

# HPS3512 Manual

*High Power with Smarts*  
**Vehicle Power Supply  
DC-to-DC Converter**

Manufactured by  
**TRI-M ENGINEERING**  
Engineered Solutions for Embedded Applications

## **Technical Manual**

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## PREFACE

*This manual is for integrators of applications of embedded systems. It contains information on hardware requirements and interconnection to other embedded electronics.*

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## CHAPTER 1 - INTRODUCTION

### 1.1 GENERAL DESCRIPTION

The HPS3512 is a high power, high performance DC-to-DC converter that supplies +3.3V, +5V, and +12V outputs. The HPS3512 also includes a flash based microcontroller that supplies advanced power management, and an RS232 serial port. The HPS3512 is designed for low noise embedded computer systems, has a wide input range of 6-40V(>6:1) and is ideal for battery or unregulated input applications. The HPS3512 is specifically designed for vehicular applications and has heavy-duty transient suppressors (up to 18000W<sup>1</sup>) that clamp the input voltage to safe levels, while maintaining normal power supply operation.

The HPS3512 is a state-of-the-art Mosfet based design that provides outstanding line and load regulation with efficiencies up to 90 percent. Organic Semiconductor Capacitors (OSC-CON) and Polymerized Organic Semiconductor capacitors (POSCAP) provide filtering that reduces ripple noises below 20mV. The low noise design makes the HPS3512 ideal for use aboard aircraft or military applications or wherever EMI or RFI must be minimized. Constant frequency architecture controllers provide excellent line and load transient response on the +5VDC and +12VDC outputs.

The HPS3512 has advanced power management functions that allow timed on/off control of the HPS3512, notification of changes to main power and secondary power status. For example, the HPS3512 can be programmed to power off the outputs in 60 seconds, and then turn on again 12 hours later.

The HPS3512 size is 3.55 x 3.775 inches, which is the same size as the PC/104 standard, and has the same mounting holes pattern as the PC/104 standard. However, the HPS3512 does not include the PC/104 bus connectors. All generated voltages are provided to a removable header. A removable plug allows the HPS3512 to be easily installed. The RS232 serial port is provided on a 2x5 row pin header.

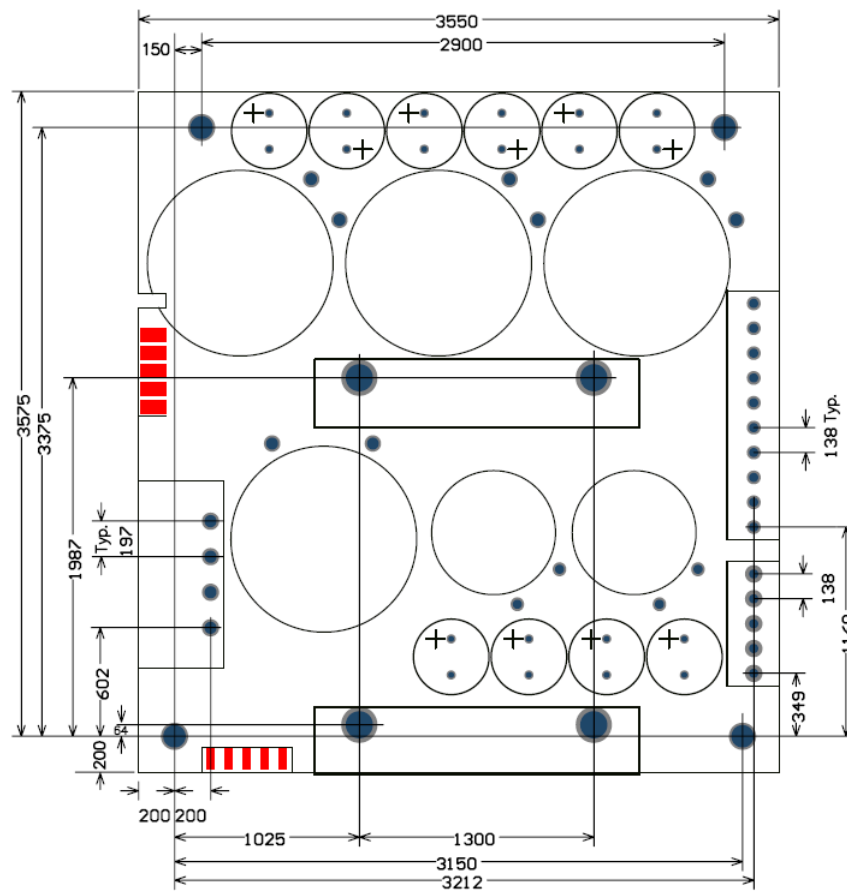
The HPS3512 can be configured to meet almost any power supply and battery powered need for embedded applications, whether that is a simple +5V application, or providing power for backlighted LCD panels.

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<sup>1</sup> Total transient dissipation with the main and secondary inputs connected in parallel.

## 1.2 FEATURES

- DC to DC converter for embedded applications.
- "Load Dump" transient suppression on input power supply.
- Operates from 6VDC to 40VDC input.
- PC/104 size and mounting holes.
- 3.3V, 5V, 12V & 5VSB outputs.
- Temperature range -40 to 85C.
- Complete with built-in digital temperature sensor.
- RS232 serial port for setup, monitoring and control.
- Optocoupled inputs for ignition, and system "shut-down" pushbutton.



