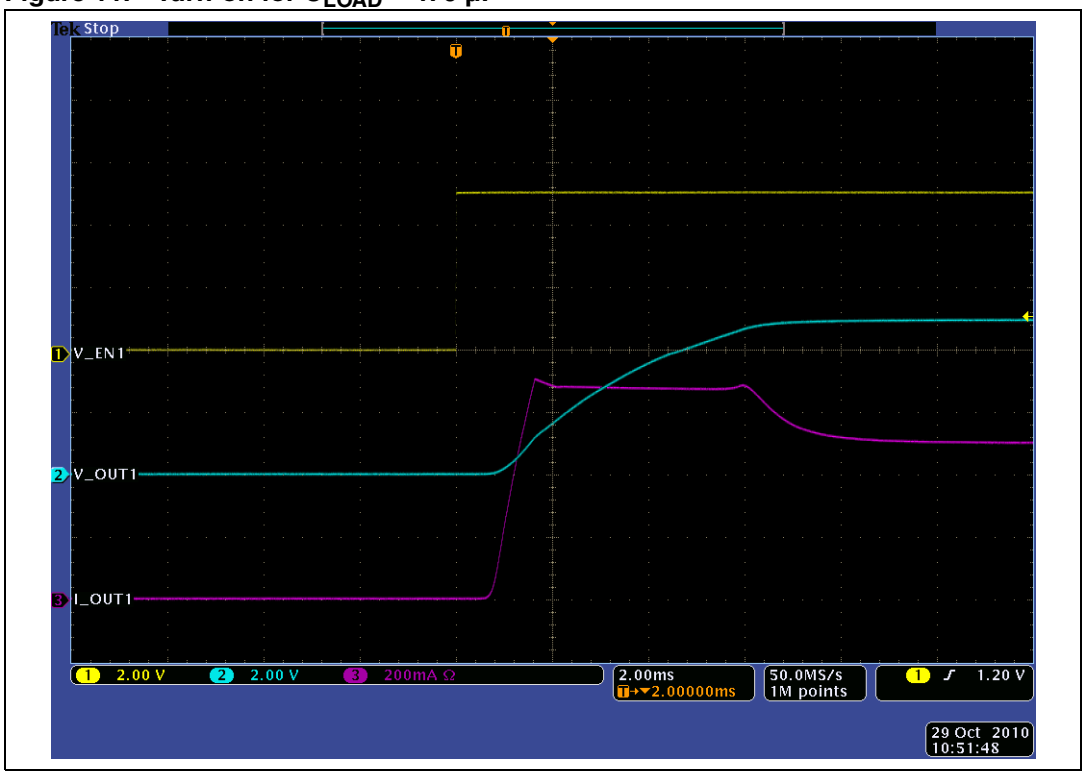


Figure 12. Turn-off for C_{LOAD} = 1 µF

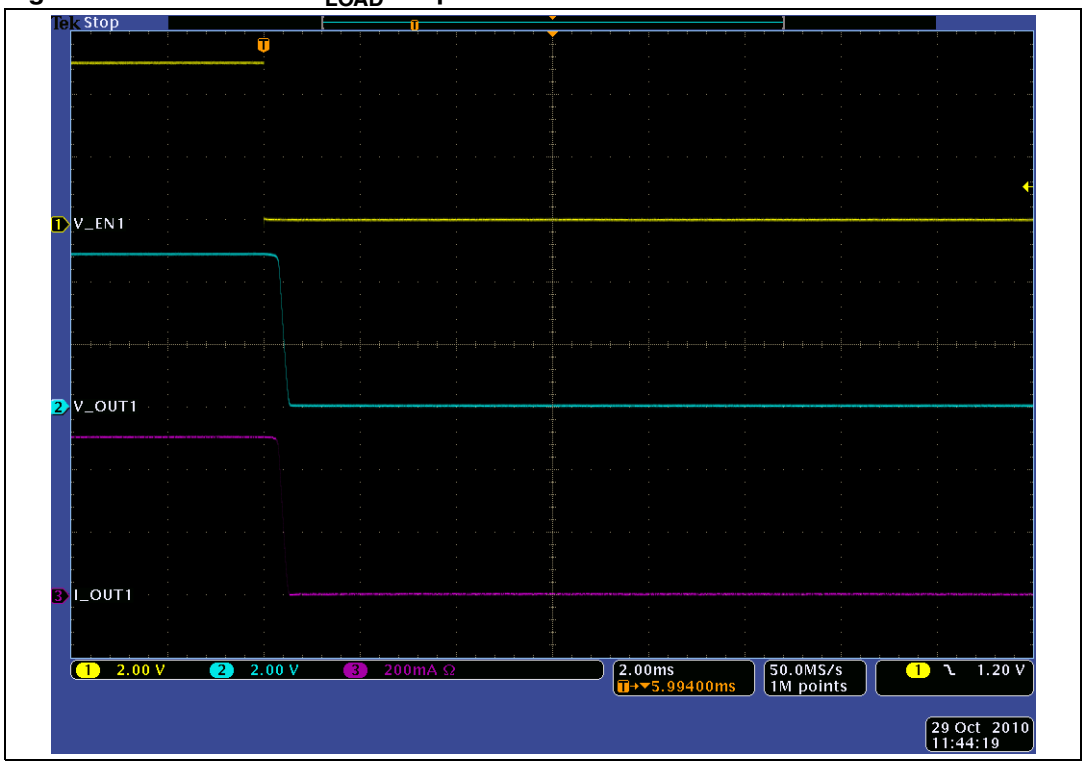


Figure 13. Turn-off for C_{LOAD} = 100 µF

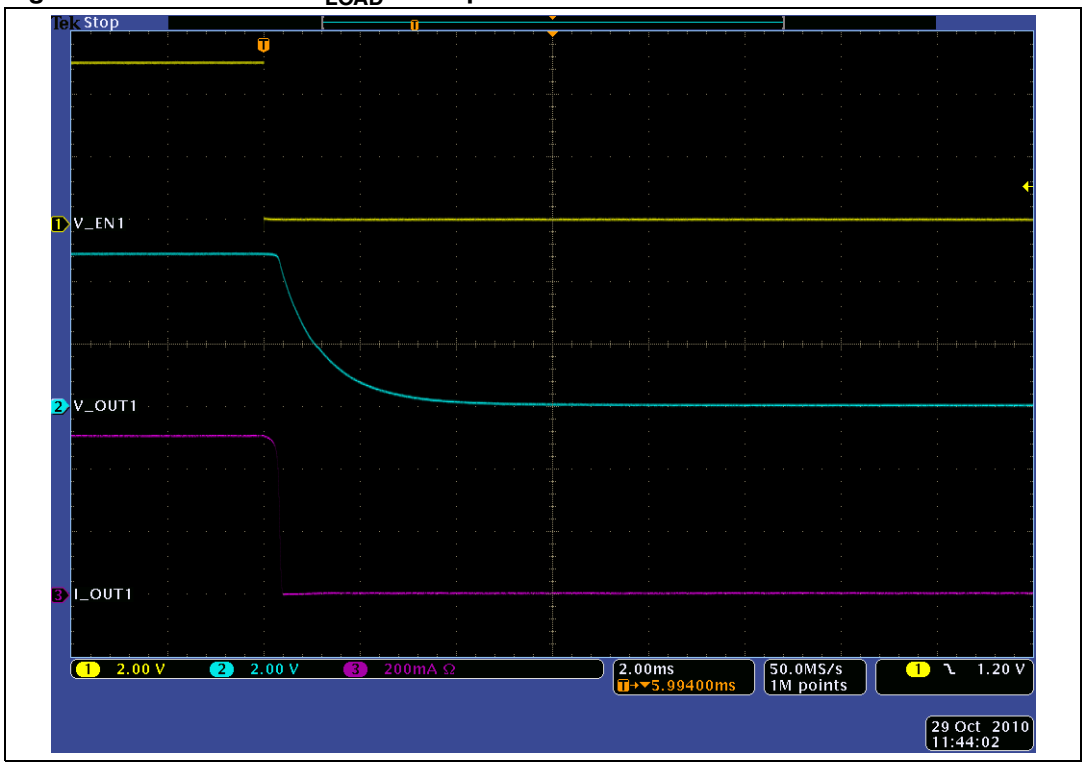
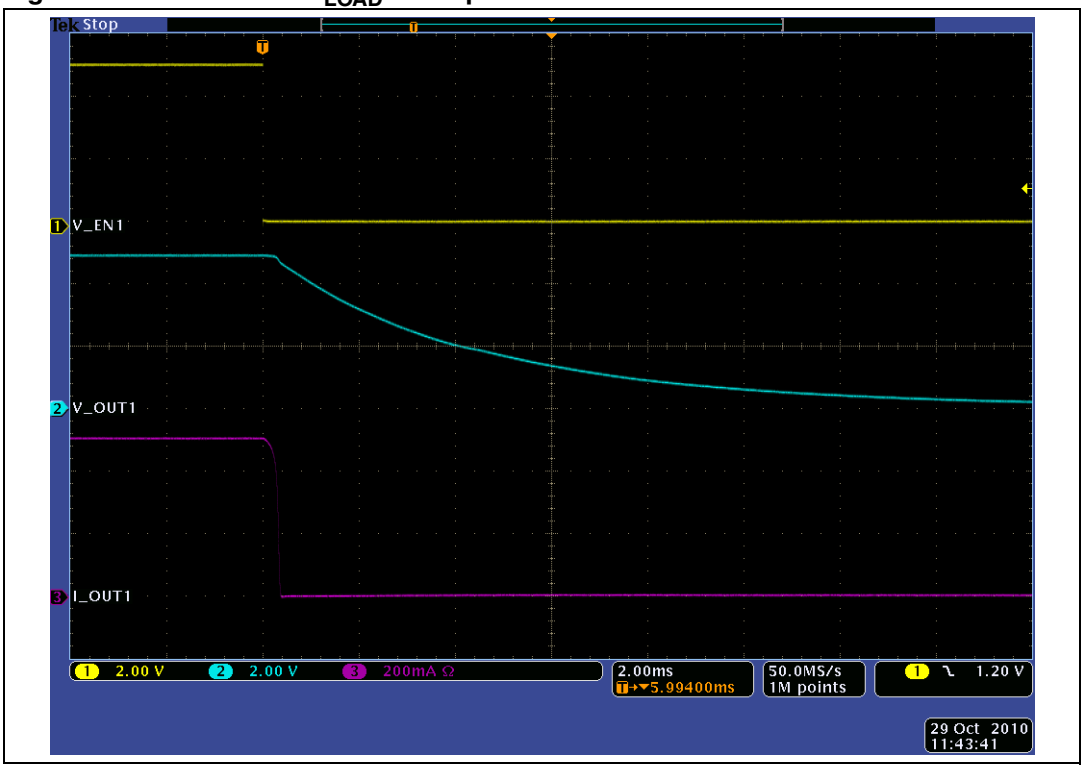


