WWW.SAFECOM.TV

# Safecom - Power Booster 5G (87V/ 50-60Hz) US/EP PATENT

CATV AC/AC Stabilizer –Zero Crossing technology & RF-PASS

## Specification & Testing results

The Scoop:
Safecom's Power booster was designed to increase voltage at remote amplifiers & node cascades, maintaining active to optimal voltage levels. Unit controller monitors the input voltage level online, and operates Power Booster Zero Crossing gears in order to ensure optimal voltage output , 87V (US) or 60 V(EU).

Patented Power Booster solves the power distribution problem in a CATV network caused by high-resistance and low energy-efficient coax or electric cables.
Passive, standalone element, life time operation & ONLINE (Zero Crossing patented technology). 15A 30-87Vac (US) / 15A 30-64Vac (EU).
The unit ensures the optimal voltage levels required in remote locations by optical nodes, trunk amplifiers, and line extenders overcoming voltage drop along the power or coaxial cable. Increasing the distance between remote power sources leads to a reduction in the number of power insertion points across the network, less power supply (especially under-loaded power supplies are unnecessary), less street cabinets and permits are needed and less flat fees to the utility company for each of the power supply (even if it was never used).
Safecom's cost-saving patented Power Booster compensate the voltage drop over coax cable and enables to utilize the DPS remote backup technology between distant locations. The Power Booster can be seamlessly connected via cable to the DPS4 enabling robust power redundancy system and overcome the range limitation of the previous DPS generations. In addition to HFC networks, the power booster now enables back up to Deep Fiber networks with central powering using existing coax infrastructure between powering centers.

- ✓ Europe 60V & US 90V Standard.
- ✓ Support full 15A RMS input /output.
- ✓ Smooth transfer between gears –Zero Crossing Technology.
- ✓ Lifetime operation.
- ✓ Top-efficiency -Genius Toroidal Transformer.
- ✓ Electronic 15A Overload Protection.
- ✓ Weatherproof Enclosure.
- ✓ Wall or Pole Mounted.
- ✓ Automatic Standby mode. (Optional)
- ✓ Opposite connection protected.
- ✓ Input & Out Surge Protection
- ✓ Protecting downstream network failure caused by inrush current, low voltage and overload.
- ✓ Automatic AC bypass.
- ✓ 5 automatic voltage stages. (4 active gain + bypass)
- ✓ RF Pass 1GHz / 1.2 Ghz options
- ✓ **Optional SPD (Surge Protection device):** 100KA.

