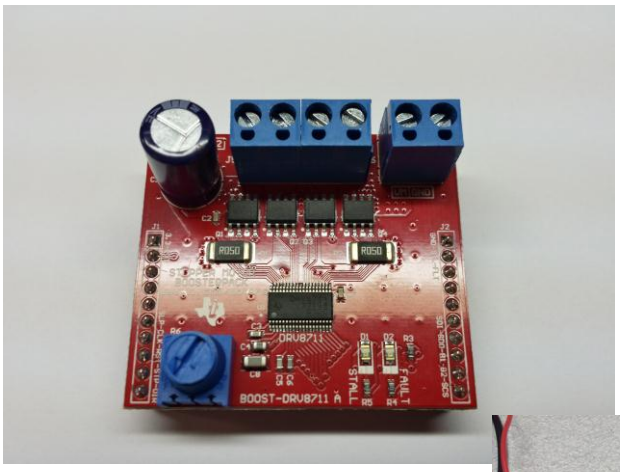
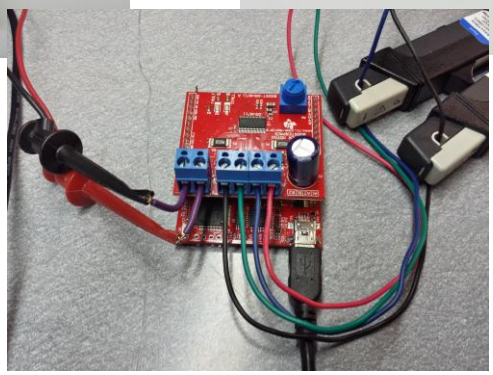
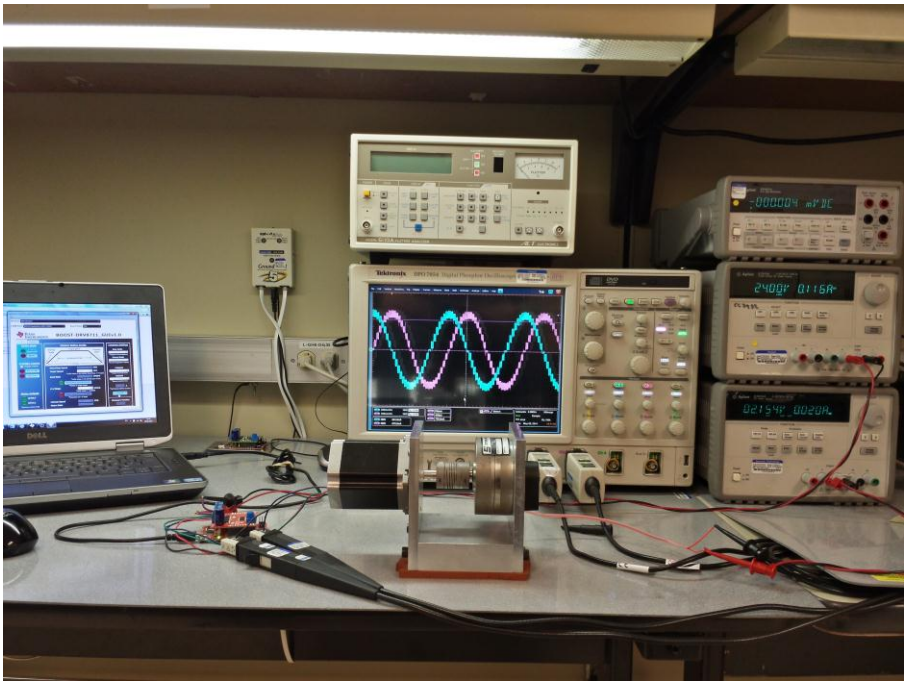
BOOST-DRV8711 Stepper Motor Booster Pack – Test Data







Types of Tests:

1. Torque vs. Regulated Current
2. Maximal RPM
3. Thermal Characteristics
4. Current Waveforms
    a. Full Step / Fast Decay
    b. Full Step / All Mixed Decay
    c. Full Step / Auto Mixed Decay
    d. Half µStep / Fast Decay
    e. Half µStep / All Mixed Decay
    f. Half µStep / Auto Mixed Decay
    g. ¼ µStep / Fast Decay
    h. ¼ µStep / All Mixed Decay
    i. ¼ µStep / Auto Mixed Decay
    j. 1/8 µStep / Fast Decay
    k. 1/8 µStep / All Mixed Decay
    l. 1/8 µStep / Auto Mixed Decay
    m. 1/16 µStep / Fast Decay
    n. 1/16 µStep / All Mixed Decay
    o. 1/16 µStep / Auto Mixed Decay
    p. 1/32 µStep / Fast Decay
    q. 1/32 µStep / All Mixed Decay
    r. 1/32 µStep / All Mixed Decay
    s. 1/64 µStep / Fast Decay
    t. 1/64 µStep / All Mixed Decay
    u. 1/64 µStep / All Mixed Decay
    v. 1/128 µStep / Fast Decay
    w. 1/128 µStep / All Mixed Decay
    x. 1/128 µStep / All Mixed Decay
    y. 1/256 µStep / Fast Decay
    z. 1/256 µStep / All Mixed Decay
    aa. 1/256 µStep / All Mixed Decay
5. Current Ramp rate vs. VM
    a. VM = 12V
    b. VM = 20V
    c. VM = 24V
6. Holding Current
    a. Fast Decay
    b. All mixed Decay
    c. Auto Mixed Decay

Measurement Tools:

Device	Brand	QTY	CAL. due
Power Supply	Agilent E3631A	1	07/29/2014
Oscilloscope	Tektronix DPO 7054	1	02/12/2015
Current Probe	Tektronix TCP0030	2	04/10/2015
Thermal Imaging	Fluke Ti32	1	Not Required
Magnetic Brake		1	

Load:

- Stepper Motor (ACT Motor 23HS8430)

Series Mode	Step Angle	Motor Length / mm	Rated Voltage / V	Rated Current / A	Phase Resistance	Phase Inductance / mH	Holding Torque (Min) Ncm	Detent Torque (Max) Ncm	Rotor Torque / gcm²	Lead Wire	Motor Weight / kg	Diameter of shaft / mm
23HS8430	1.8	76	3.0	3.0	1	3.5	190	6	480	4	1.05	6.35

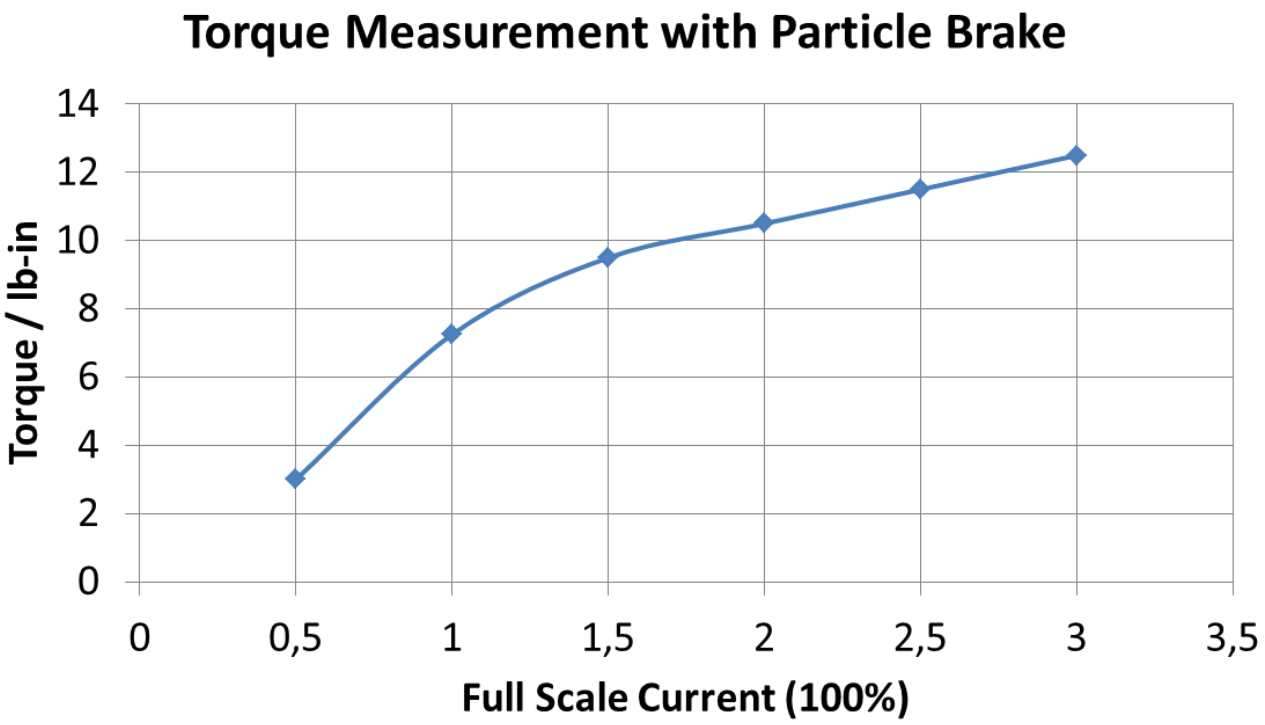
- 2 x Inductor 330µH (Only for thermal measurement)

Test Date:

- 05/01/2014 – 05/09/2014

1. Torque vs. Regulated Current

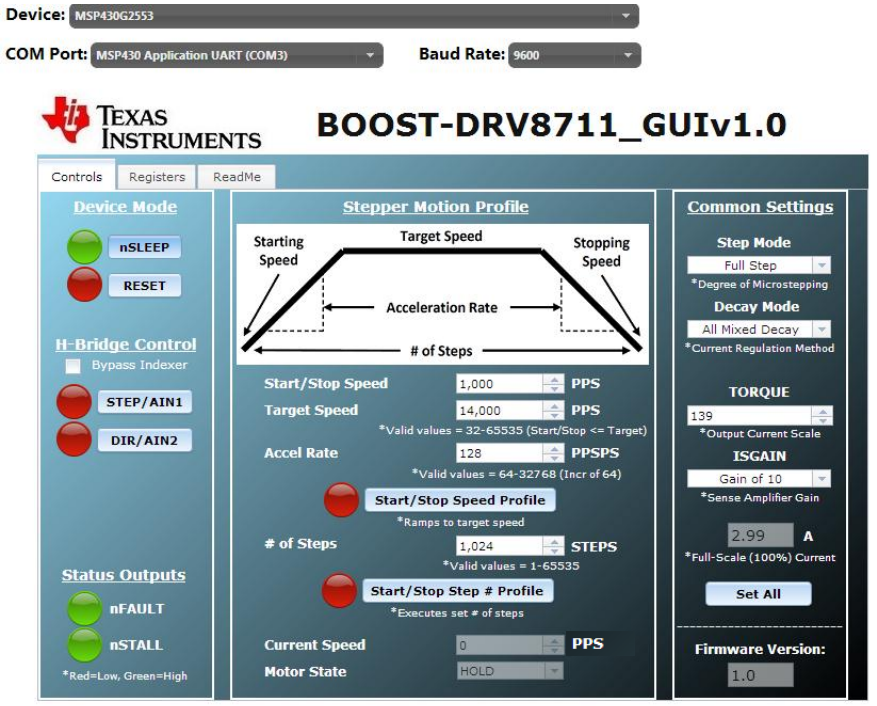
I_FS / A	Torque	
0.5 A	3.00 lb-in	0.339 Nm
1.0 A	7.25 lb-in	0.819 Nm
1.5 A	9.50 lb-in	1.07 Nm
2.0 A	10.5 lb-in	1.18 Nm
2.5 A	11.5 lb-in	1.30 Nm
3.0 A	12.5 lb-in	1.41 Nm