Figure 14. Turn-off for C_{LOAD} = 470 µF



6.1.3 UVLO characteristics

Figure 15. UVLO, V_I rising

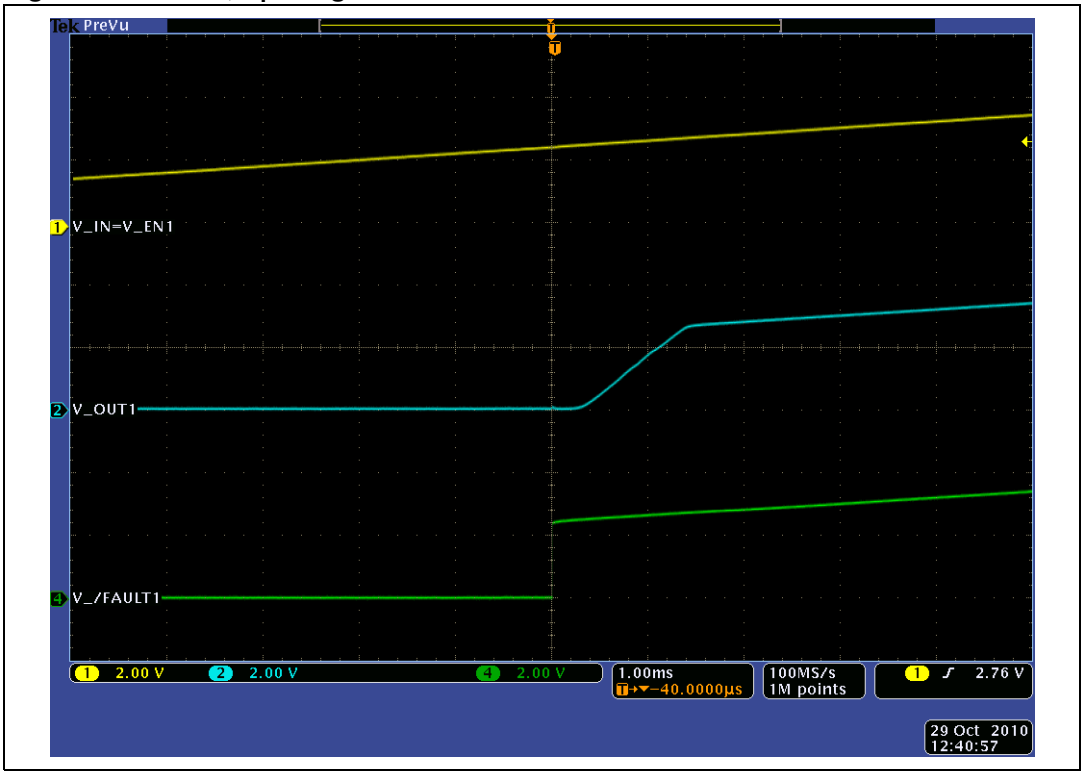
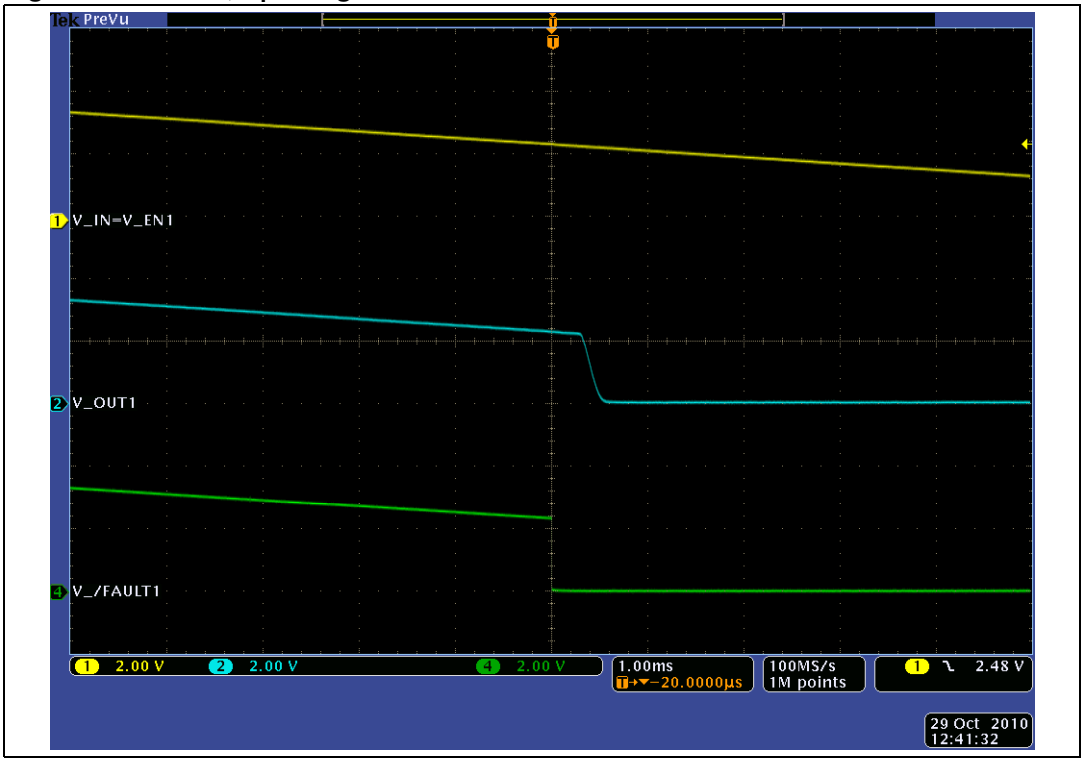


Figure 16. UVLO, V_I falling



6.1.4 Overcurrent protection characteristics

Figure 17. Overcurrent protection characteristics, V_I = 3 V, R_{LOAD} = 2.2 Ω

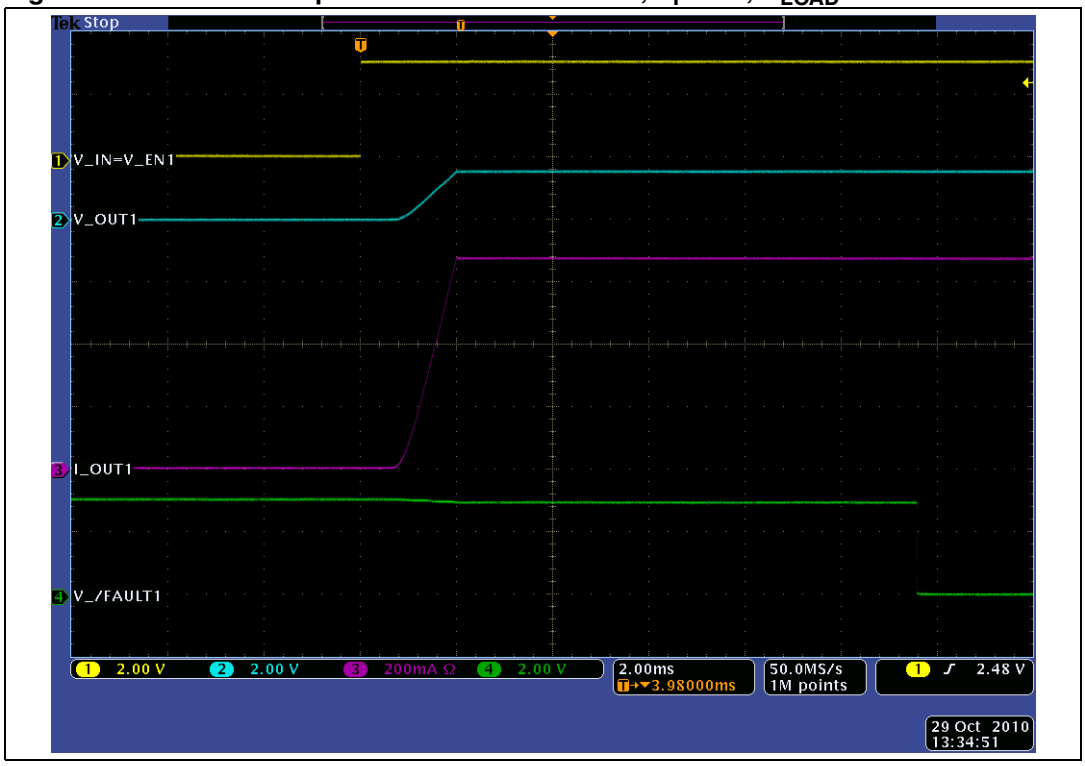
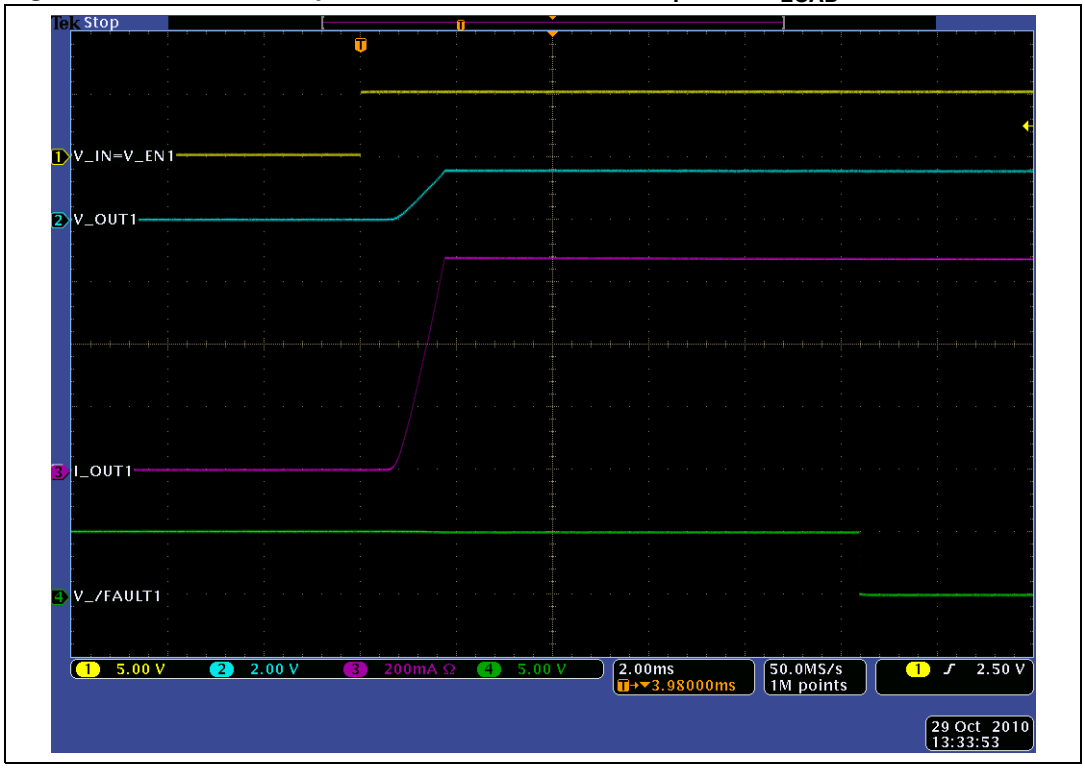