SAFECOM LTD
Tel 972-544311933
Fax 972-9-7968033

Habustan St (P.O 132) Herut
Herut Israel 40691
E-mail: david@safecom.tv

SAFECOM

WWW.SAFECOM.TV

# Specification

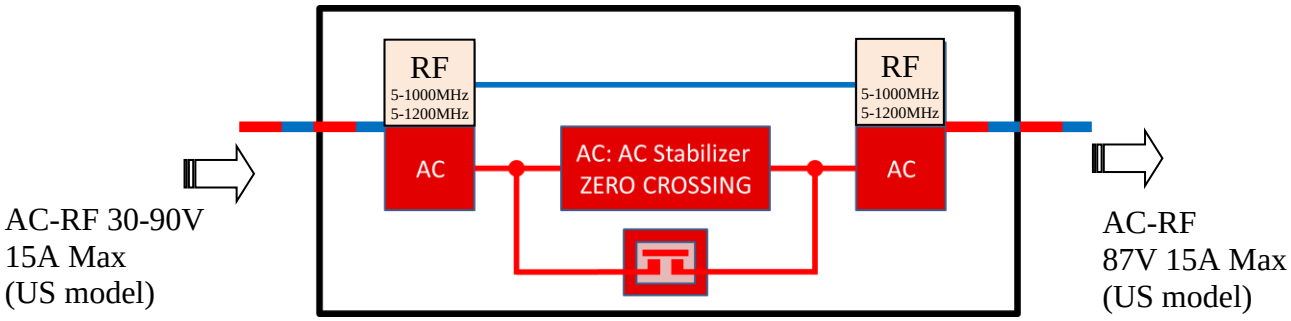
| **Electronic** | | | | **Mechanical** | |
|---|---|---|---|---|---|
| Input Frequency (Hz) | | 50/60 Hz | | Dimensions ( L , W , H ) mm | 250 X 200 X 152 |
| Max Output Current (A) | | 15A | | Weight (Kg/lbs) | 6/13.2 |
| Max Input Current | | 15A | | Connector 5/8 inch | √ |
| Self current Load | | <190mA | | Environment | |
| US | Input operating Voltage range (Vac) | 30÷ 90 Vac (US) | | Operating Temperature | -40°C ÷ +65°C |
| | Optimal Voltage range | 51-90Vac | | Storage Temperature | -40°C ÷ +70°C |
| | Voltage gain ratio ( input 80-90 Vac ) | 1:1.00 | | Humidity (waterproof) IPX8 | 0 ÷ 100% |
| | Voltage gain ratio ( input 72-80 Vac ) | 1:1.12 | | Corrosion | ASTM B 336Hr |
| | Voltage gain ratio (65-72) | 1:1.24 | | Finishes | Chromate Conversion |
| | Voltage gain ratio(59-65Vac) | 1:1.33 | | | |
| | Voltage gain ratio (input below 59Vac) | 1:1.52 | | Bandwidth (RF PCB 1.2 GHz) | 5-1200 MHz |
| EU | Input operating Voltage range (Vac) | 30÷ 65 Vac (EU) | | Impedance | 75 Ohm |
| | Optimal Voltage range | 37-65 Vac | | Through loss 5-250 MHz | < 0.5 dB |
| | Voltage gain ratio ( input 57-64 Vac ) | 1:1.00 | | Through loss 250-500 MHz | < 0.7 dB |
| | Voltage gain ratio (53-57 Vac ) | 1:1.12 | | Through loss 500-700 MHz | < 0.9 dB |
| | Voltage gain ratio (48-53 Vac) | 1:1.23 | | Through loss 700-800 MHz | < 1.0 dB |
| | Voltage gain ratio (43-48 Vac) | 1:1.36 | | Through loss 800-900 MHz | < 1.3 dB |
| | Voltage gain ratio (30-43 Vac) | 1:1.48 | | Through loss 900-1000 MHz | < 1.6 dB |
| Load Regulation (%) | | <2% | | Through loss 1000-1200 MHz | < 2.1 dB |
| Efficiency (%) | | >96% | | Flatness | +/- 0.5 dB |
| **Transfer time-active gear (0 sec)** | | **ONLINE** | | Return loss | <18dB |
| Standard Features | | | | RFI | 130 dB |
| Direct Connection In / Out 5/8 inch | | √ | | Hum Modulation | > 65dB |
| Electronic Overload protection | | √ | | | |
| Power Booster indication Green /Red LED | | √ | | | |
| Auto Standby mode | | √ | | | |

SAFECOM LTD
Tel 972-544311933
Fax 972-9-7968033

Habustan St (P.O 132) Herut
Herut Israel 40691
E-mail: david@safecom.tv

SAFECOM
WWW.SAFECOM.TV


Block diagram




Procedure:

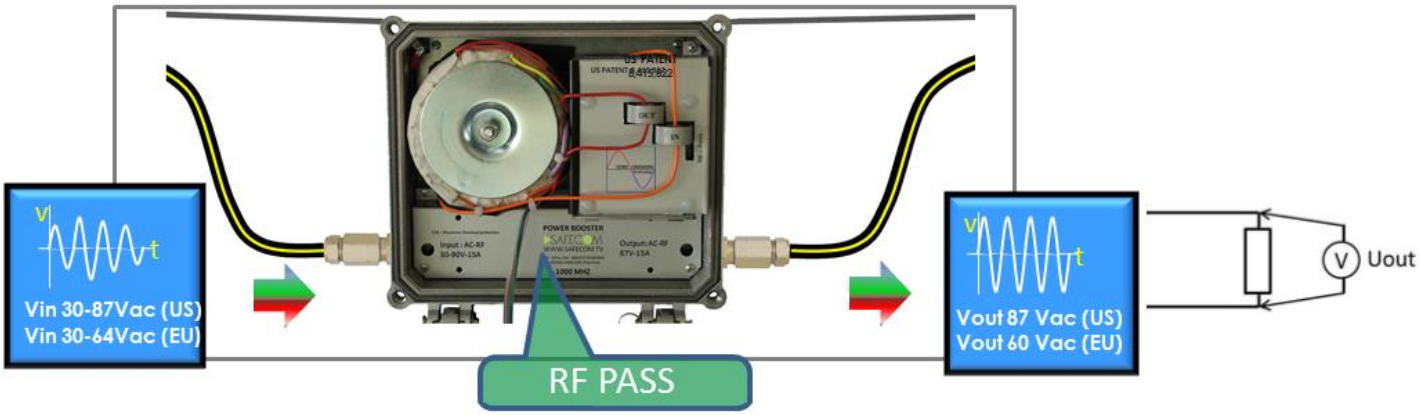
1. Connect Unit Under Test (UUT) to a CATV P.S ferroresonant or Pure Sine Power Supply through a variable resistor (simulating a coax cable).
2. Connect a True RMS Volt Meter to the input and to the output of the UUT.
3. Set the resistor to minimize resistance.
4. Turn on the power supply, the indicator LED should light in Red for two seconds and turns to the green indicating presence of regular output voltage.
5. Change the input variable resistor to obtain input voltage of 30Vac and record the output voltage, calculate the gear gain.
6. Change the input variable resistor to obtain input voltage that would cause transition from the 5st to the 4nd gear, record input and output voltage before and after the transition and calculate the gear gain.
7. Repeat step 6 for all the designed input voltage range up to 87Vac.
8. Measure & record no-load input current.
9. Turn off the power supply and connect a variable load resistor (10Ω – 1KW) to the UUT output.
10. Turn on the UUT.
11. Perform Load Regulation; maintain a constant input voltage of 78V and change the load to achieve load current between no-load & up to the current that would cause the input current limit.
12. Repeat steps 6 & 7 with an output load of 8A.
13. Check & record input current limit for all input voltage ranges.
14. Turn off the Power Supply & disconnect UUT from the test bench.

SAFECOM LTD
Tel 972-544311933
Fax 972-9-7968033

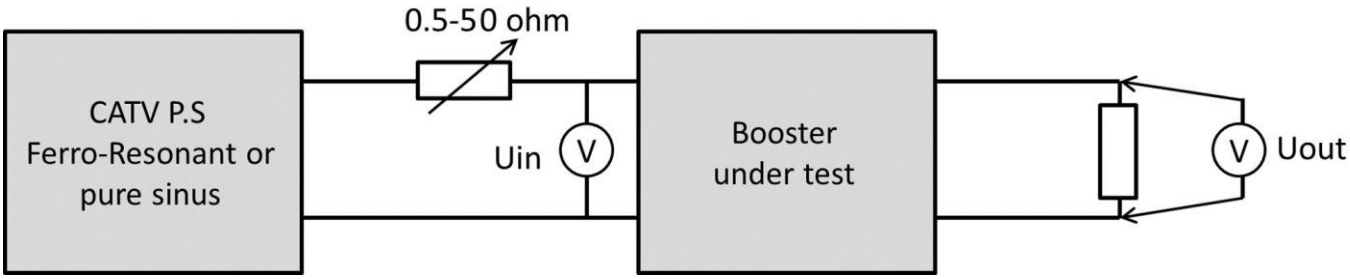
Habustan St (P.O 132) Herut
Herut Israel 40691
E-mail: david@safecom.tv

SAFECOM
WWW.SAFECOM.TV

## Power Booster inside




Test bench:




- Rin > 0.5 ohm

SAFECOM LTD
Tel 972-544311933
Fax 972-9-7968033

Habustan St (P.O 132) Herut
Herut Israel 40691
E-mail: david@safecom.tv

SAFECOM
WWW.SAFECOM.TV

**Test report:**

**Voltage & Current Measurments:**

**No-Load Test:**

| $U_{IN}$ (Volt) | $U_{OUT}$ | Gain | Gear |
|---|---|---|---|
| <30V | 0V - OFF | 0 | OFF |
| 30.0V | 45.2 | 1.509 | 5 |
| 59.3 | 89.5 | | 5 ⇨ 4 |
| 59.4 | 81.3 | 1.369 | |
| 65.7 | 90.0 | | 4 ⇨ 3 |
| 65.8 | 81.5 | 1.239 | |
| 72.6 | 90.0 | | 3 ⇨ 2 |
| 72.7 | 81.5 | 1.122 | |
| 80.1 | 90.0 | | 2 ⇨1 Bypass |
| 80.2 | 80.2 | 1.000 | 1: Bypass |
| 90.0 | 90.0 | | |