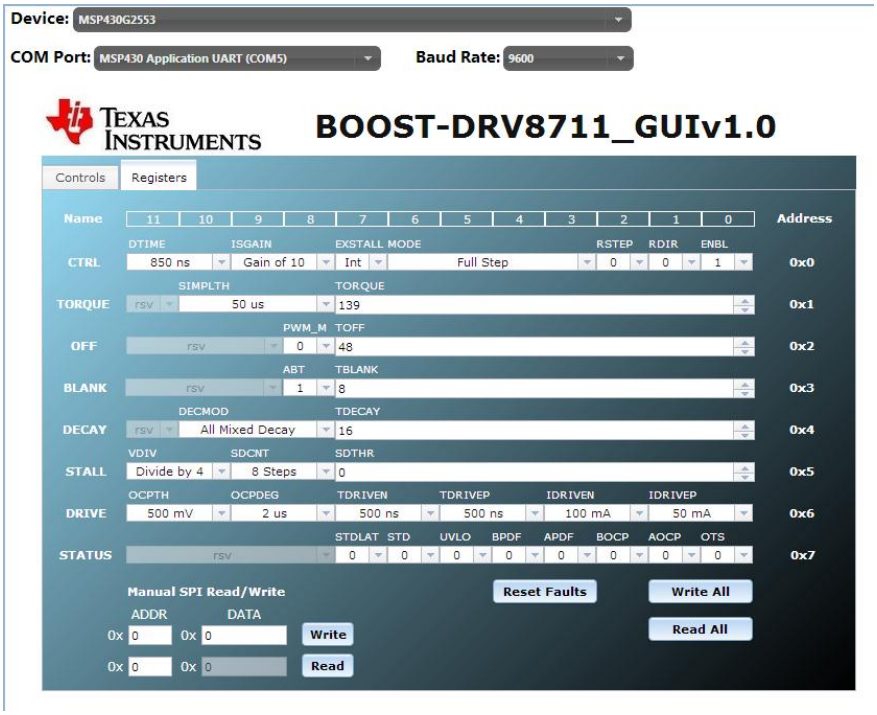


Measurement collected @ 60 RPM, Full Step using magnetic particle brake. Loading was increased continuously until motor stall. Measurements in other Step Modes delivered same results.

2. Maximum RPM

Measurement Condition:





Motor stall at around 11000 PPS => **Maximum RPM = 3300**

3. Thermal Characteristics

VM=24V
Full Scale Current = 6.23A
Phase Current = 4.4A RMS / CH2 = B2 & CH3 = A2
Load = 2 x Inductor à 330µH / 11.4A

Fig. 1

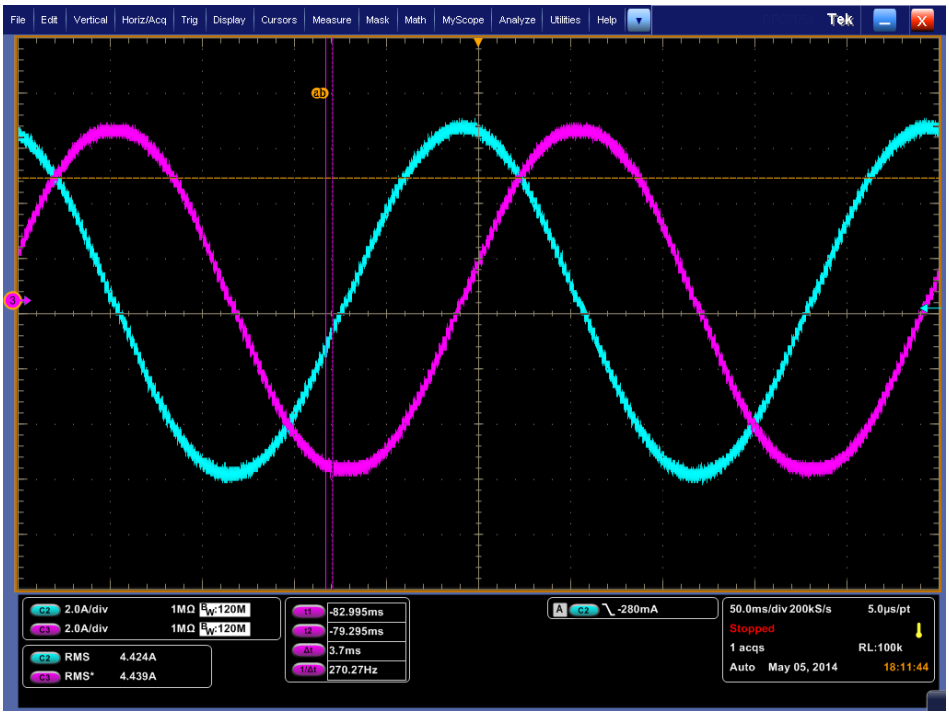
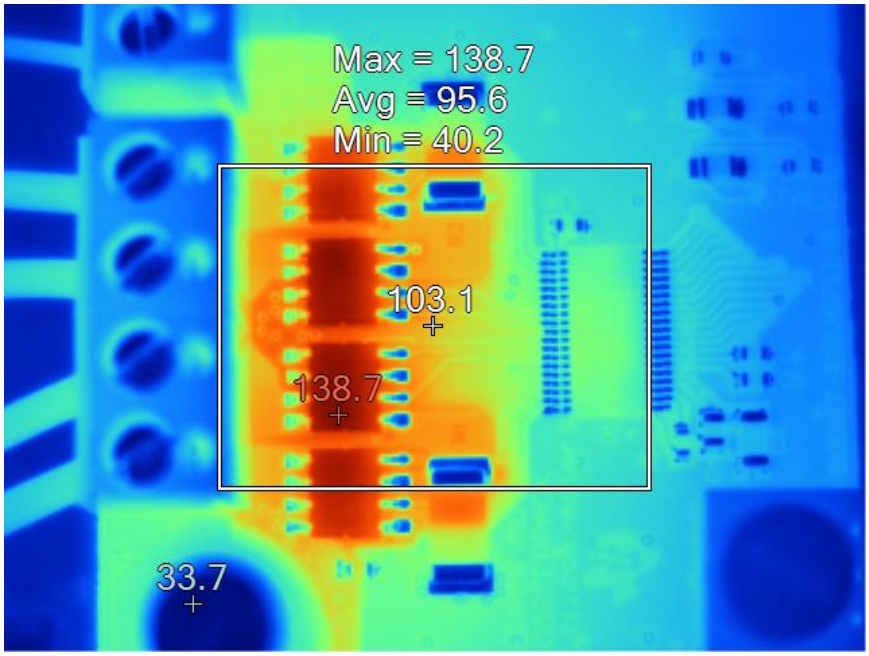