Figure 18. Overcurrent protection characteristics, V_I = 5 V, R_{LOAD} = 2.2 Ω



6.1.5 Other electrical characteristics

Figure 19. I_{CC} versus V_I

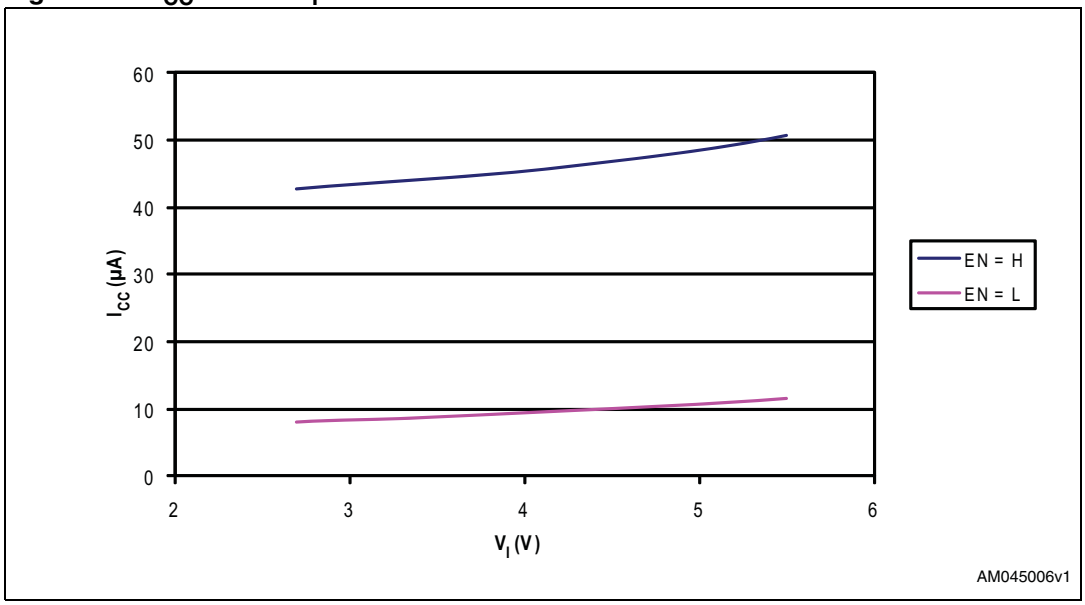


Figure 20. t_r versus V_I

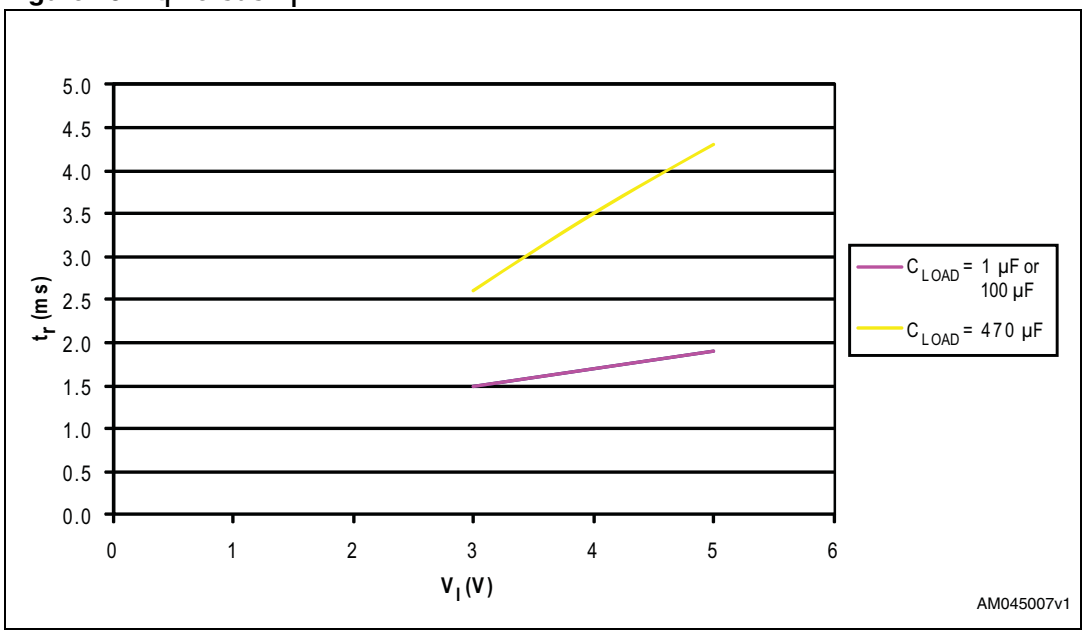


Figure 21. t_f versus V_I

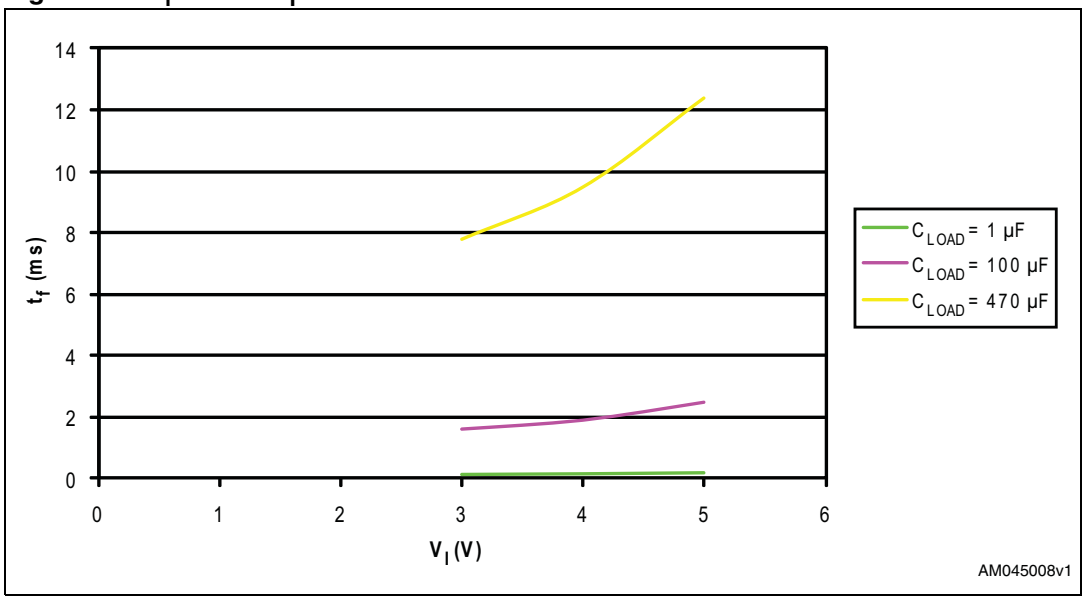
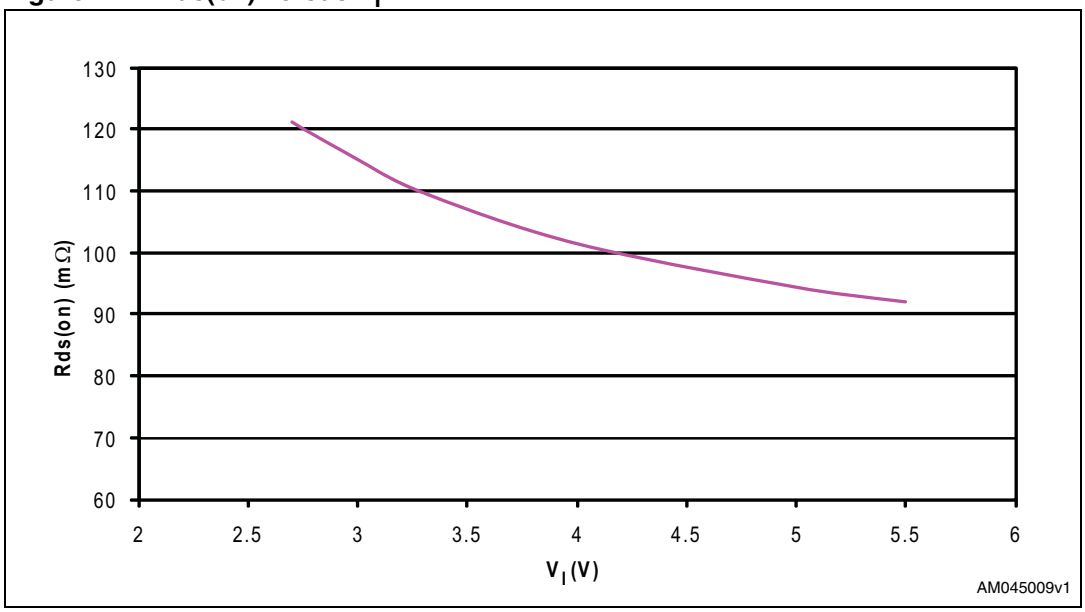


Figure 22. Rds(on) versus V_I



6.2 STMPS2262, STMPS2272 characteristics

The waveforms and characteristics shown in this section pertain to the STMPS2272 device. The STMPS2262 is expected to have the same characteristics with inverted EN input function. All measurements are at ambient temperature 25 °C.