No load input current 90V model: ~100mA @ 60Hz

**Load Regulation:**

| $U_{IN}$ (Volt) | $U_{OUT}$ (Volt) | Iout (Ampers) |
|---|---|---|
| 78.0 | 87.5 | 0 |
| 78.0 | 87.0 | 2.0 |
| 78.0 | 87.0 | 4.0 |
| 78.0 | 86.8 | 6.0 |
| 78.0 | 86.6 | 8.0 |
| 78.0 | 86.4 | 10.0 |
| 78.0 | 86.2 | 12.0 |
| 78.0 | 86.0 | 14.0 |

SAFECOM LTD
Tel 972-544311933
Fax 972-9-7968033

Habustan St (P.O 132) Herut
Herut Israel 40691
E-mail: david@safecom.tv

WWW.SAFECOM.TV

Gear transitions under load:

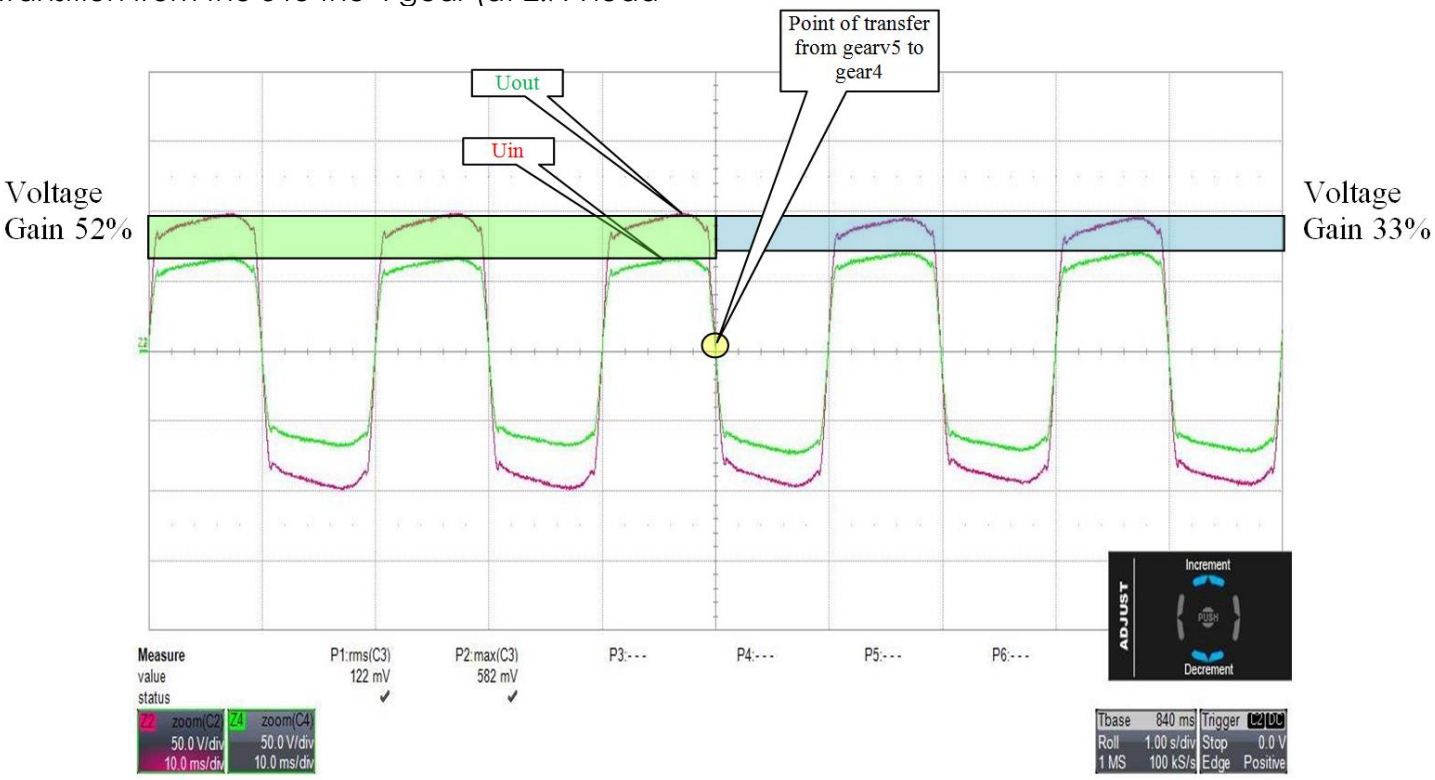
| $U_{IN}$ (Volt) | $U_{OUT}$ (Volt) | Iout [A] | Gear |
|---|---|---|---|
| 30.0 | 41.6 | 8.0 | 5 |
| 60.7 | 89.3 | 8.0 | 5 ⇨ 4 |
| 67.3 | 90.2 | 8.0 | 4 ⇨ 3 |
| 74.3 | 90.7 | 8.0 | 3 ⇨ 2 |
| 82.0 | 90.9 | 8.0 | 2 ⇨ 1 Bypass |