Fig. 2 Thermal Image @ 138.7 °C HotSpot



4. Current Ramp Rate vs. VM

Measurement collected at Half Step, 60 RPM, All Mixed Decay

Fig. 3 VM=12V

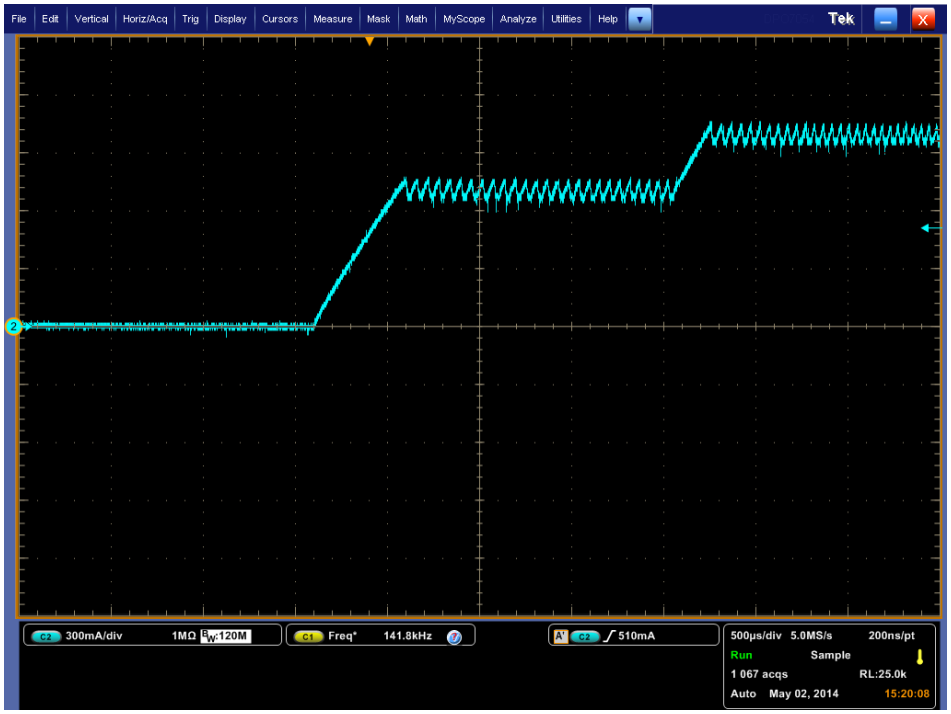


Fig. 4 VM=24V

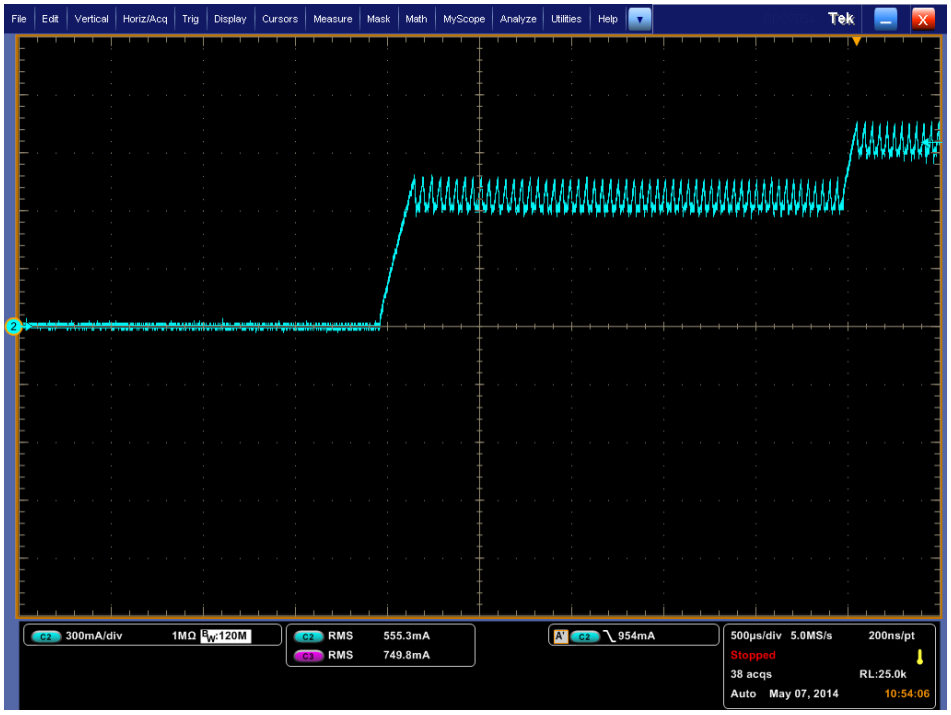


Fig. 5 VM=36V

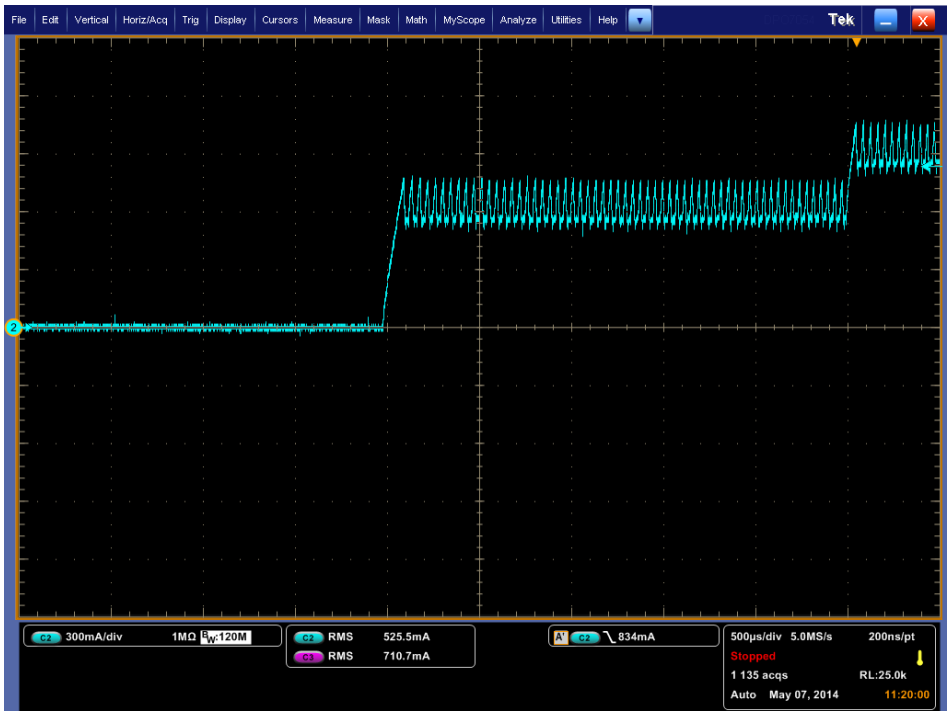
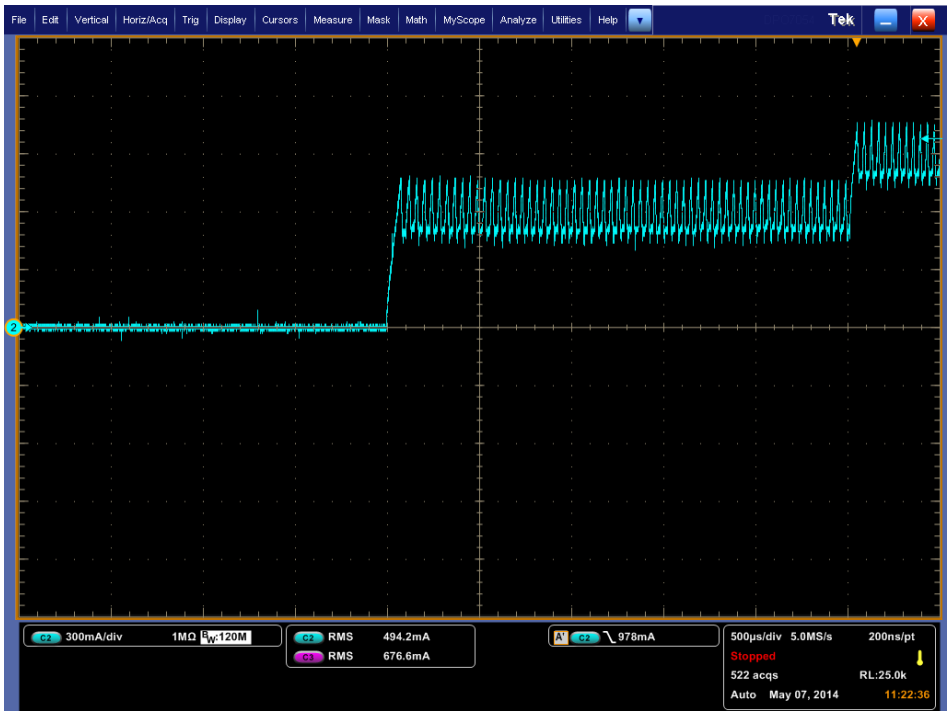


Fig. 6 VM=48V



5. Current Waveforms

Baseline Settings: 60 RPM constant, t_off=36µs, t_Blank=1µs, t_Decay=11µs, Adaptive Blanking Time disabled, CH2 = B2, CH3 = A2