6.2.1 Turn-on/off characteristics for V_I = 3 V, R_{LOAD} = 3 Ω

Figure 23. Turn-on for C_{LOAD} = 1 µF

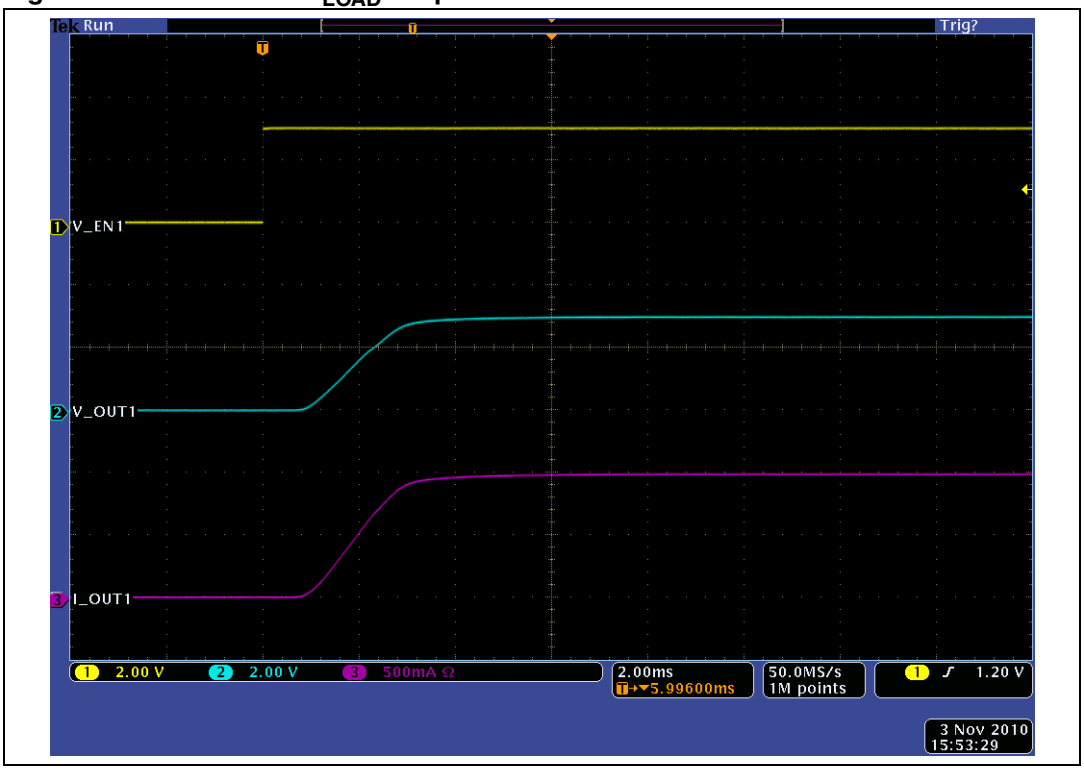


Figure 24. Turn-on for C_{LOAD} = 100 µF

Figure 25. Turn-on for C_{LOAD} = 470 µF

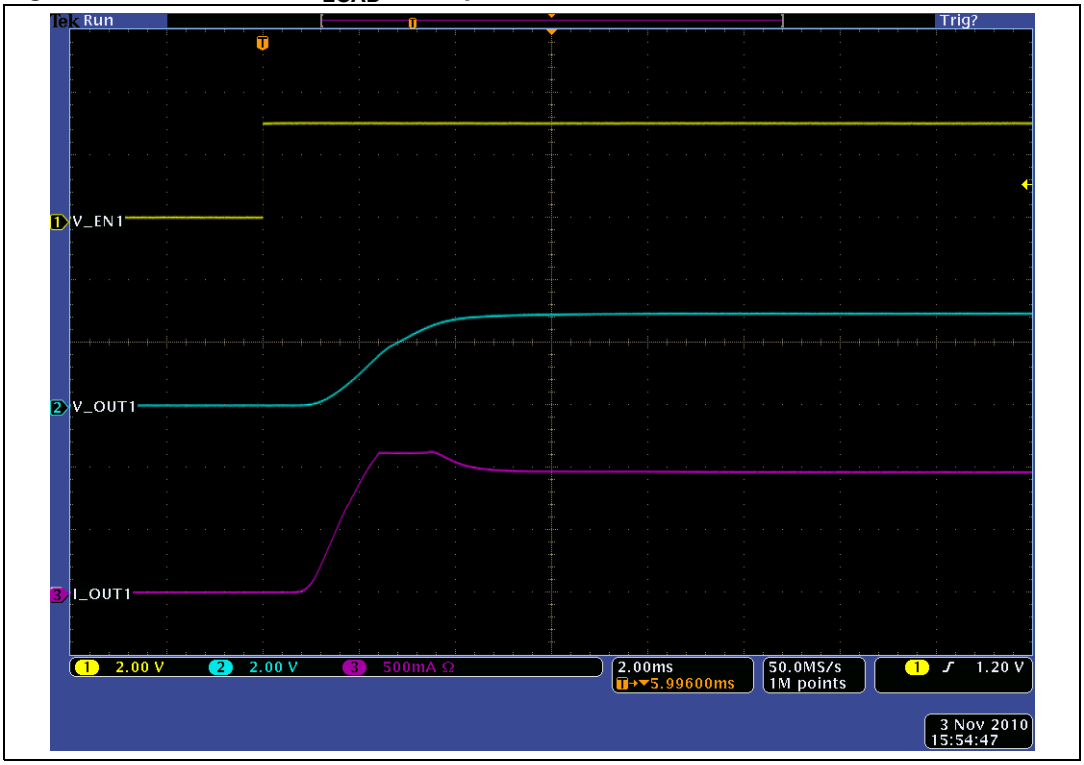


Figure 26. Turn-off for C_{LOAD} = 1 µF

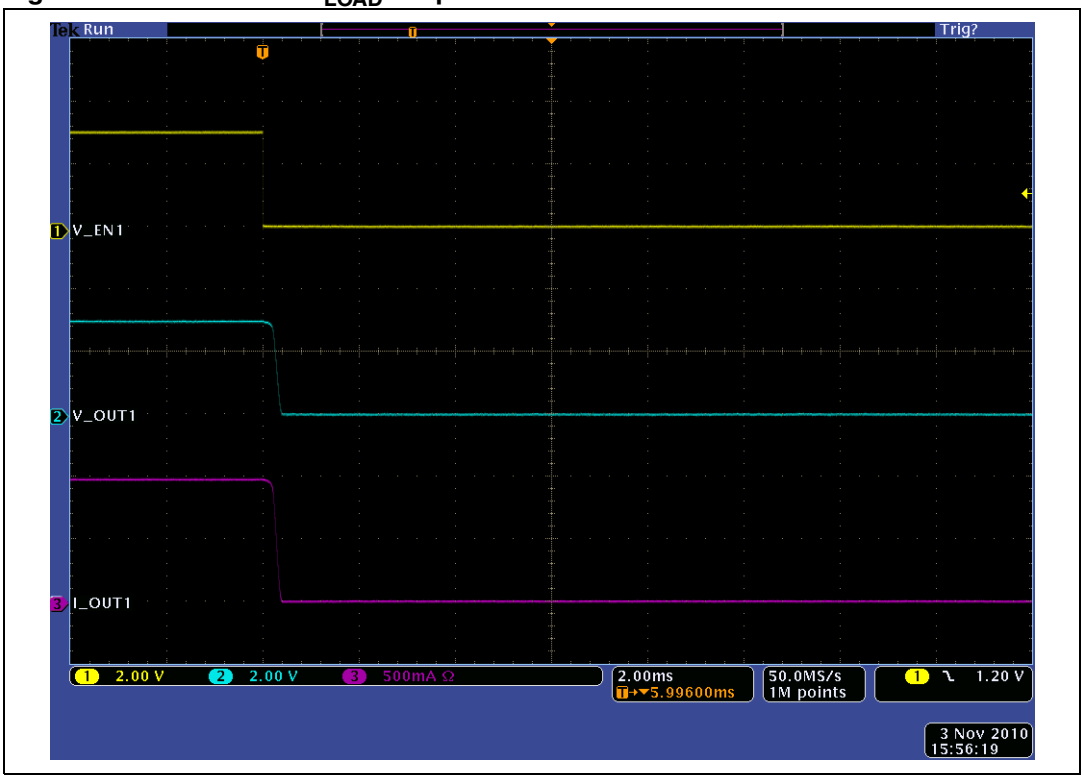


Figure 27. Turn-off for C_{LOAD} = 100 µF

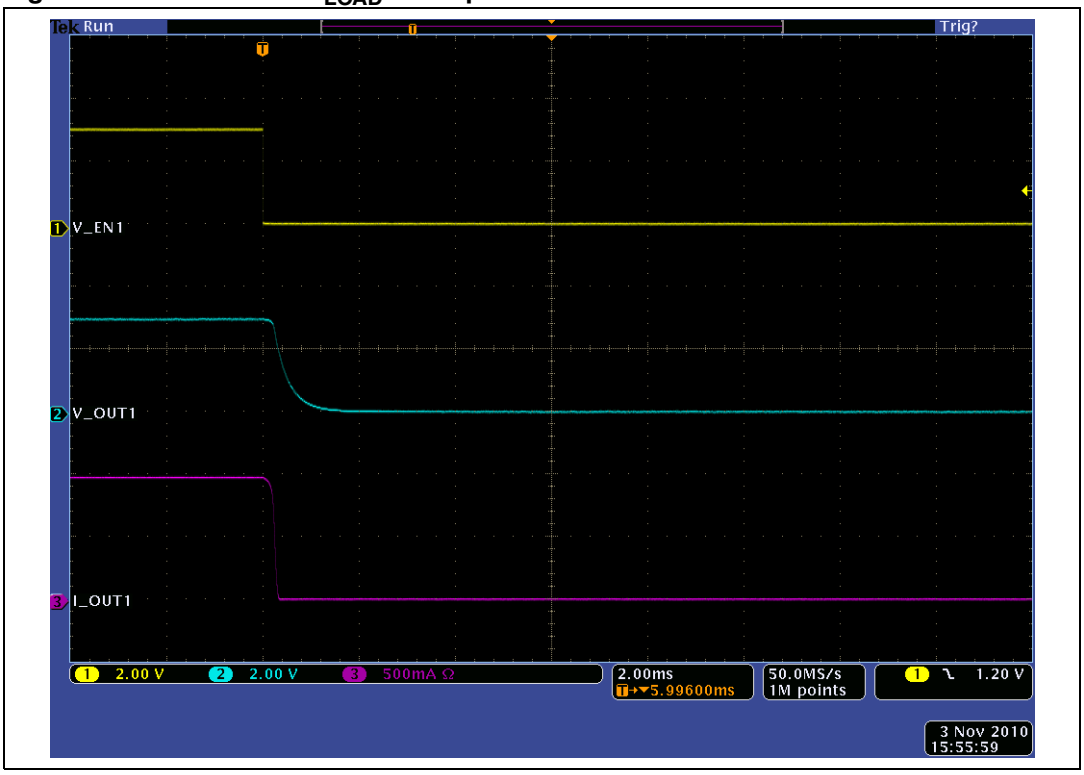
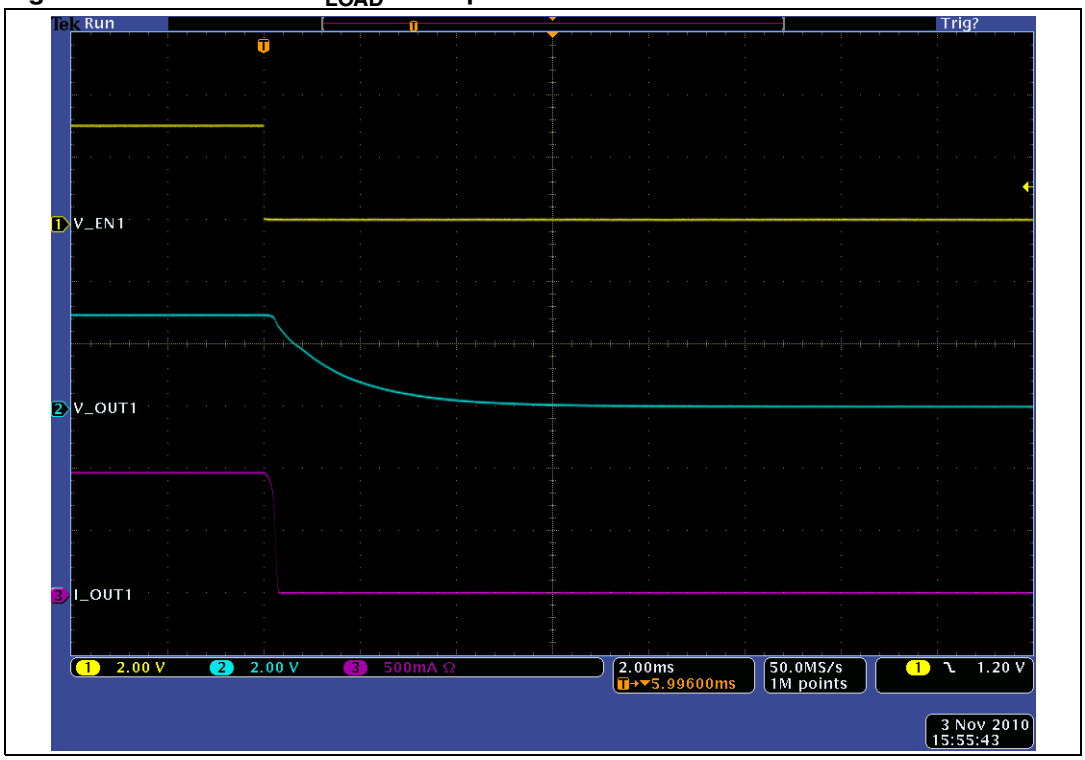