Input current limit: 15A±0.5A

Lab testing results using ferroresonant P.S

Waveforms: ZERO CROSSING TECHNOLOGY

Transition from the 5 to the 4 gear (at 2.7A load



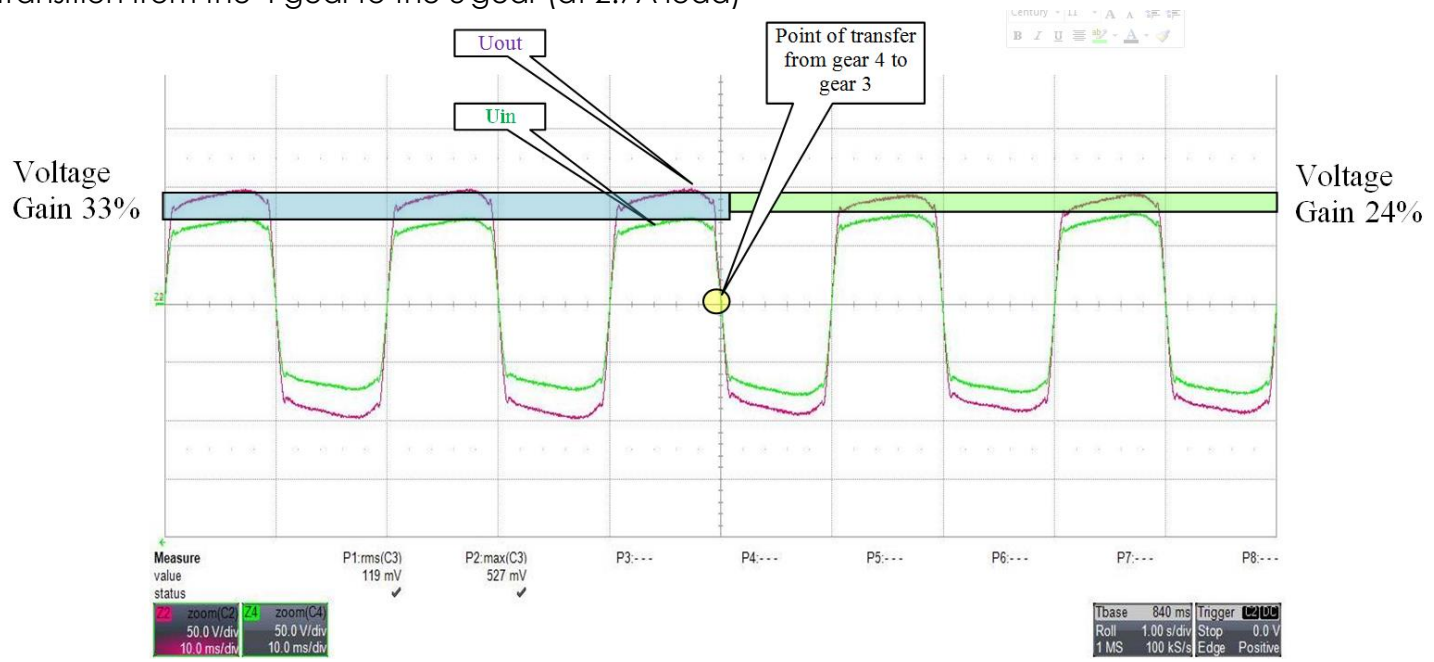

SAFECOM LTD
Tel 972-544311933
Fax 972-9-7968033