Fig. 7 Full Step / Fast Decay

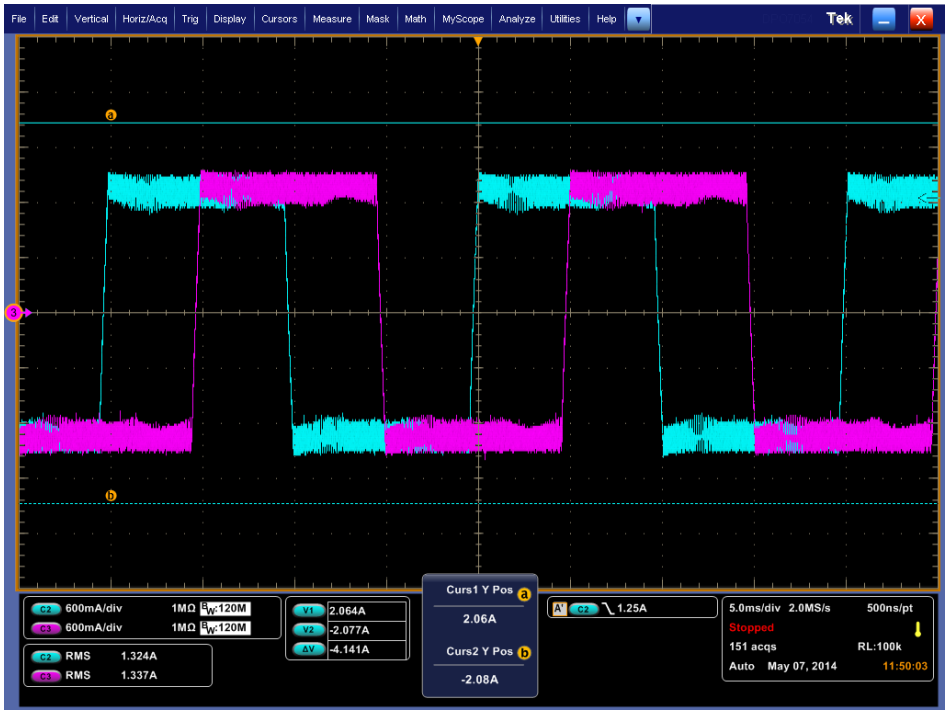


Fig. 8 Full Step / All Mixed Decay

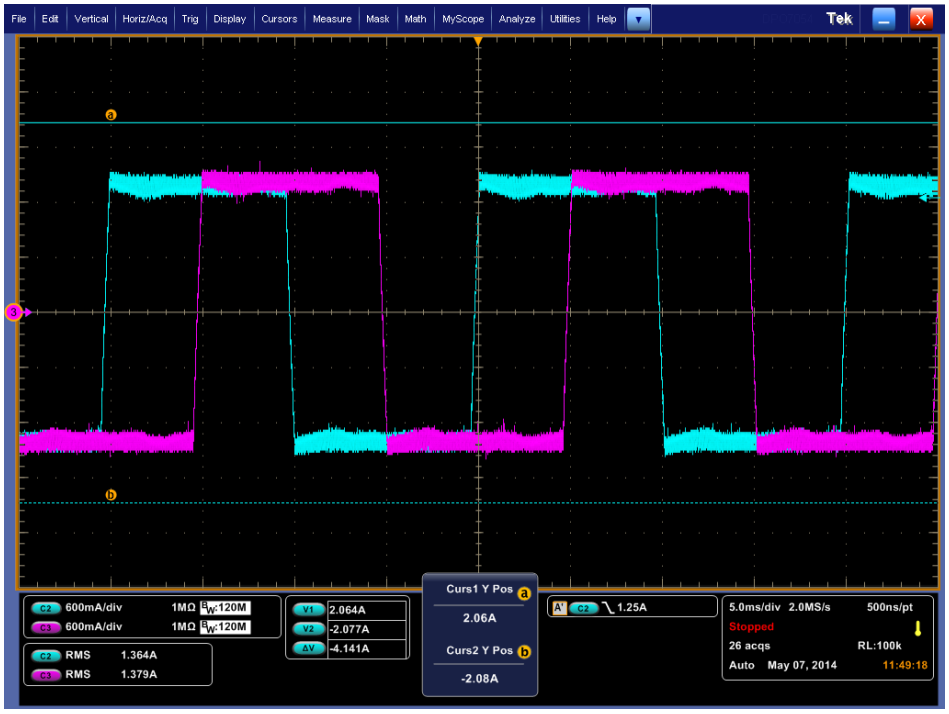


Fig. 9 Full Step / Auto Mixed Decay

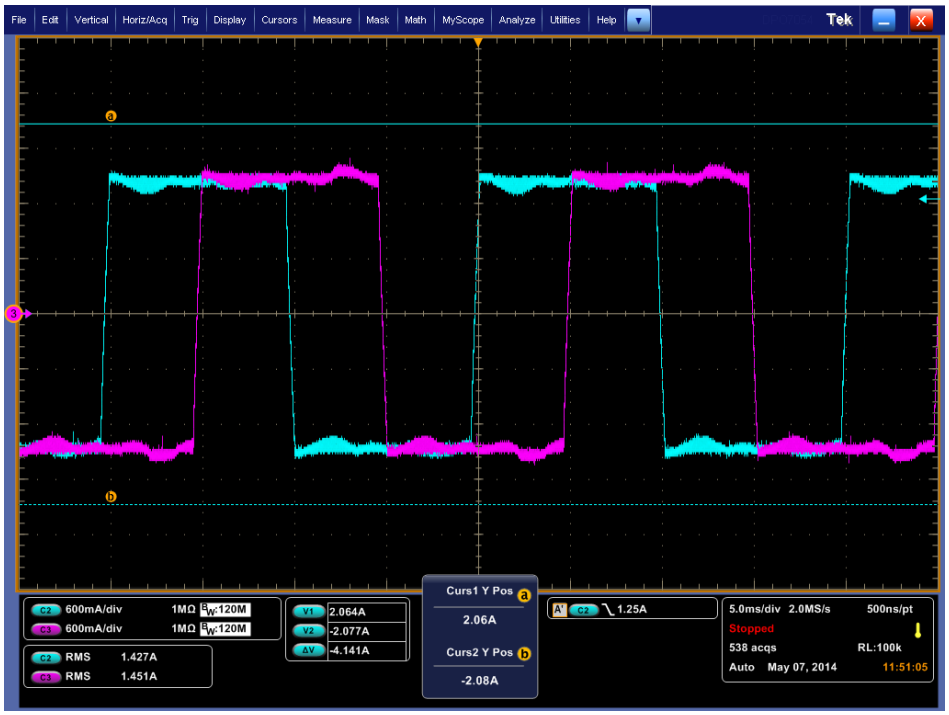


Fig. 10 Half Step / Fast Decay

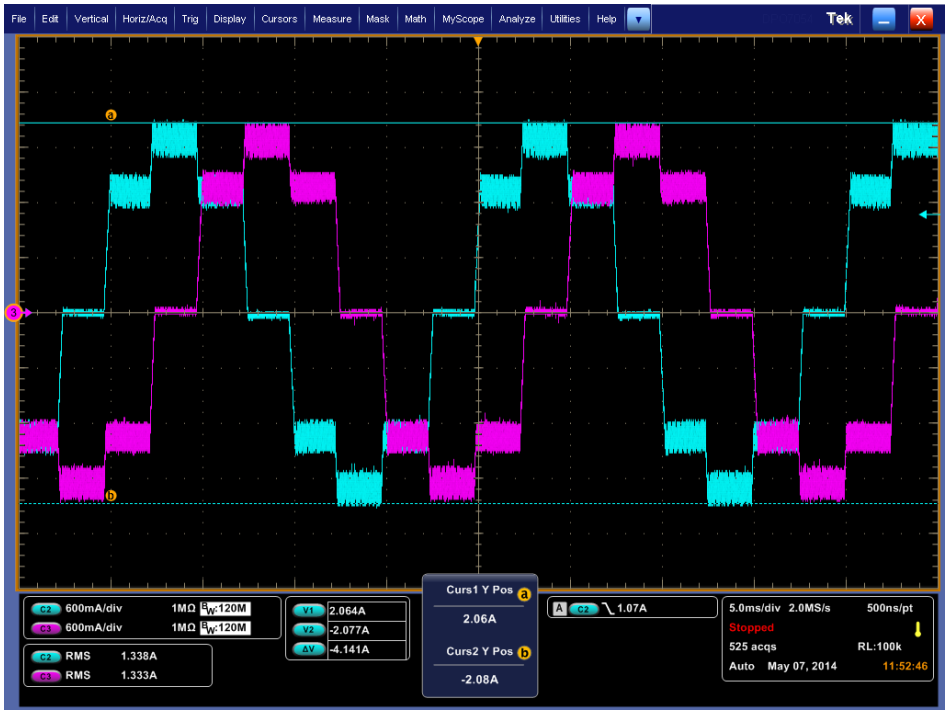


Fig. 11 Half Step / All Mixed Decay

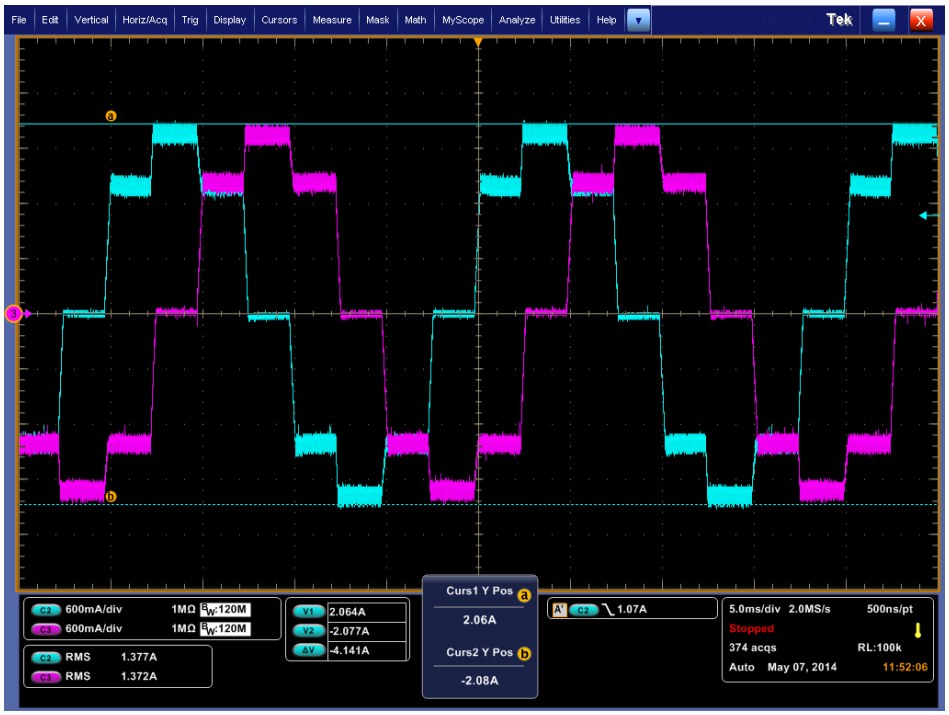


Fig. 12 Half Step / Auto Mixed Decay

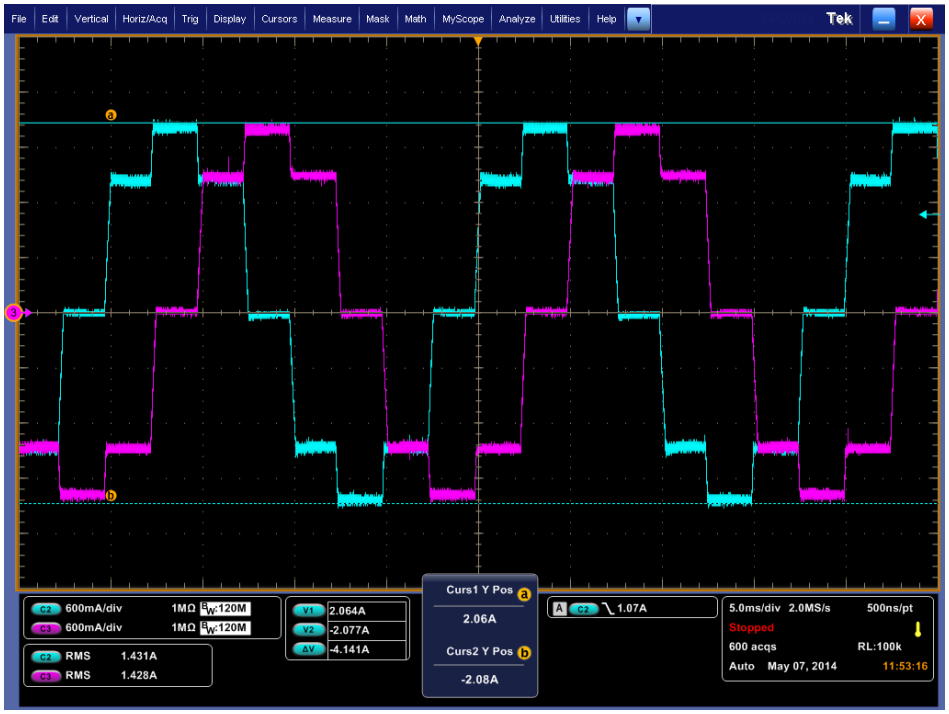


Fig. 13 Quad µStep / Fast Decay