Figure 28. Turn-off for C_{LOAD} = 470 µF



6.2.2 Turn-on/off characteristics for V_I = 5 V, R_{LOAD} = 5 Ω

Figure 29. Turn-on for C_{LOAD} = 1 µF

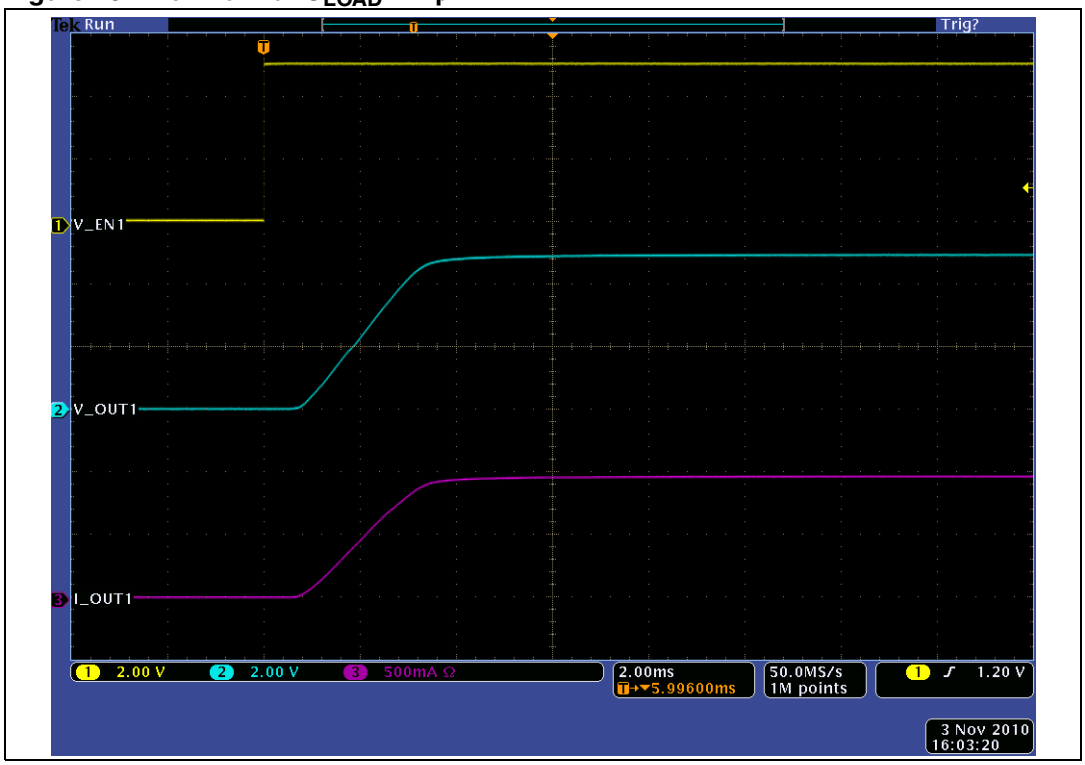


Figure 30. Turn-on for C_{LOAD} = 100 µF

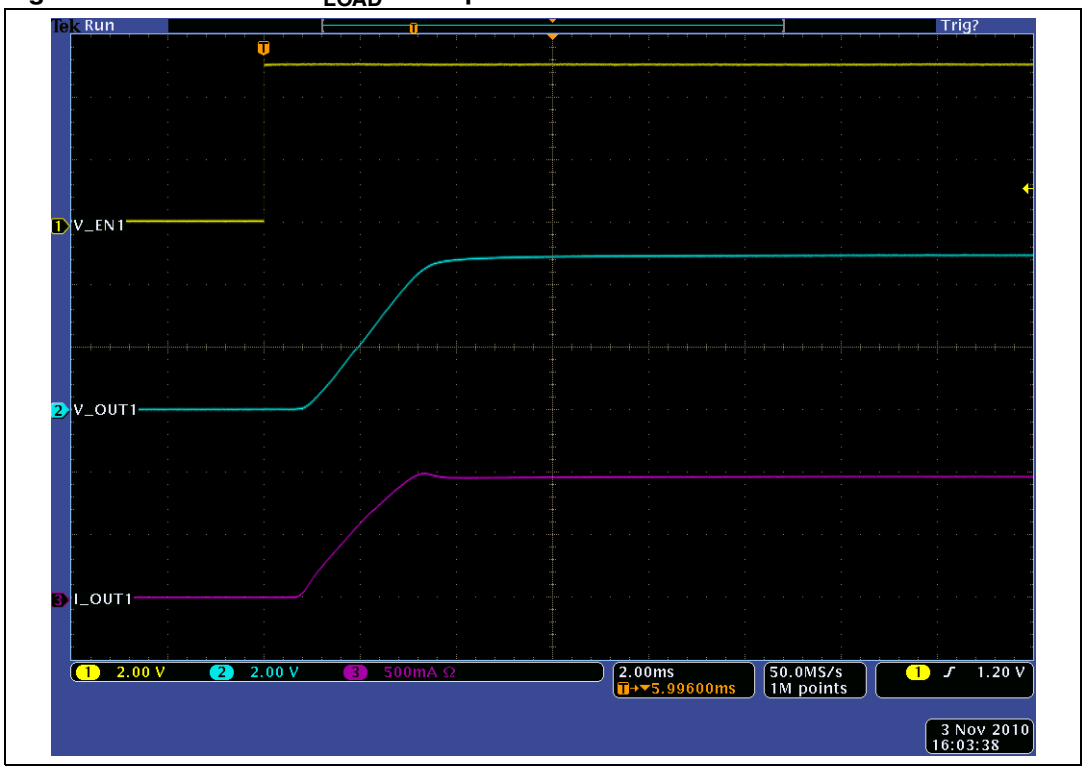


Figure 31. Turn-on for C_{LOAD} = 470 µF

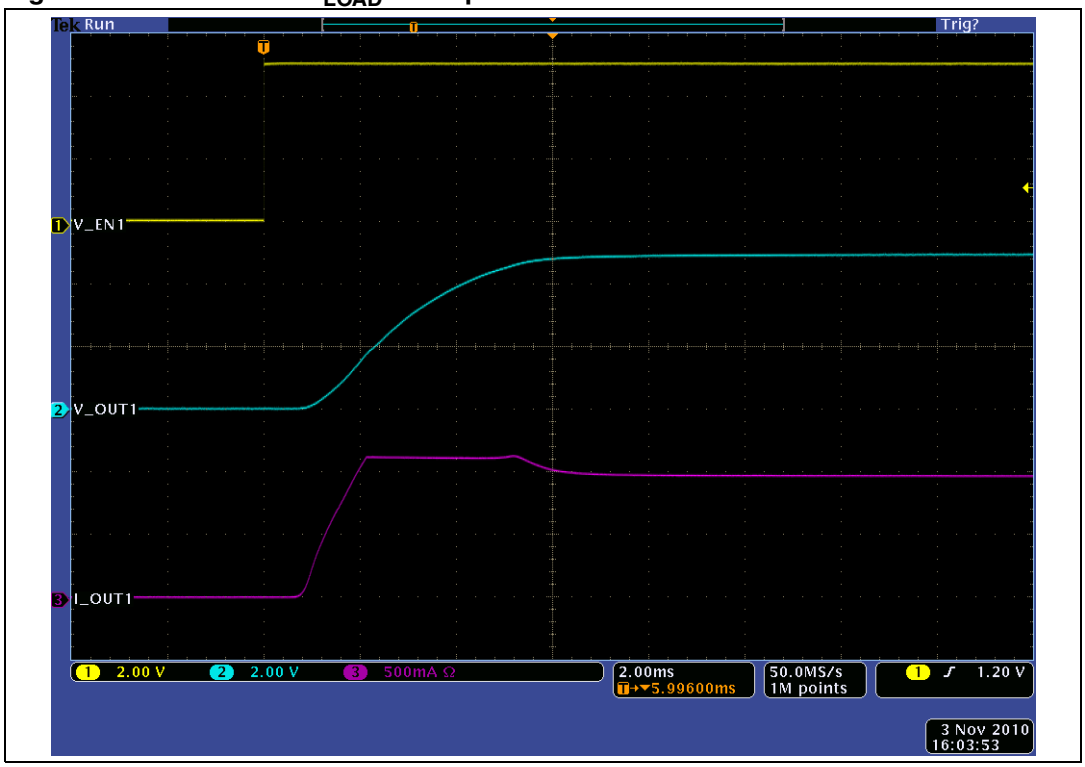


Figure 32. Turn-off for C_{LOAD} = 1 µF

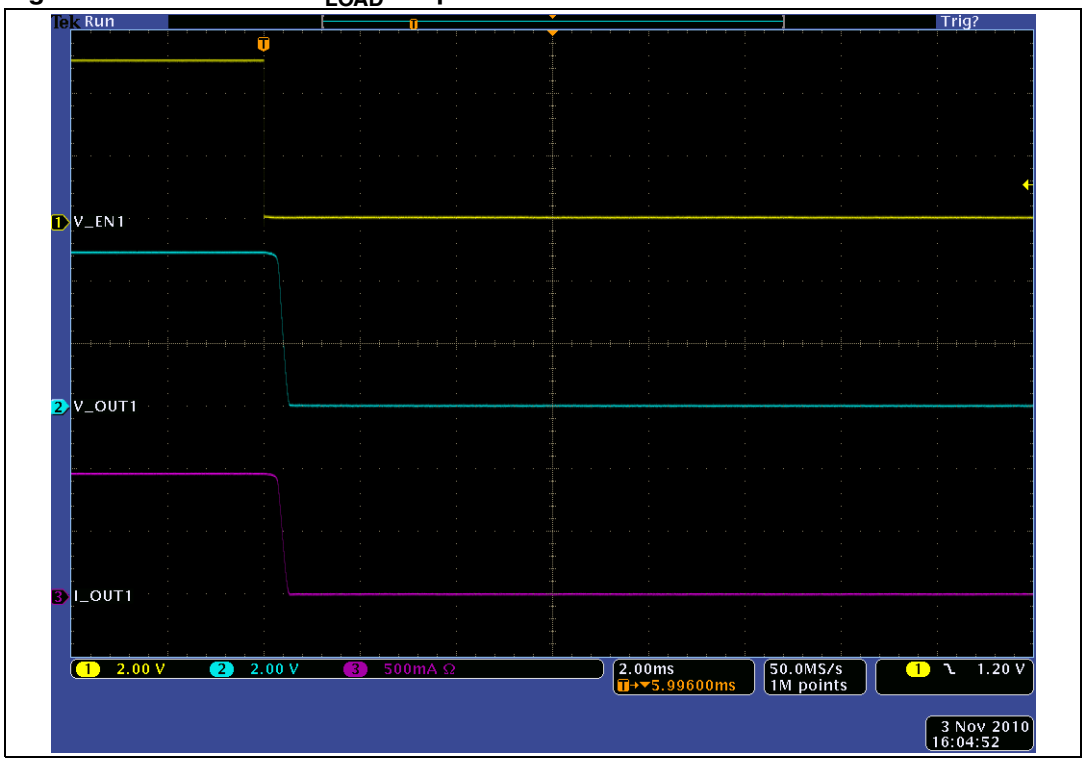


Figure 33. Turn-off for C_{LOAD} = 100 µF

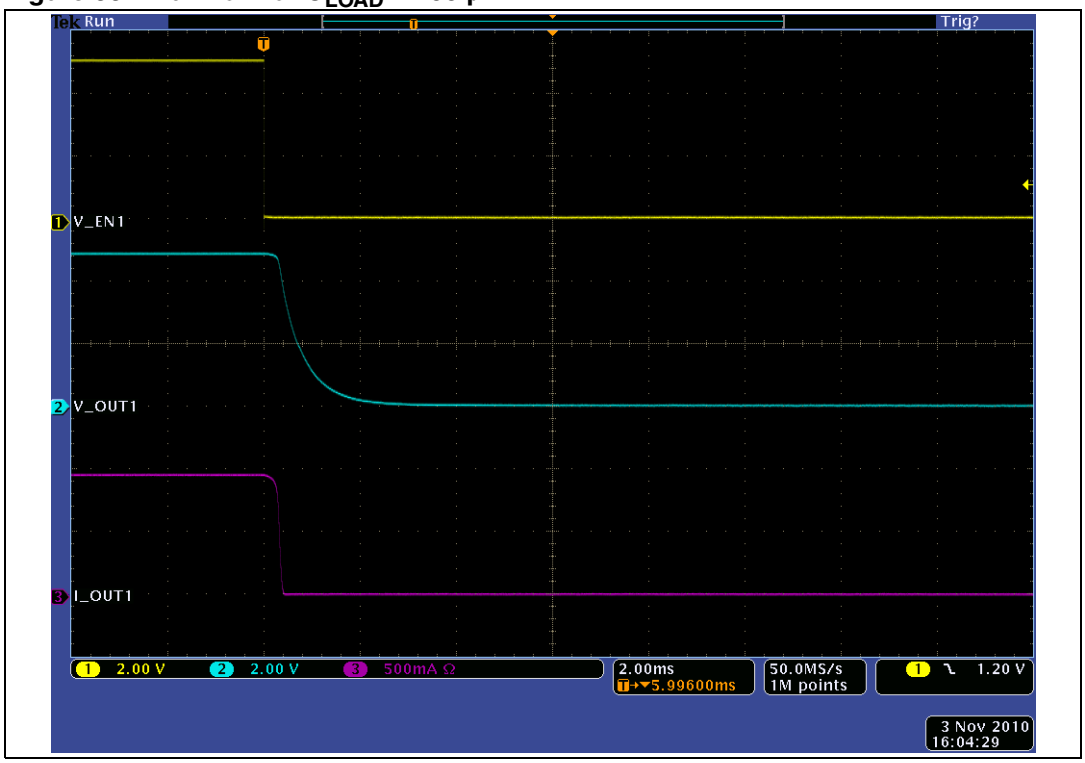
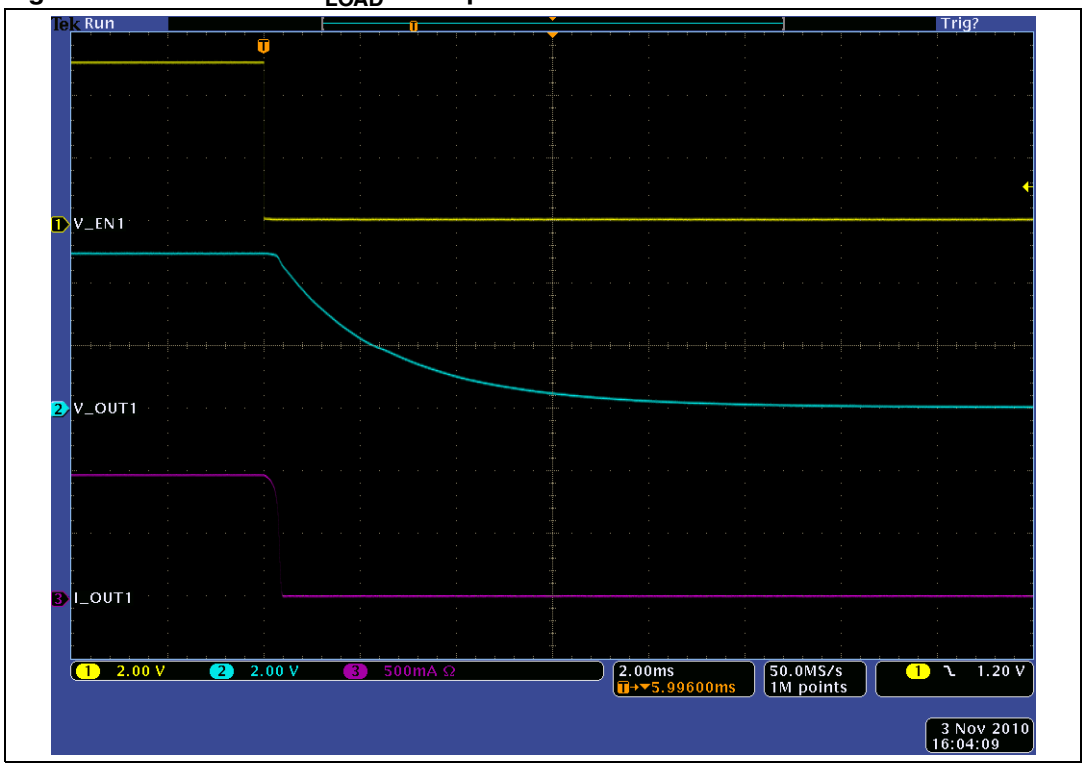