Habustan St (P.O 132) Herut
Herut Israel 40691
E-mail: david@safecom.tv

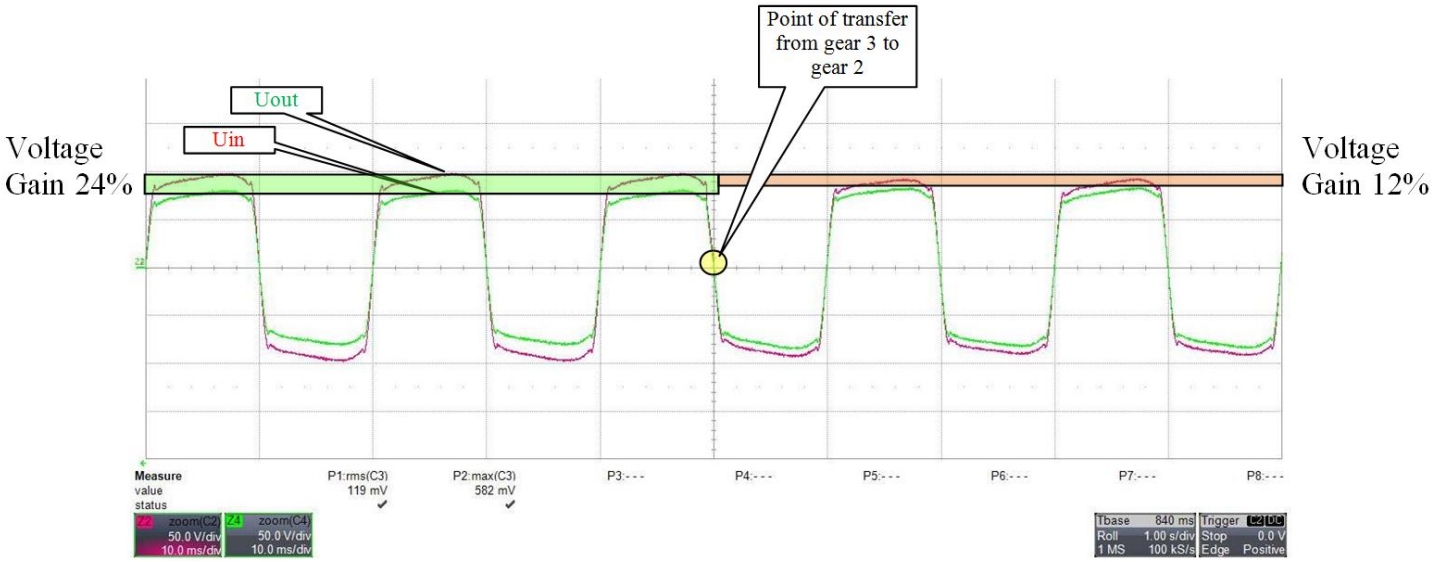
SAFECOM

WWW.SAFECOM.TV

Transition from the 4 gear to the 3 gear (at 2.7A load)




Transition from the 3nd to the 2d gear (at 2.7A load) **ZERO CROSSING TECHNOLOGY**