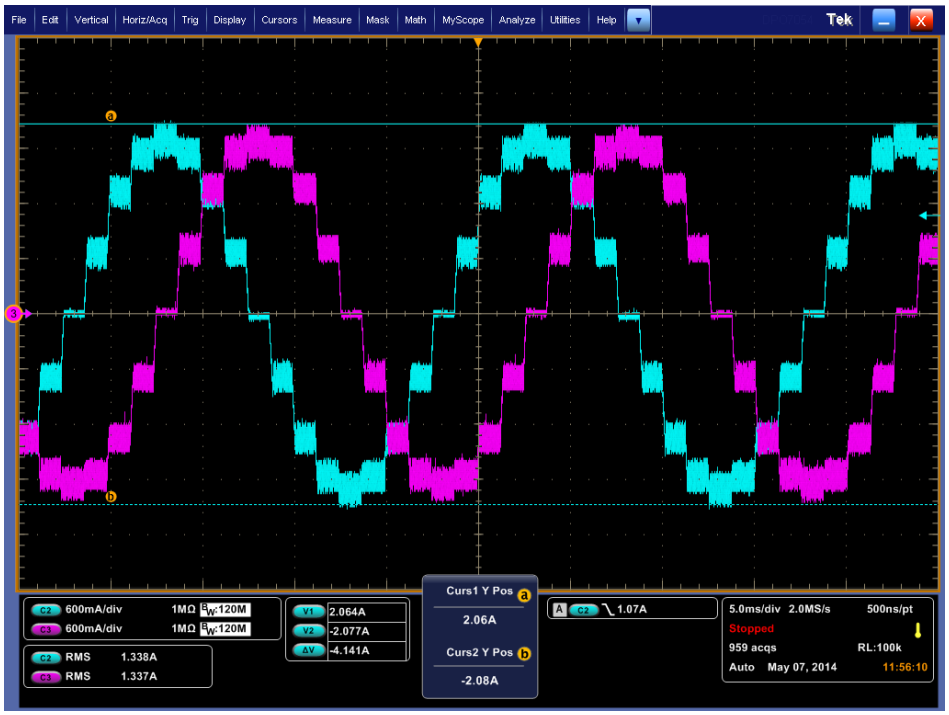


Fig. 14 Quad µStep / All Mixed Decay

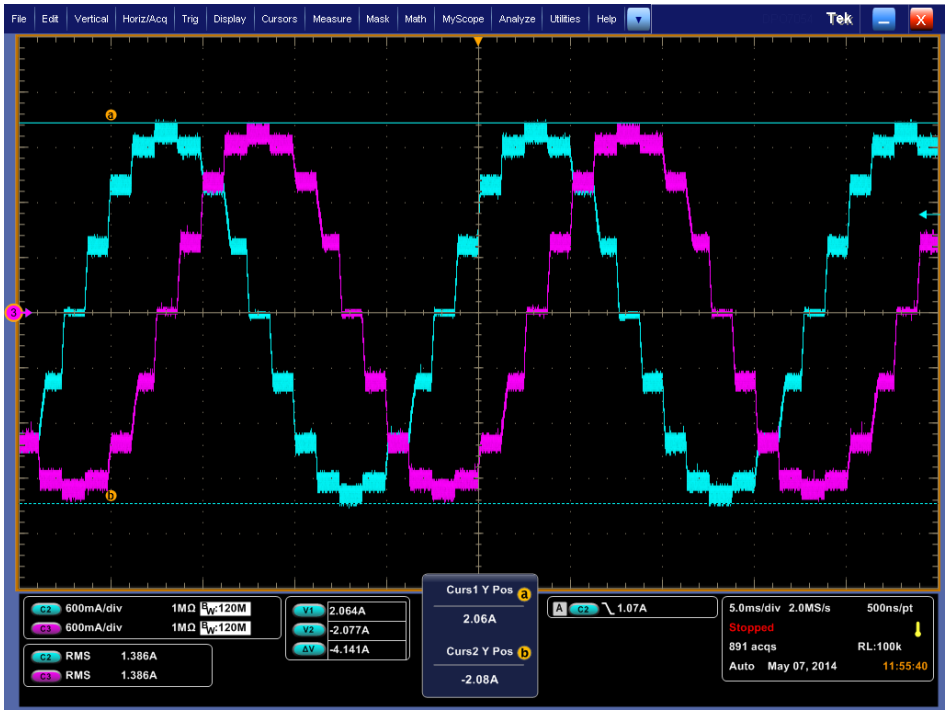


Fig. 15 Quad µStep / Auto Mixed Decay

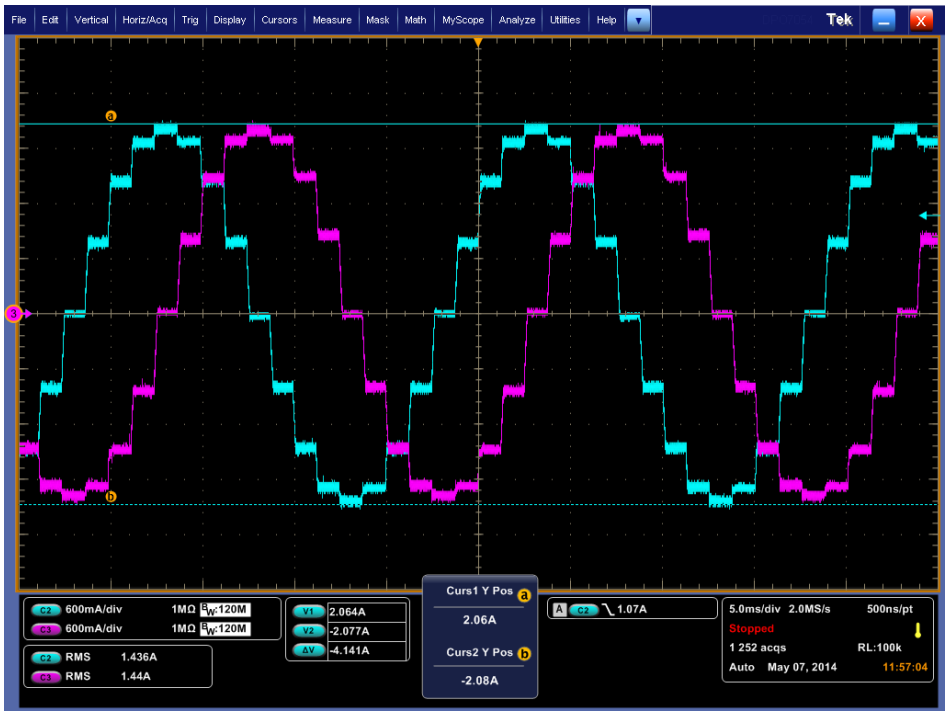


Fig. 16 8µStep / Fast Decay

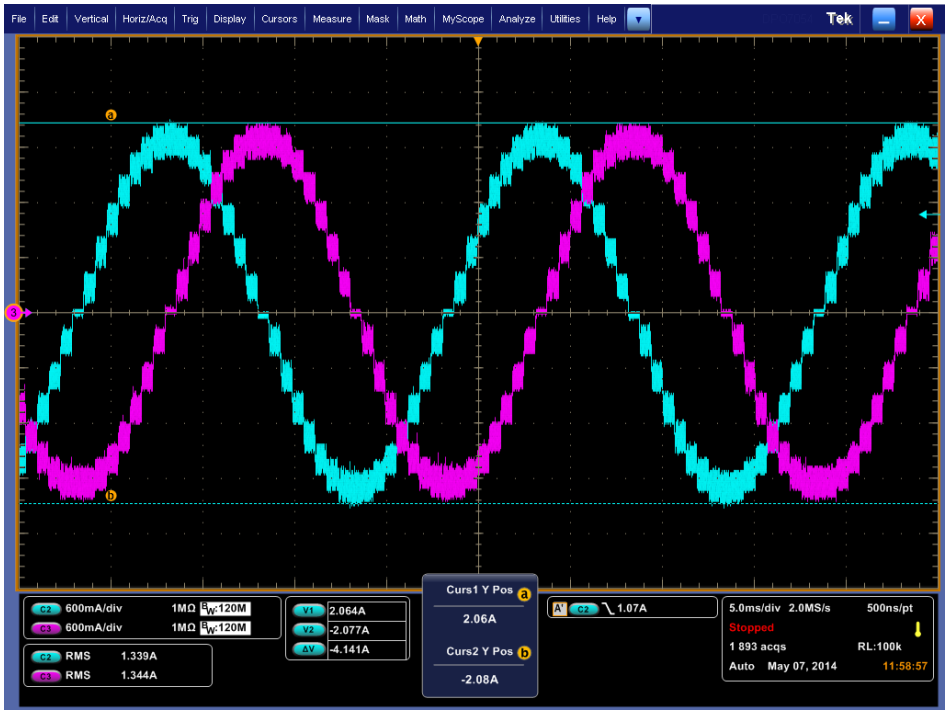


Fig. 17 8µStep / All Mixed Decay

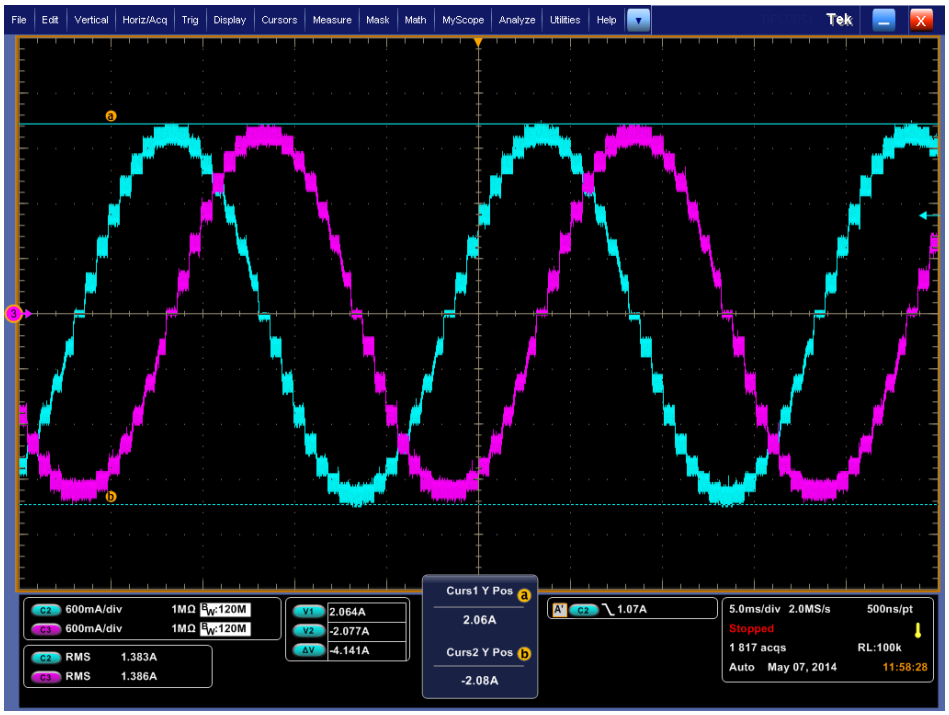


Fig. 18 8µStep / Auto Mixed Decay

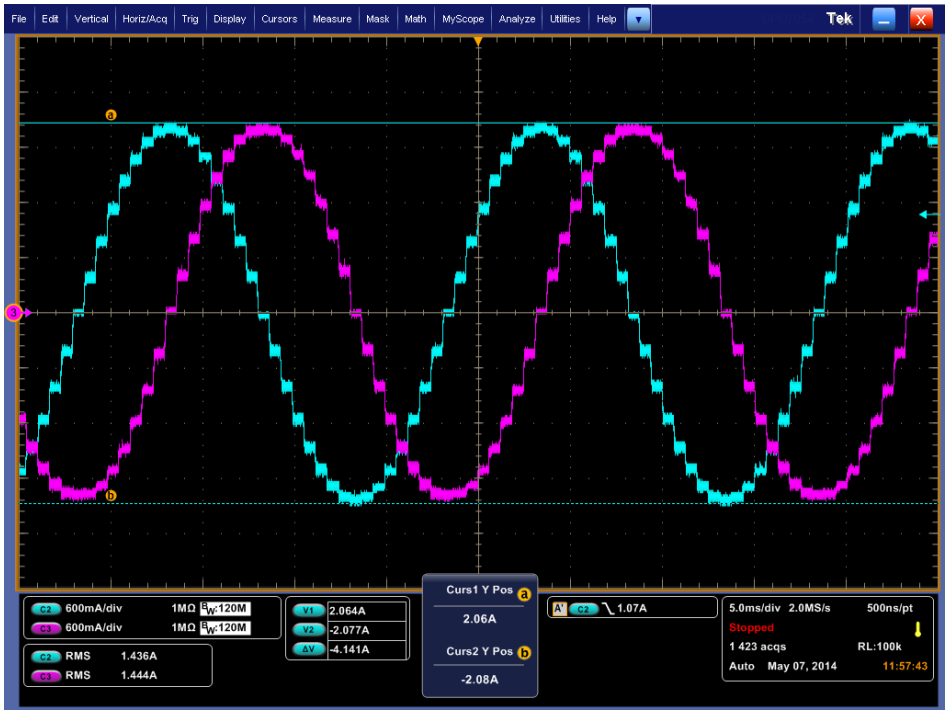


Fig. 19 16µStep / Fast Decay

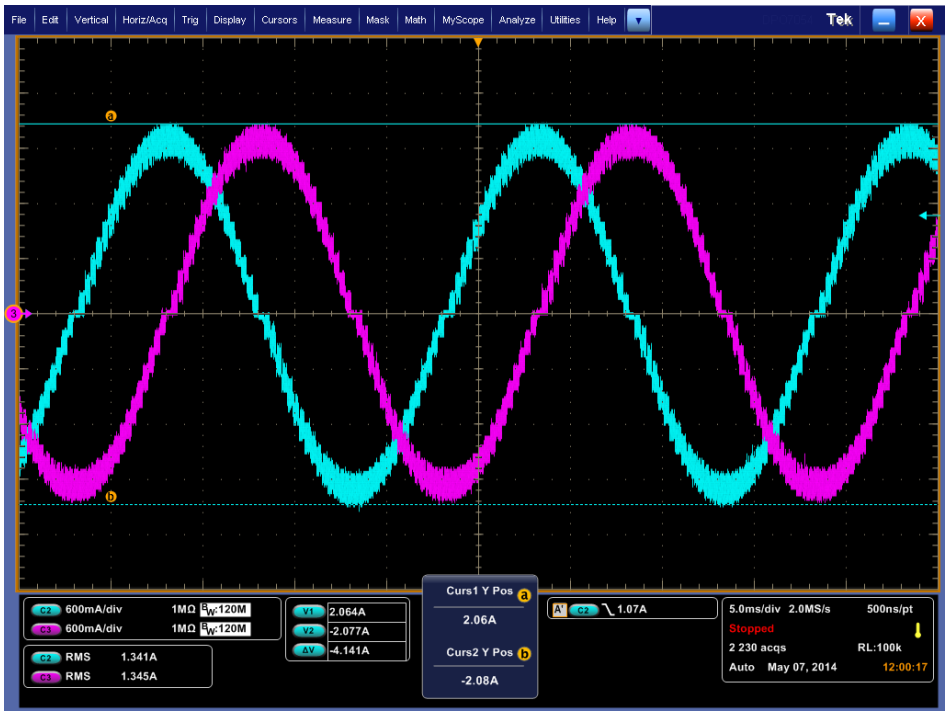