Figure 34. Turn-off for C_{LOAD} = 470 µF



6.2.3 UVLO characteristics

Figure 35. UVLO, V_I rising

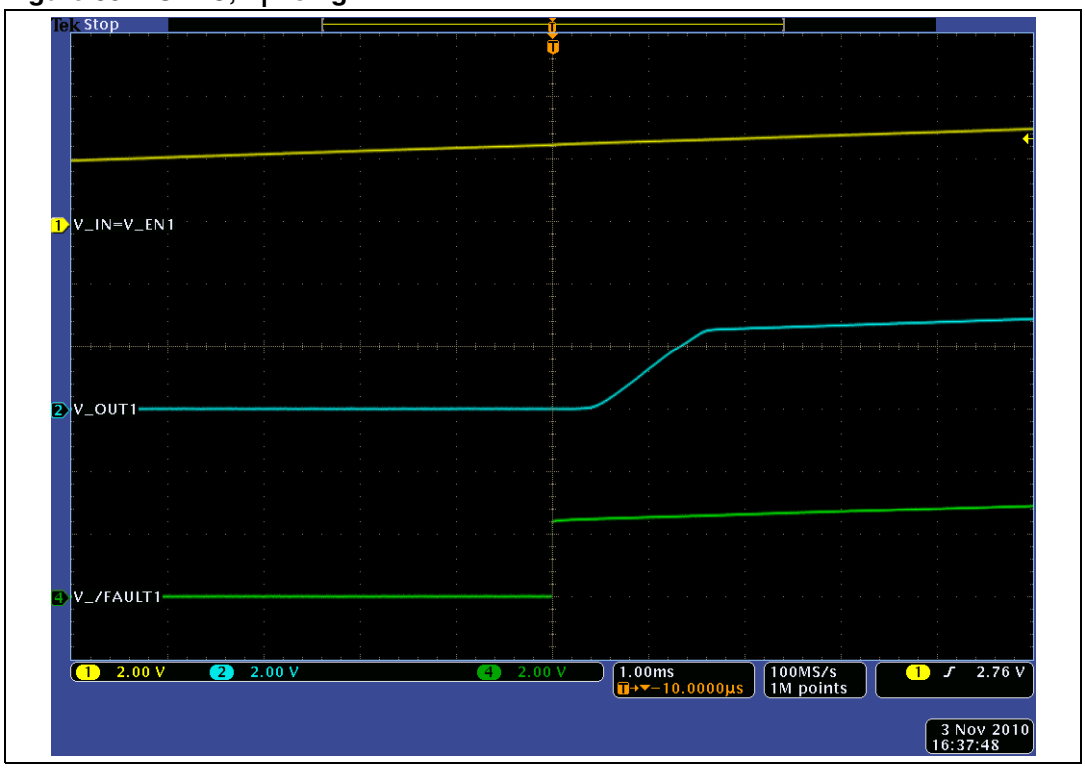
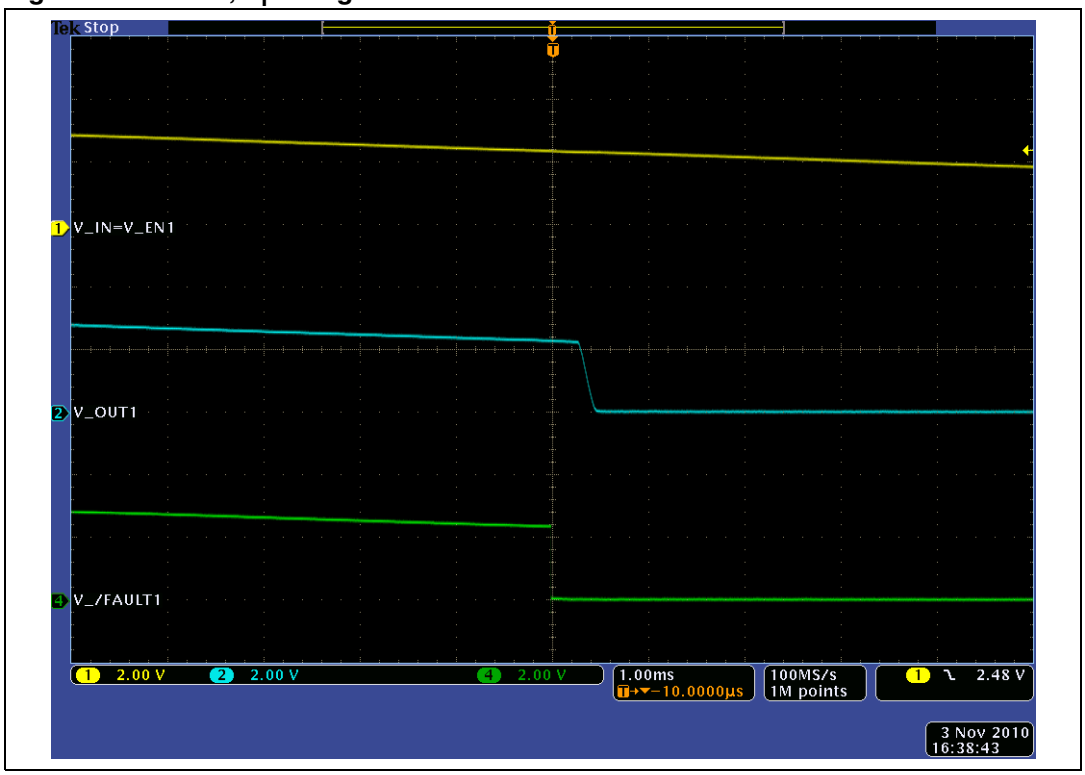


Figure 36. UVLO, V_I falling



6.2.4 Overcurrent protection characteristics

Figure 37. Overcurrent protection characteristics, V_I = 3 V, R_{LOAD} = 1 Ω

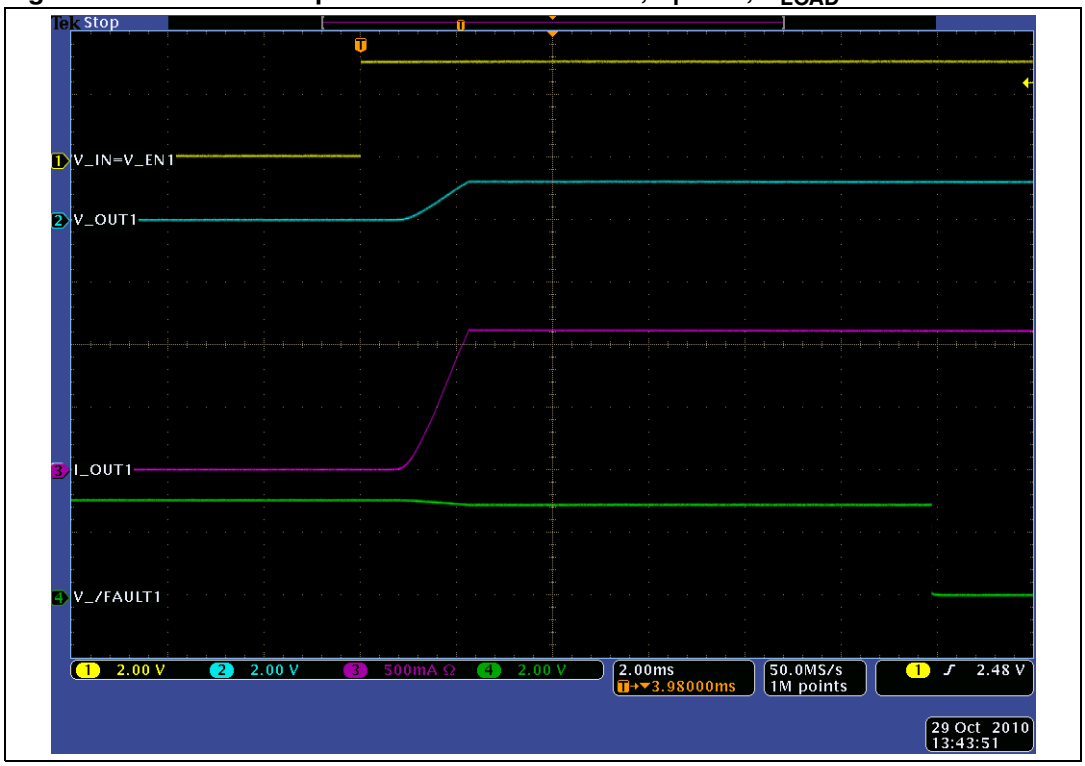
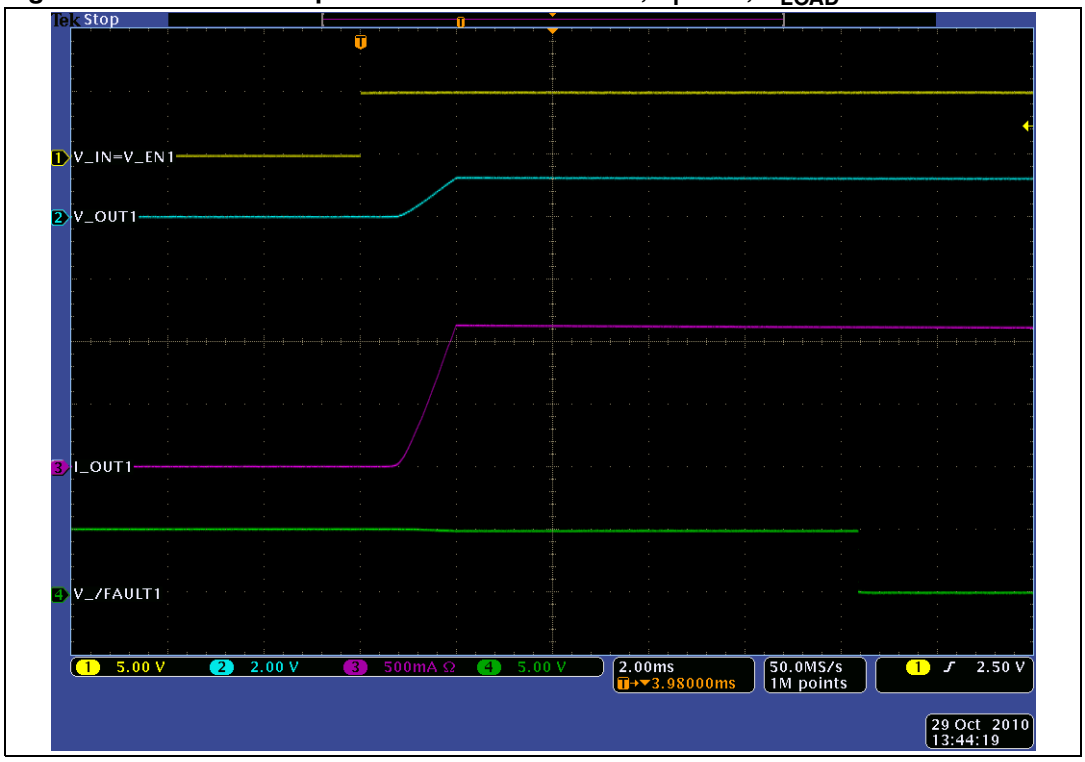