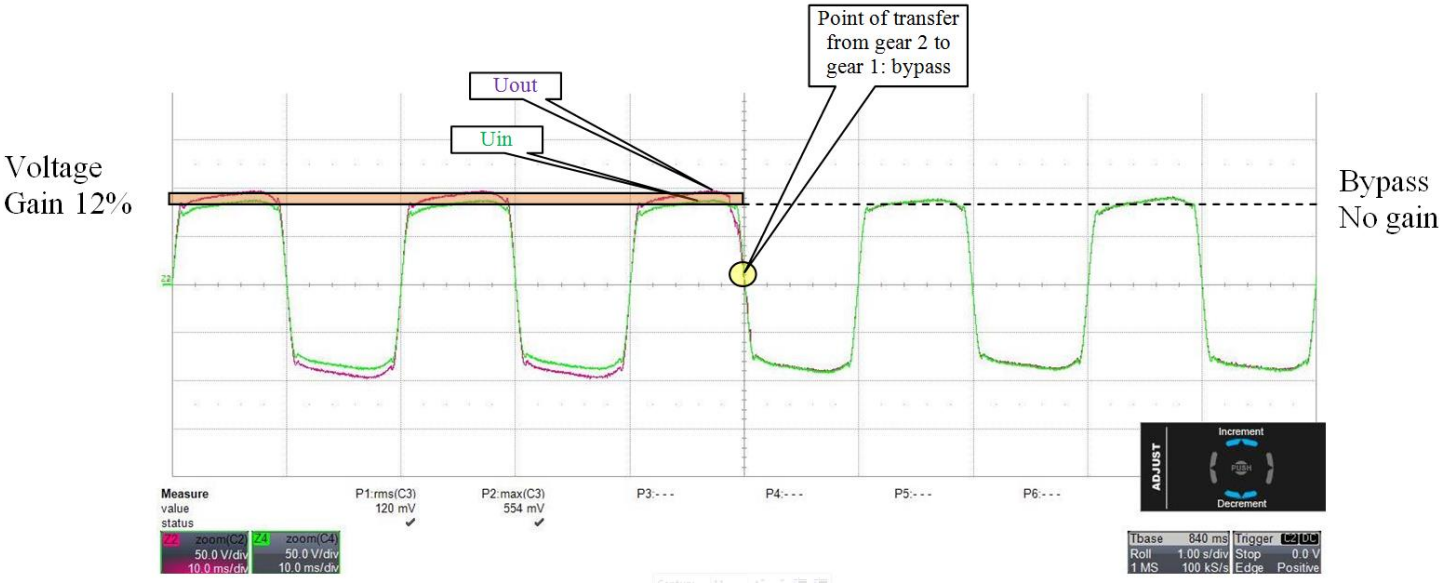



SAFECOM LTD
Tel 972-544311933
Fax 972-9-7968033

Habustan St (P.O 132) Herut
Herut Israel 40691
E-mail: david@safecom.tv

WWW.SAFECOM.TV

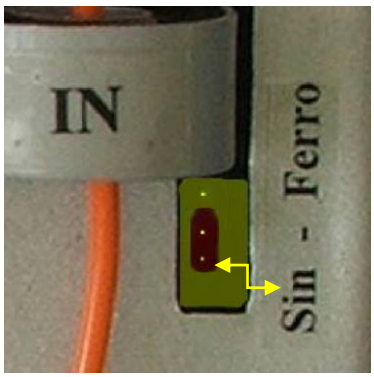
Transition from the 2nd to the 1 gear (bypass mode)

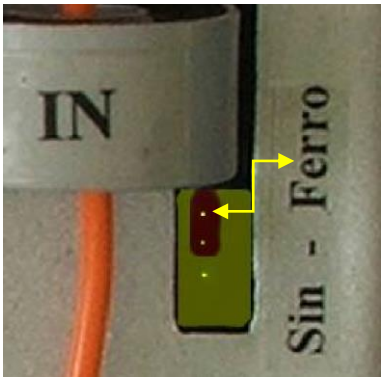



The transitions were tested @ $I_{OUT}$ = $3A_{RMS}$

## Power Booster (US type) configuration

Power Booster 90V model includes a **jumper connector** on the PCB that enables to use the Power Booster with pure sine wave (T-Former) & with the Quasi-square wave (Ferro-resonance PS).




SAFECOM LTD
Tel 972-544311933
Fax 972-9-7968033

Habustan St (P.O 132) Herut
Herut Israel 40691
E-mail: david@safecom.tv