Fig. 20 16µStep / All Mixed Decay

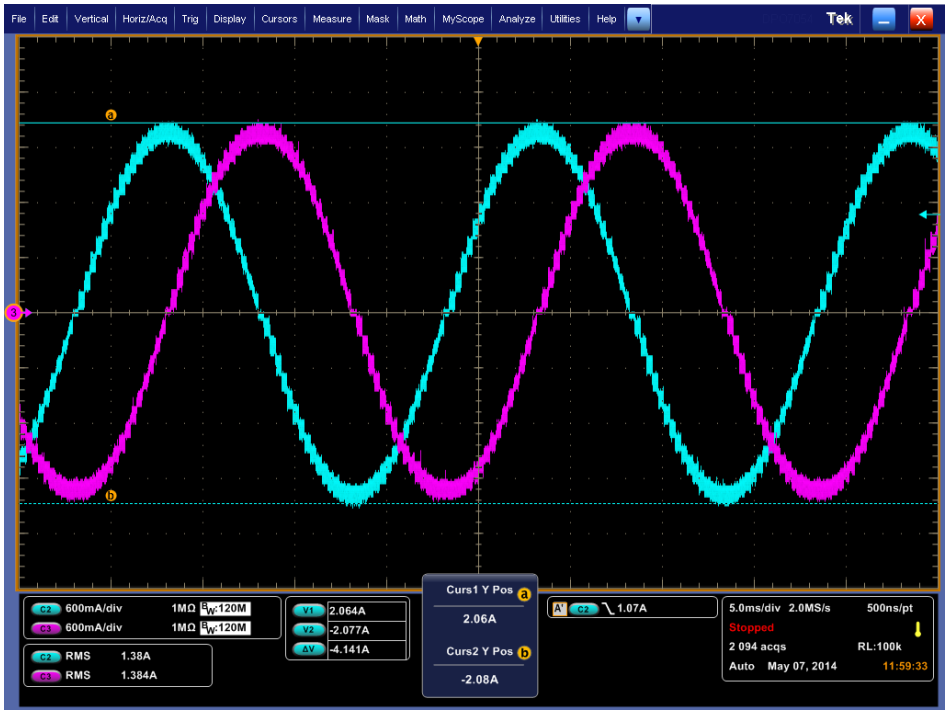


Fig. 21 16µStep / Auto Mixed Decay

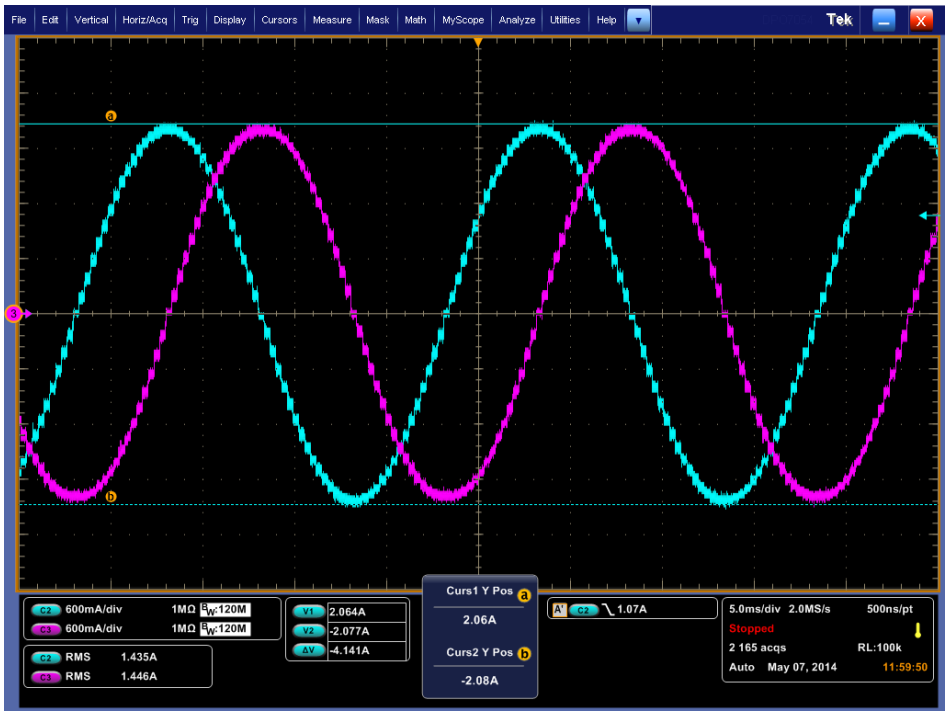


Fig. 22 32µStep / Fast Decay

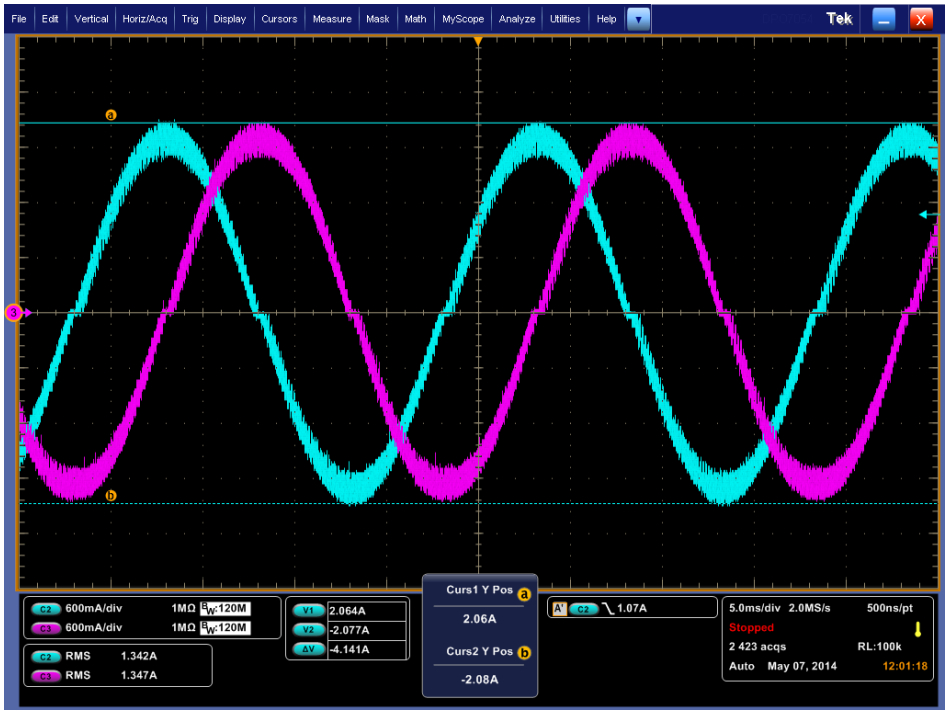


Fig. 23 32µStep / All Mixed Decay

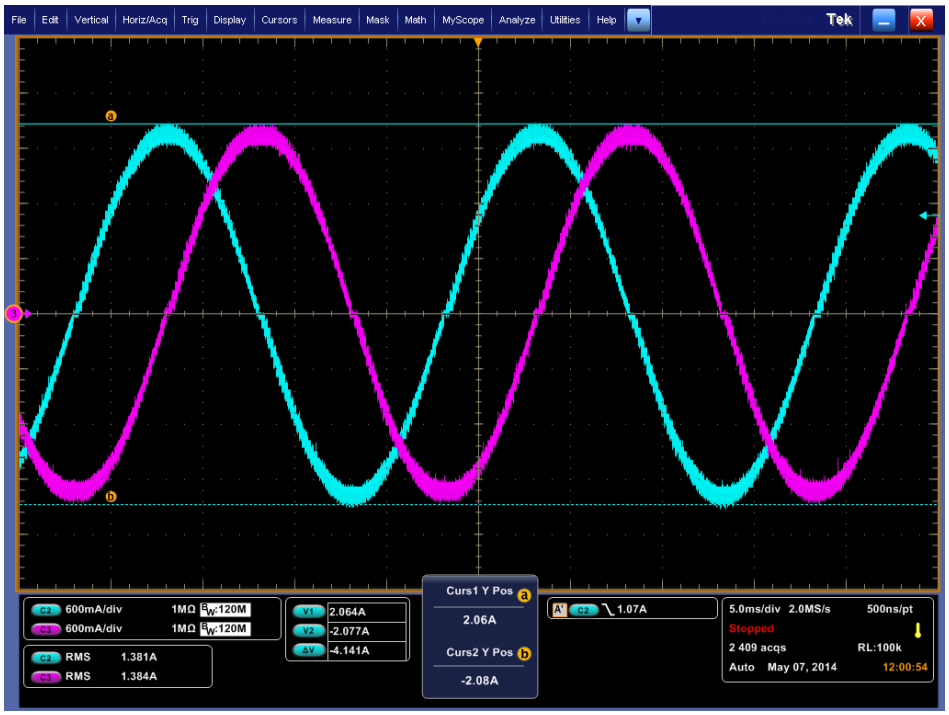


Fig. 24 32µStep / Auto Mixed Decay

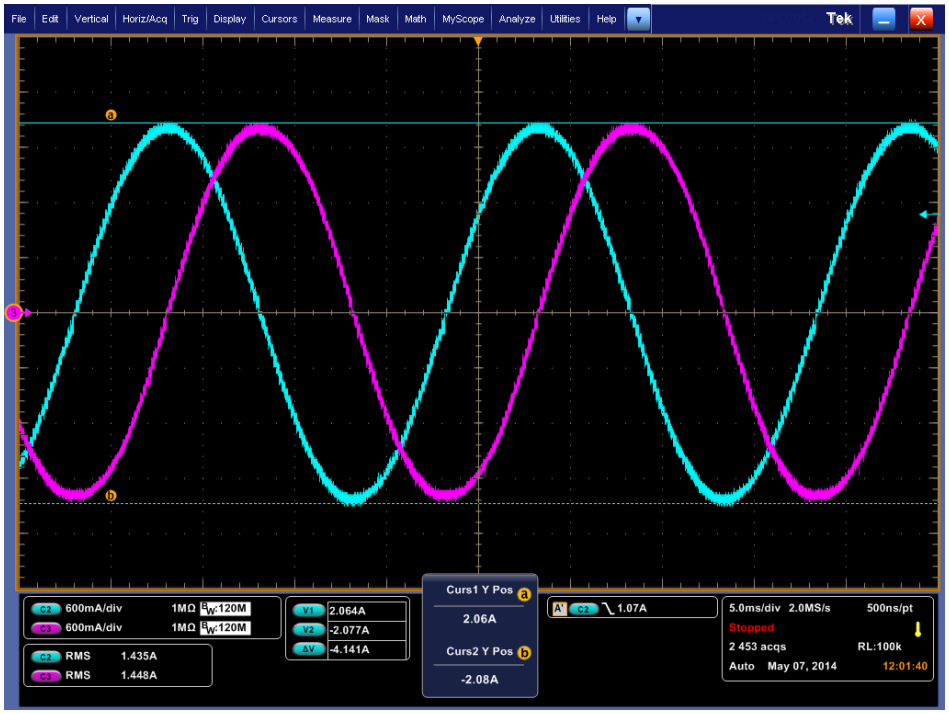


Fig. 25 64µStep / Fast Decay

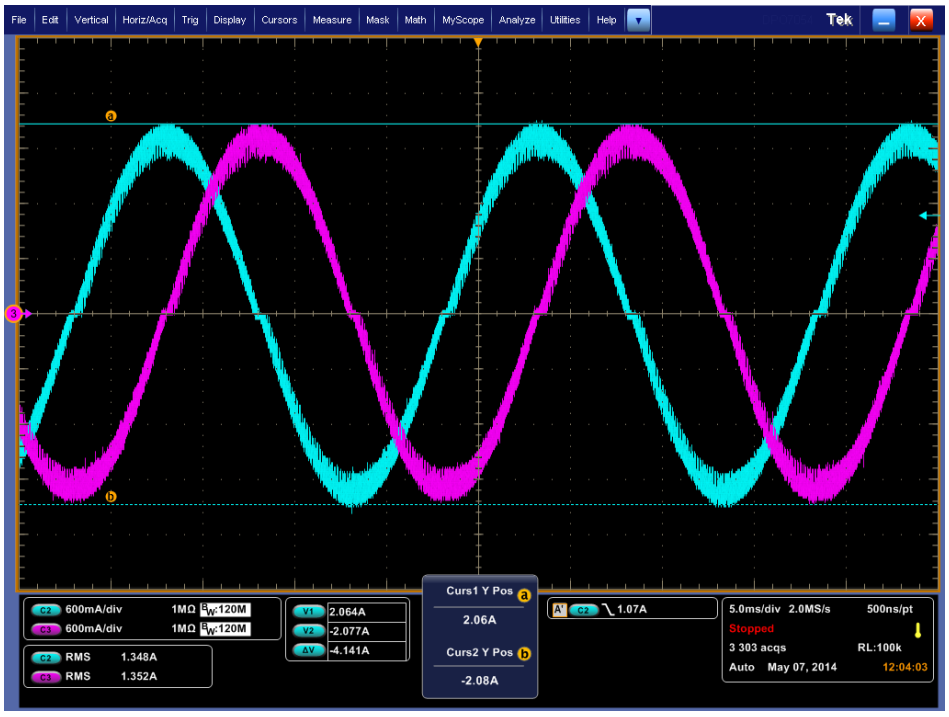


Fig. 26 32µStep / All Mixed Decay