Figure 38. Overcurrent protection characteristics, V_I = 5 V, R_{LOAD} = 1 Ω



6.2.5 Other electrical characteristics

Figure 39. I_{CC} versus V_I

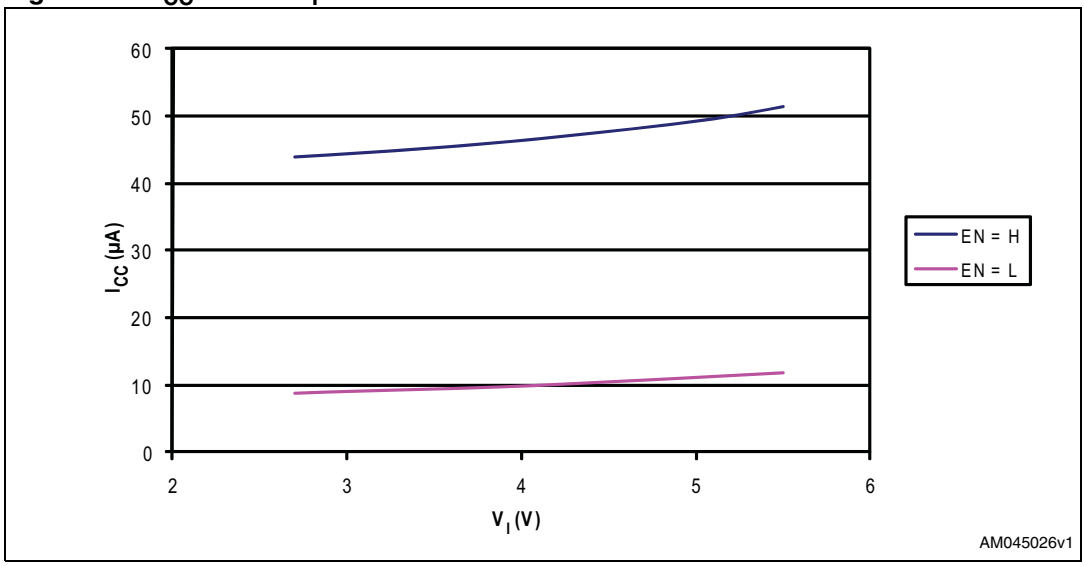


Figure 40. t_r versus V_I

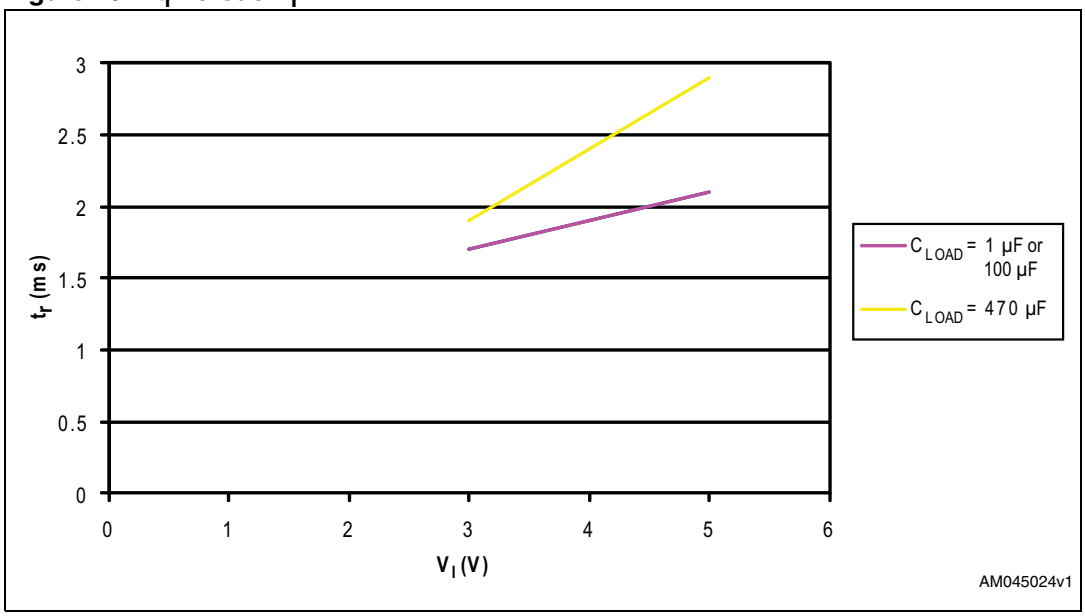


Figure 41. t_f versus V_I

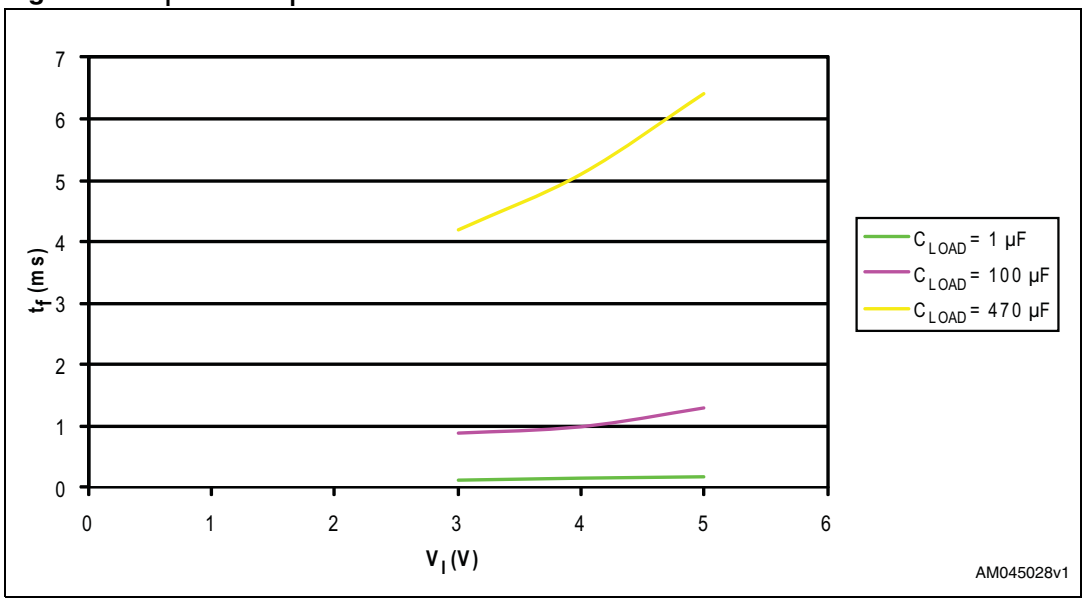
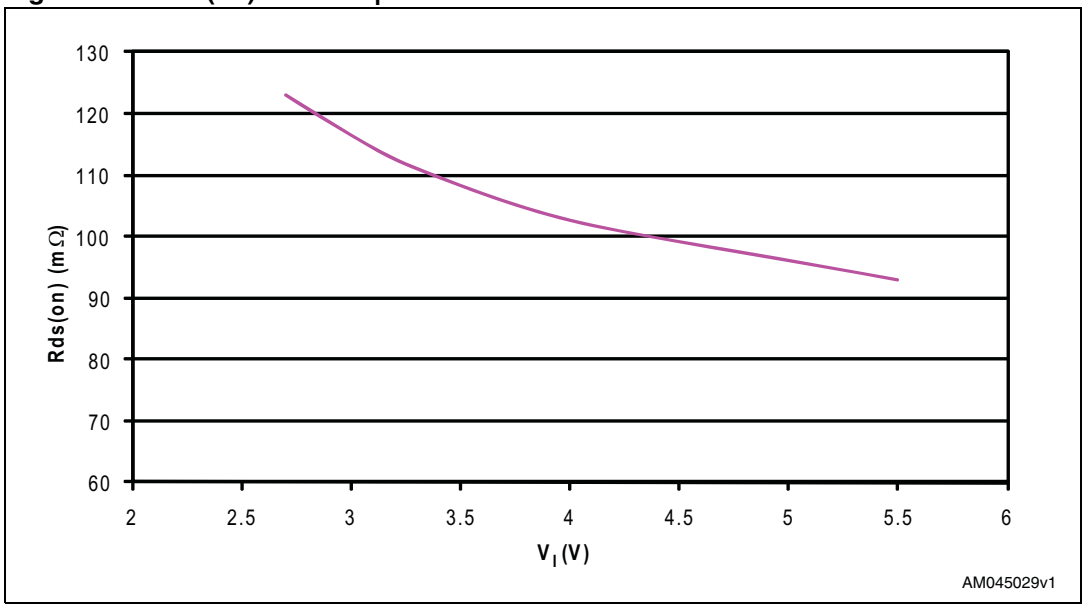


Figure 42. Rds(on) versus V_I



7 Application information

7.1 Input and output capacitors

Input and output capacitors improve the performance of the device; the actual capacitance should be optimized for the particular application. For all applications, a 0.1 µF or greater ceramic bypass capacitor between IN and GND as close to the device as possible is recommended for local noise decoupling. This precaution also reduces ringing on the input due to power supply transients.

An additional capacitor may be needed on the input to reduce input voltage overshoots from exceeding the absolute maximum voltage of the device during heavy transient conditions. This is especially important during bench testing when long, inductive cables are used to connect the evaluation board to the bench power supply. The value of 100 µF may be adequate in most situations.

An output capacitor is not required for device functionality, but placing a high-value (in the order of 10 - 100 µF) electrolytic capacitor on the output pins is recommended when large transient currents are expected on the output.

8 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

Figure 43. SO-8 package outline

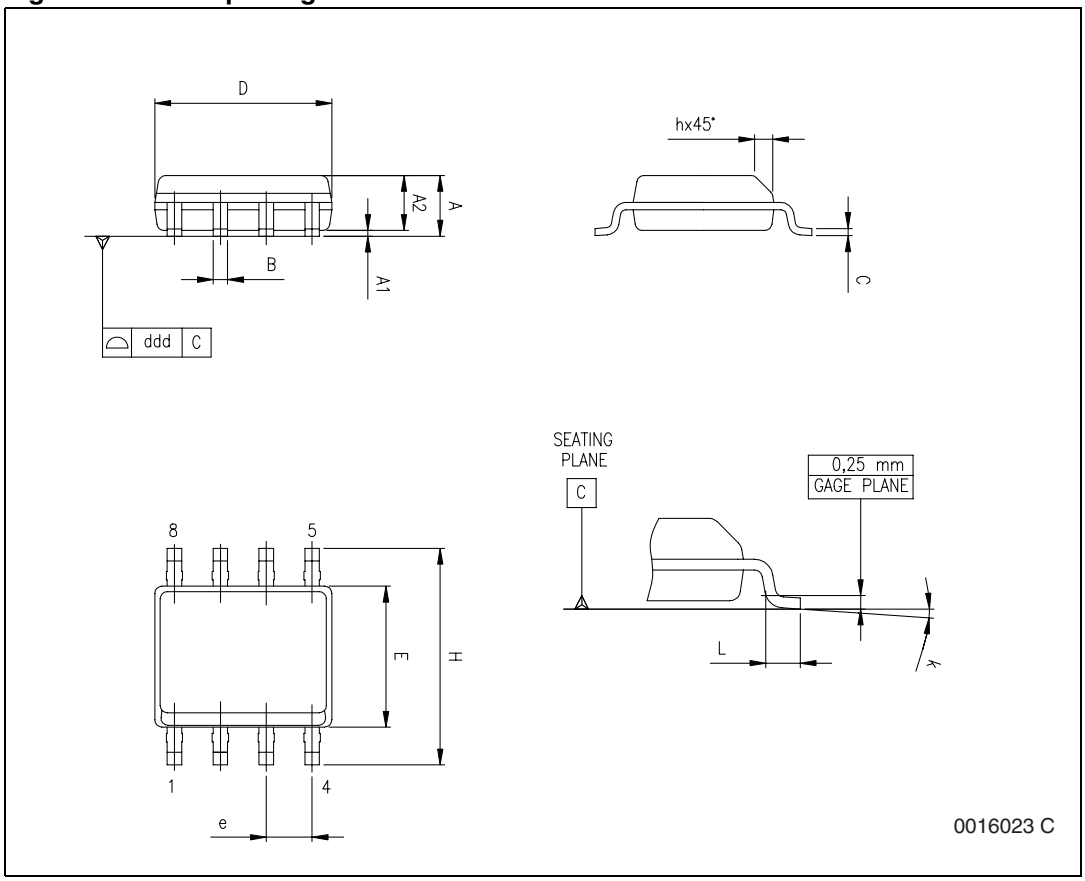


Table 12. SO-8 mechanical data

Symbol	Millimeters		
	Min	Typ	Max
A	1.35	–	1.75
A1	0.10	–	0.25
A2	1.10	–	1.65
B	0.33	–	0.51
C	0.19	–	0.25
D (1)	4.80	–	5.00
E	3.80	–	4.00
e	–	1.27	–
H	5.80	–	6.20
h	0.25	–	0.50
L	0.40	–	1.27
k	0° (min.), 8° (max.)		
ddd	–	–	0.10