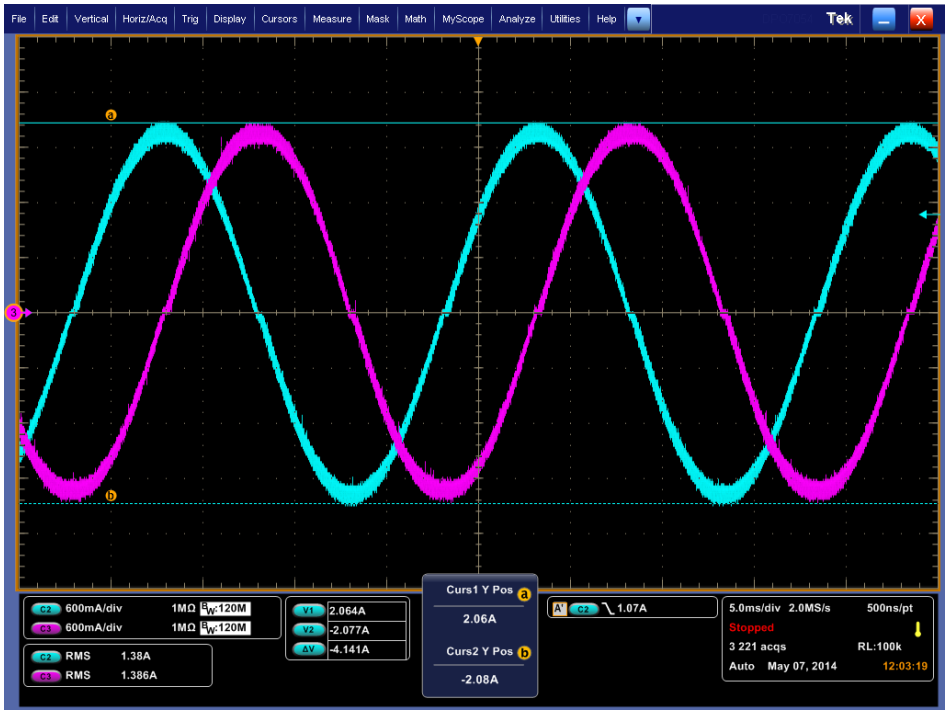


Fig. 27 64µStep / Auto Mixed Decay

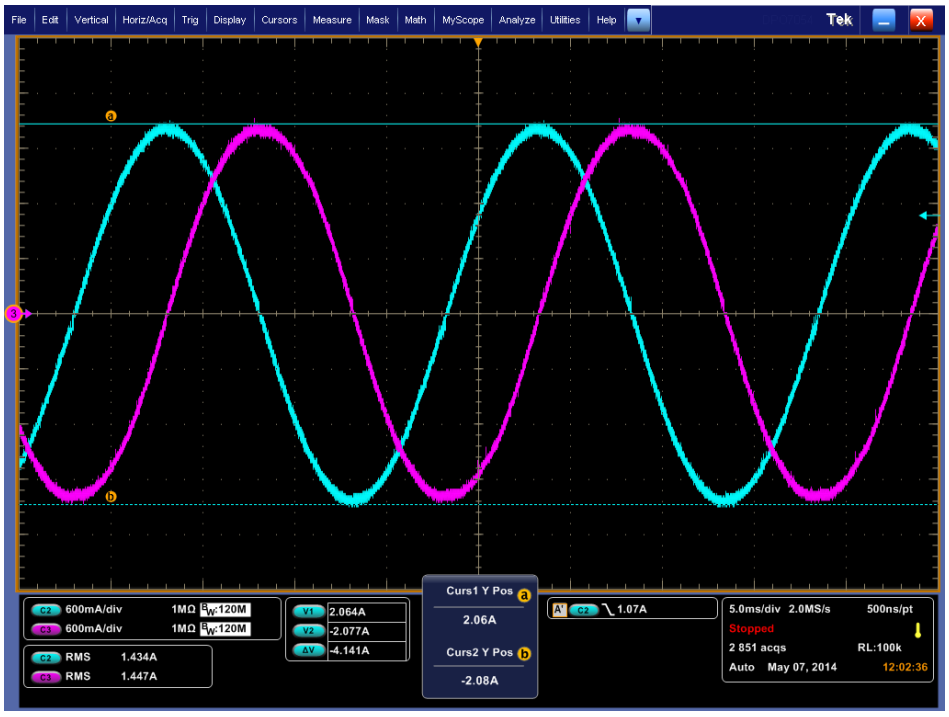


Fig. 28 128µStep / Fast Decay

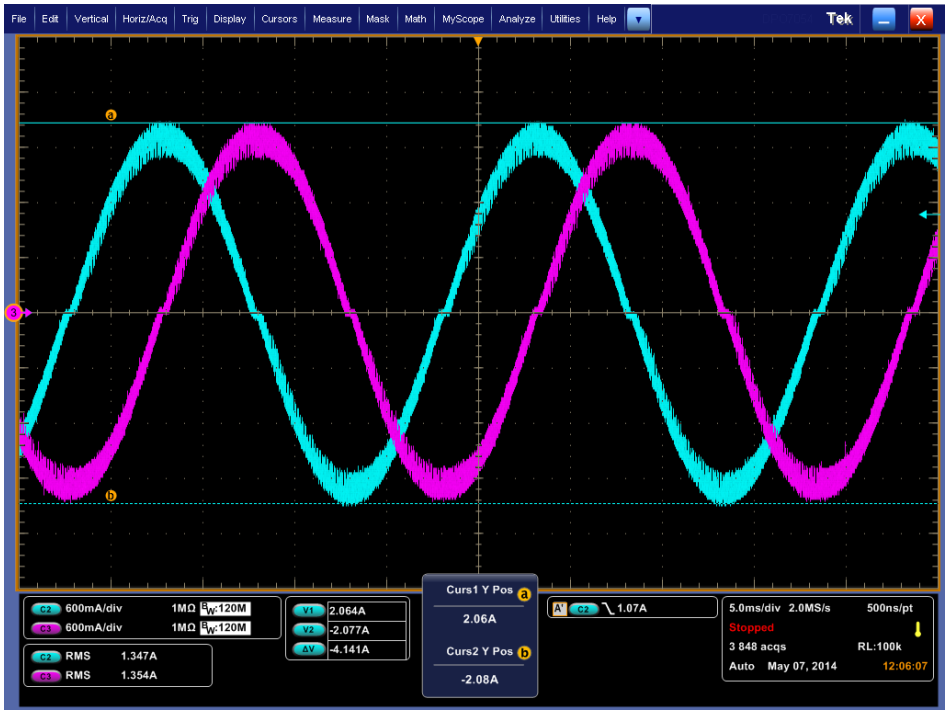


Fig. 29 128Step / All Mixed Decay

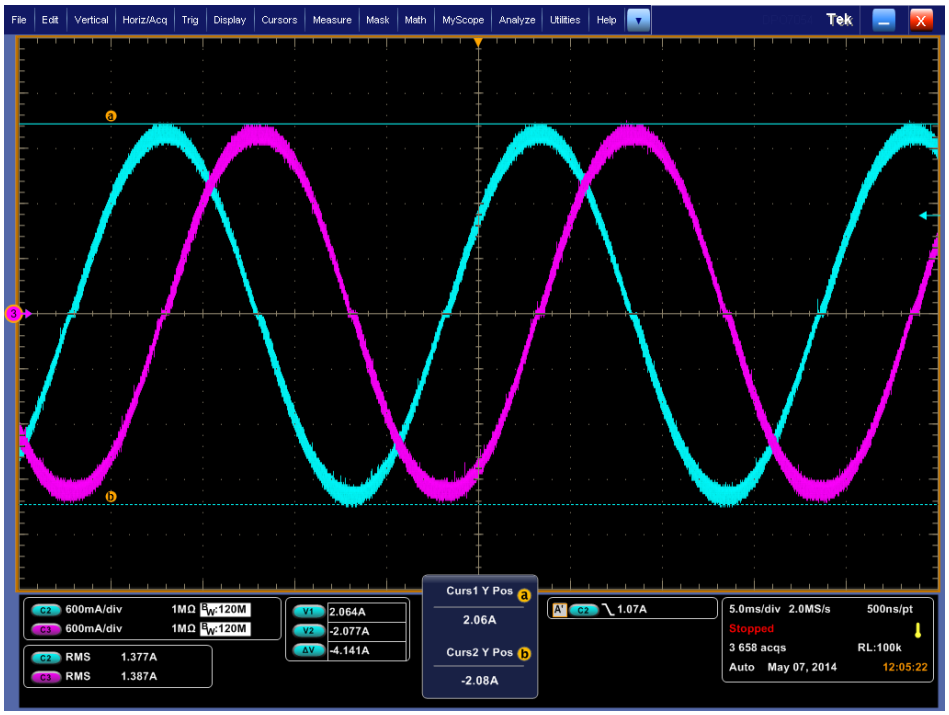


Fig. 30 128Step / Auto Mixed Decay

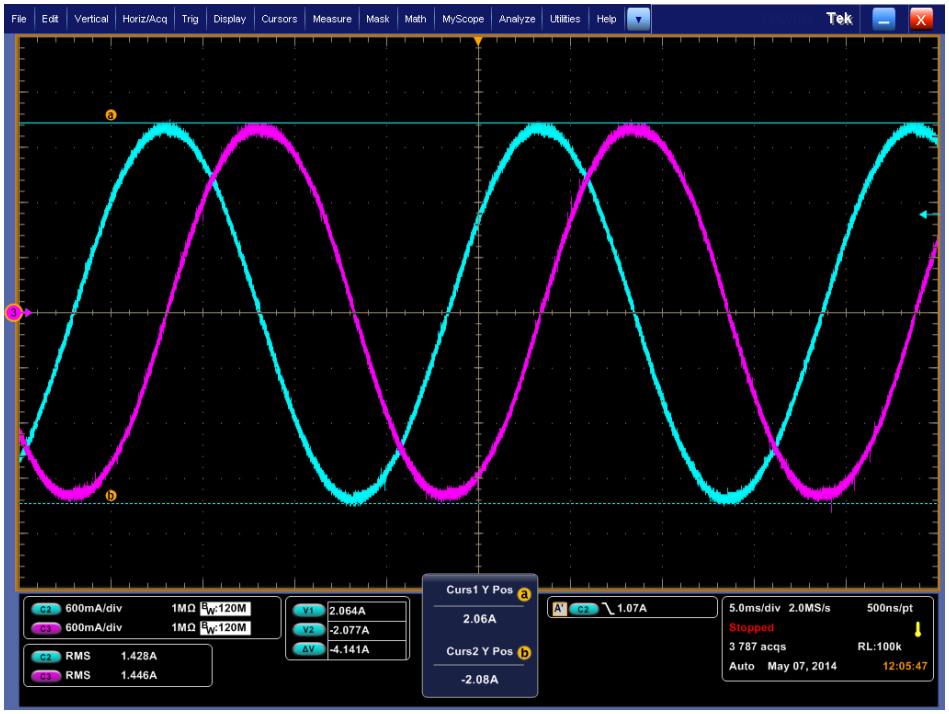


Fig. 31 256µStep / Fast Decay

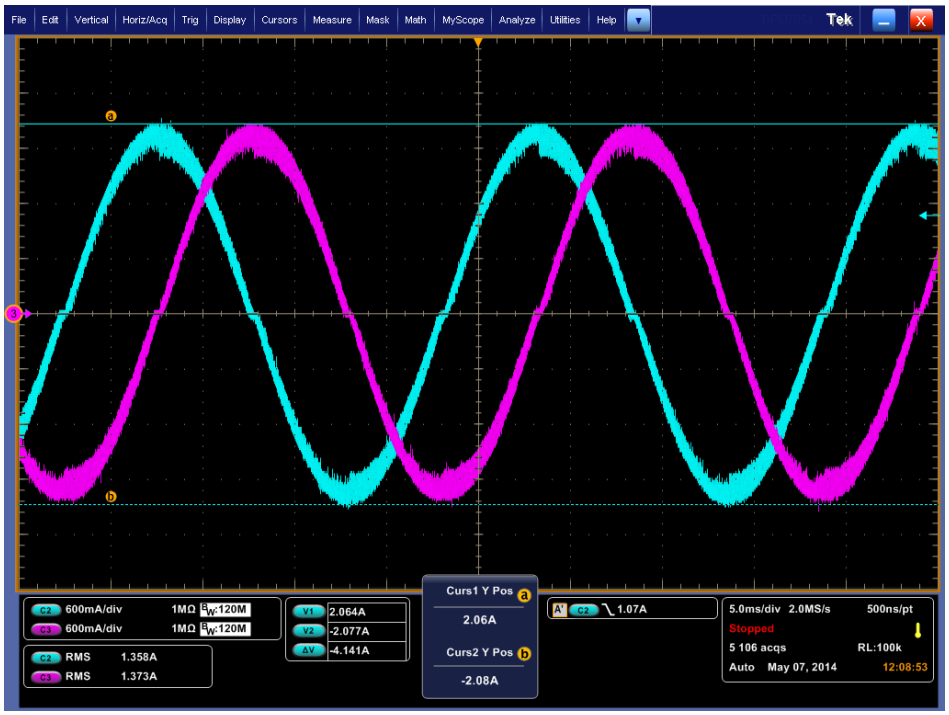


Fig. 32 256µStep / All Mixed Decay

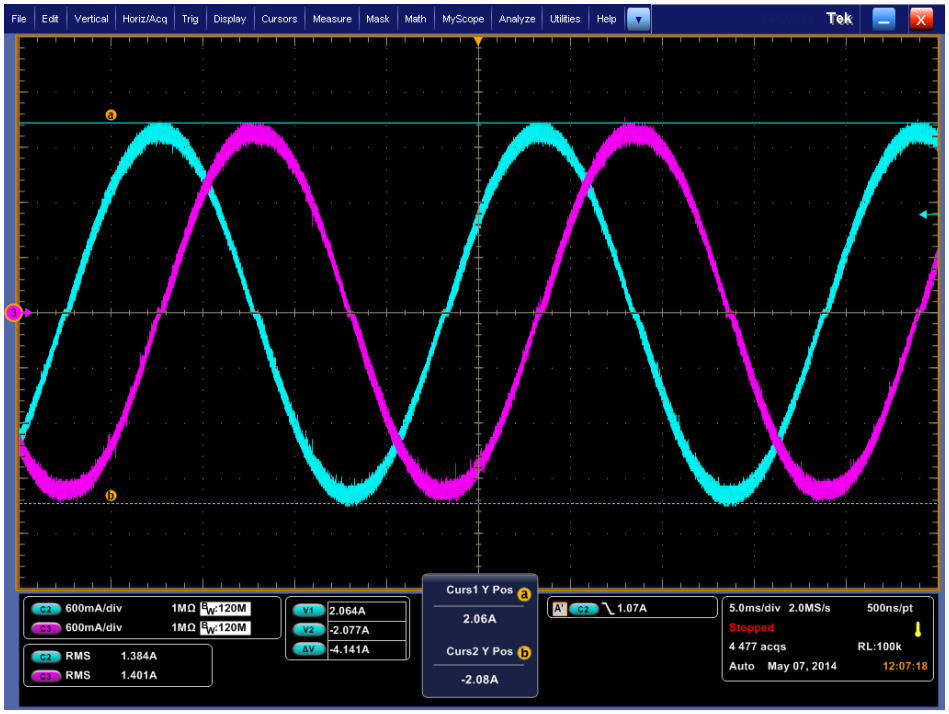


Fig. 33 256µStep / Auto Mixed Decay, t_off=36µs

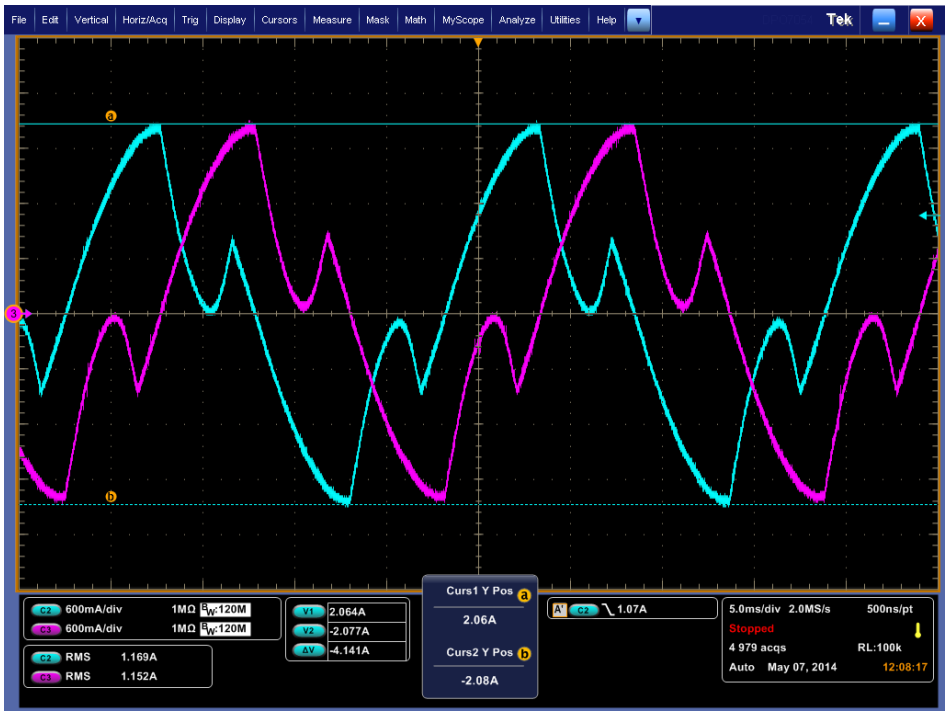
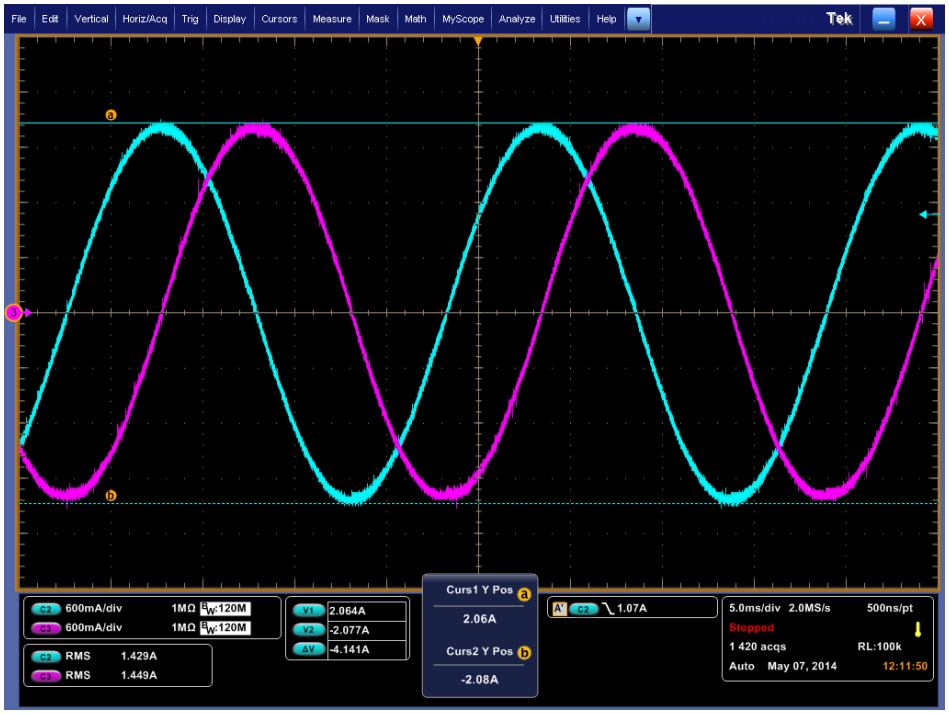


Fig. 34 256µStep / Auto Mixed Decay, t_off=16µs



6. Holding Current vs. Decay Mode

Fig. 35 Fast Decay

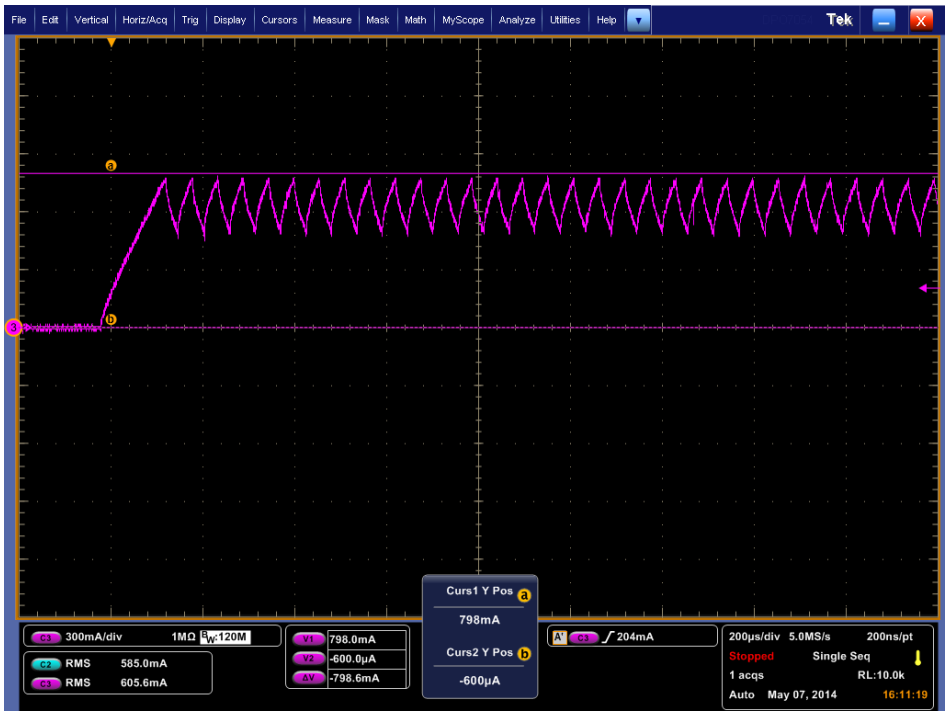


Fig. 36 All Mixed Decay

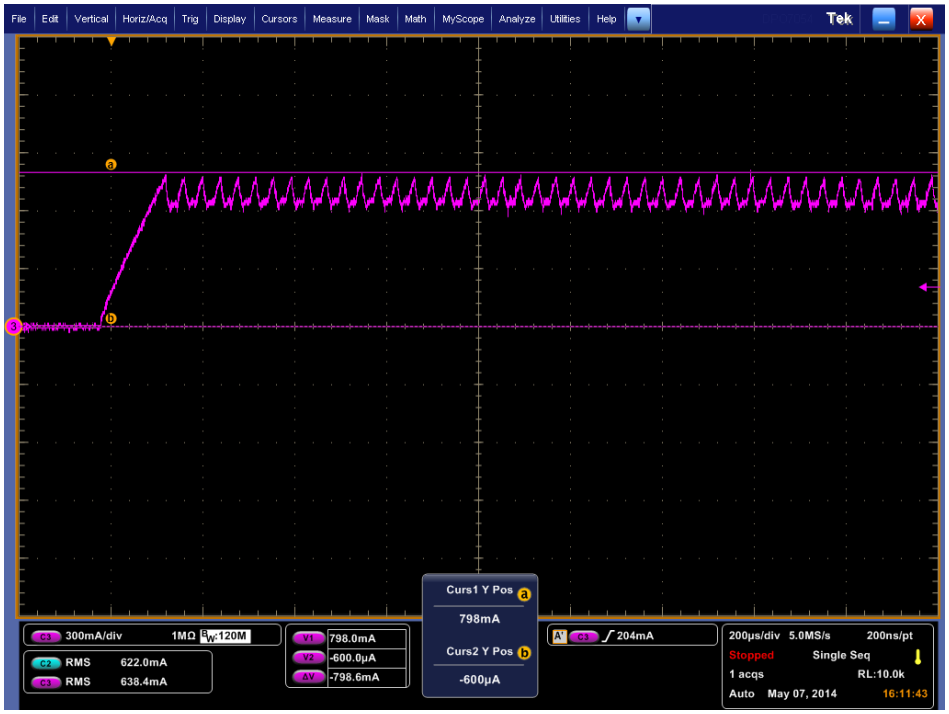
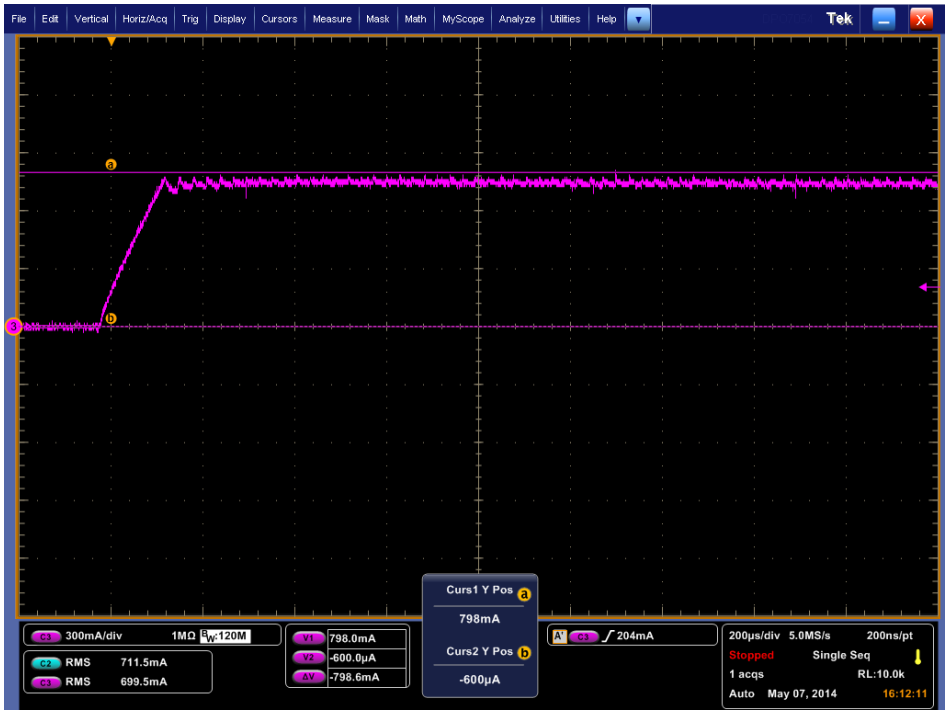


Fig. 37 Auto Mixed Decay



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