1. Dimension D does not include mold flash, protrusions or gate burrs. Mold flash, potrusions or gate burrs shall not exceed 0.15 mm (0.006 inch) in total (both sides).

Figure 44. MSOP8 package outline

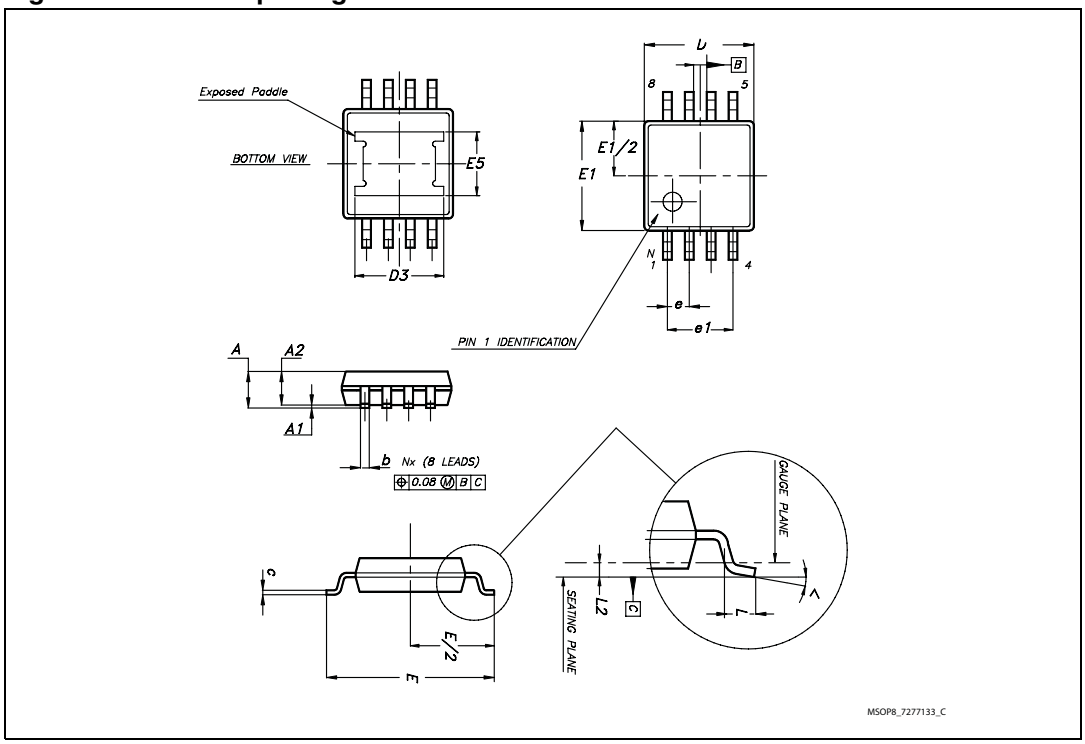
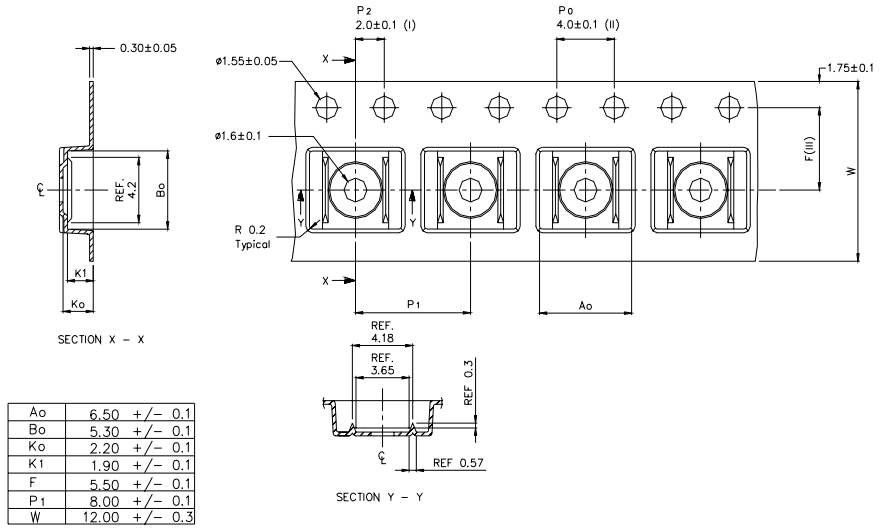


Table 13. MSOP8 mechanical data

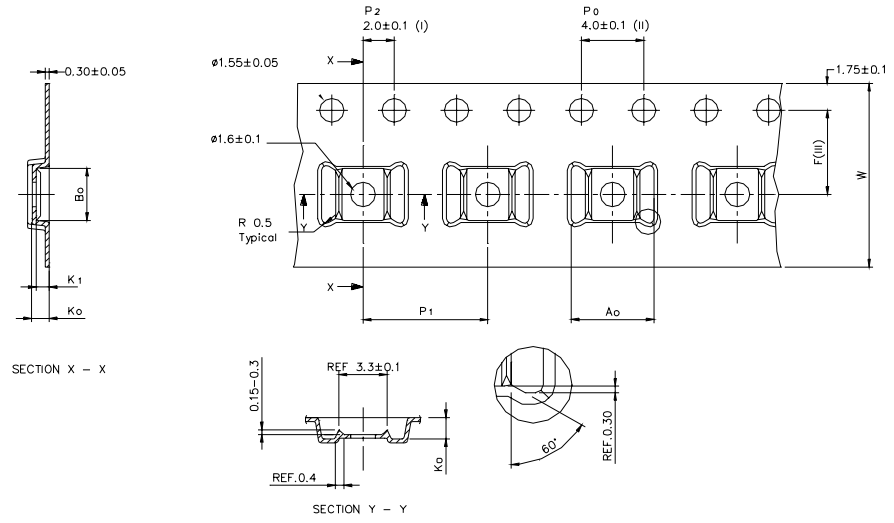
Symbol	Millimeters		
	Min	Typ	Max
A	–	–	1.10
A1	0	–	0.15
A2	0.75	0.85	0.95
b	0.22	–	0.40
c	0.08	–	0.23
D	2.90	3.00	3.10
D3	–	2.16	–
E	4.67	4.90	5.07
E1	2.90	3.00	3.10
E5	–	1.73	–
e	–	0.65	–
e1		1.95	–
L	0.40	–	0.80
L2	–	0.25	–
<	0°	–	6°

Figure 45. SO-8 carrier tape



Ao	6.50 +/– 0.1
Bo	5.30 +/– 0.1
Ko	2.20 +/– 0.1
K1	1.90 +/– 0.1
F	5.50 +/– 0.1
P1	8.00 +/– 0.1
W	12.00 +/– 0.3

Figure 46. MSOP8 carrier tape



Ao	5.30 +/– 0.1
Bo	3.30 +/– 0.1
Ko	1.30 +/– 0.1
K1	1.00 +/– 0.1
F	5.50 +/– 0.1
P1	8.00 +/– 0.1
W	12.00 +/– 0.3

Figure 47. Reel information

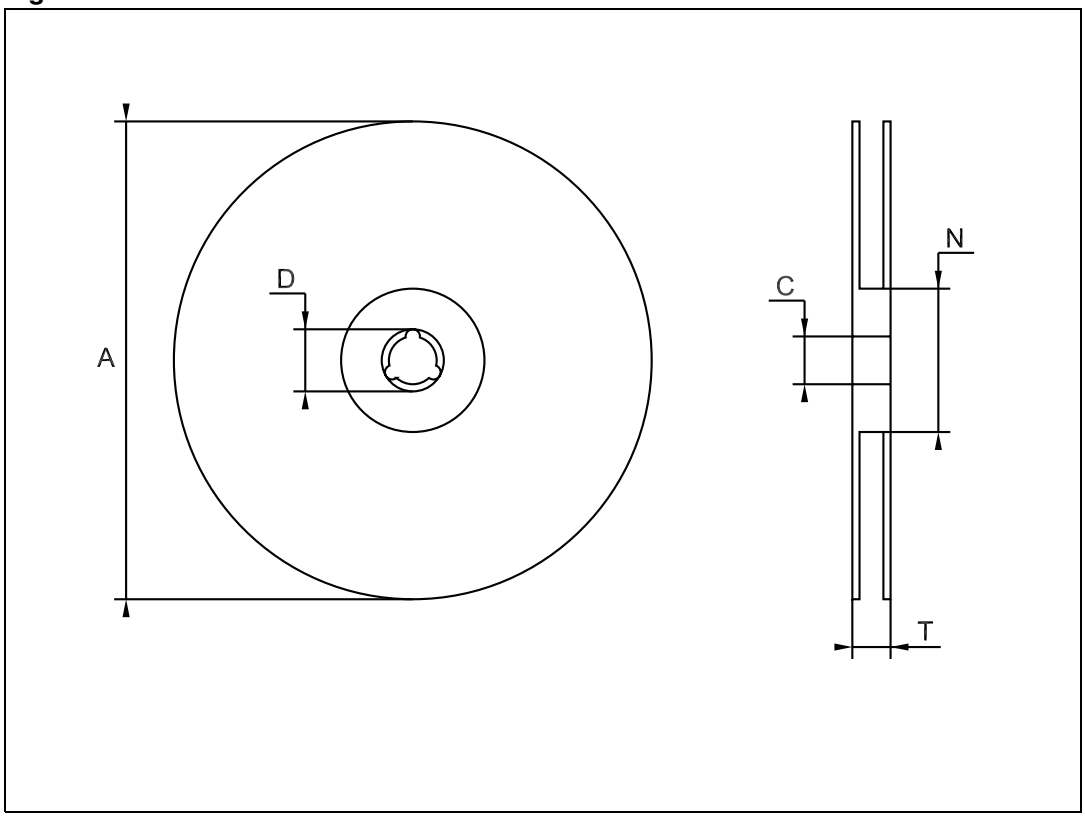


Table 14. Reel mechanical data

Symbol	Millimeters		
	Min	Typ	Max
A			330
C	12.8		13.2
D	20.2		
N	60		
T			22.4

9 Revision history

Table 15. Document revision history

Date	Revision	Changes
03-Dec-2008	1	Initial release.
18-Dec-2009	2	Modified: *Table 6*, *Table 7* and *Table 9*.
19-Jan-2011	3	Added *Section 6: Typical operating characteristics* and *Section 7: Application information*; minor textual changes.

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