HESC3512 Mechanical

Note: All dimensions in mils (1000mils = 1 inch)

### 1.3 SPECIFICATIONS

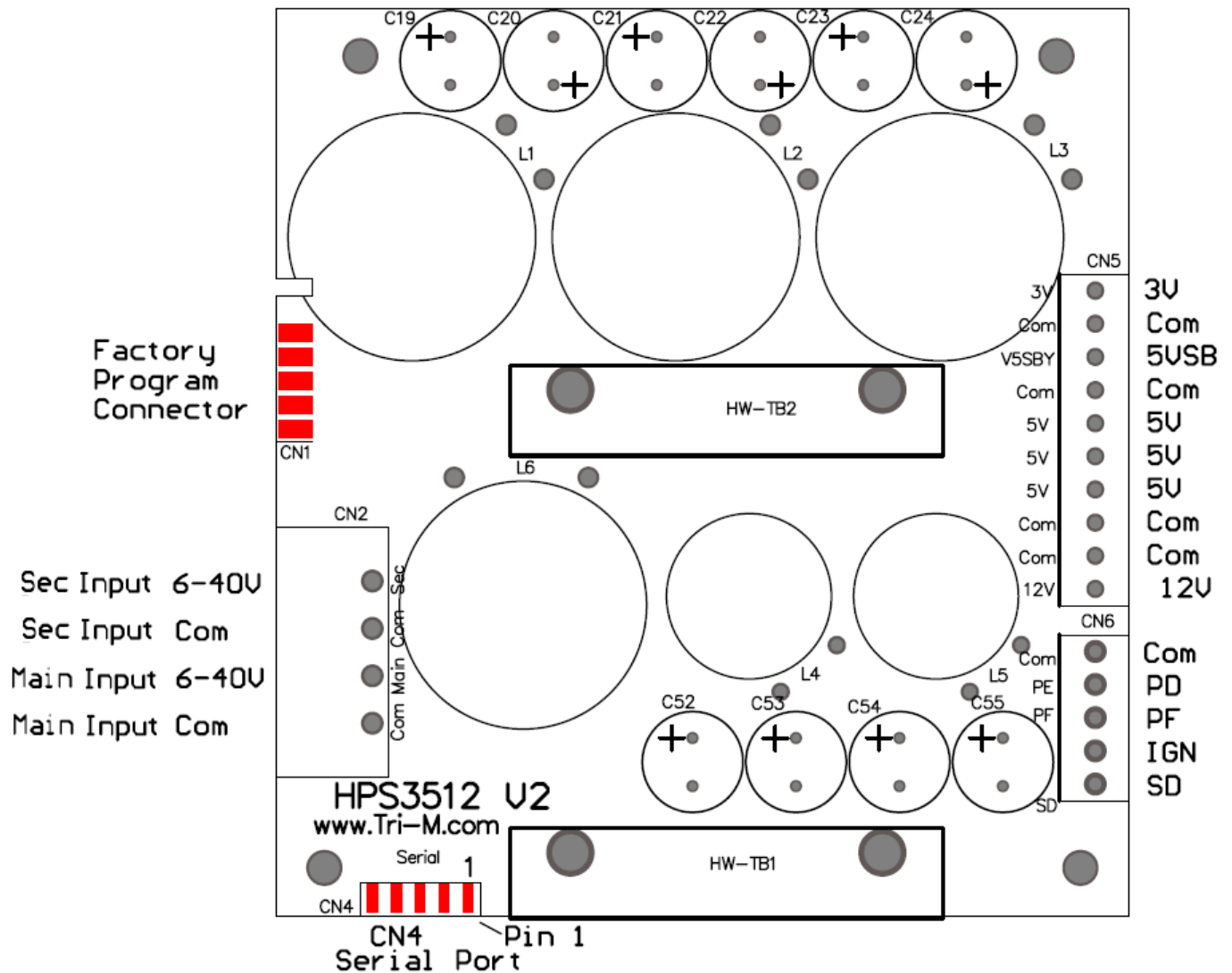
Power Supply General Specifications	
<b>Model</b>	<b>HPS3512</b>
5V output	15 A
12V output	5 A
3.3V output	10 A
5VSB output	7A
Input Voltage Range	6 to 40V

5V Output Specification	
<b>Model</b>	<b>HPS3512</b>
5V output	15 A
Load Regulation	< 60mV
Line Regulation	40mV
Output temp. drift	< 40mV
Switching Freq.	320-330kHz
Maximum Input Transient	125V for 100msec
Output Ripple	< 20mV
Conducted Susceptibility	> 57db
Efficiency	Up to 90%
Temp. Range	-40 to 85C (as measured on heat sink)
Size, PC/104 size & mounting holes	3.55"W. x 3.775"L. x 0.6"H.

## CHAPTER 2 - CONFIGURATION AND INSTALLATION

### 2.1 Introduction

This chapter describes the configuration and installation of the HPS3512 power supply. Figure 2-1 shows the HPS3512 connectors, jumpers and other options.



## 2.2 Main Input and Secondary Power Connector

Main and Secondary power is connected to the HPS3512 by a four position removable plug (CN2) with screw locking flanges. The power supply accepts DC input voltages in the range of 6VDC to 40VDC.

Unregulated vehicle power is connected as follows:

Input Power Connector CN2	
Terminal Identification	Description
SEC INPUT 6-40V	Secondary DC input
SEC INPUT COM	Common (0VDC)
MAIN INPUT 6-40V	Main DC input
MAIN INPUT COM	Common (0VDC)

## 2.3 Output Power Connector CN5

Output power is supplied to a removable connector CN5. Each output terminal is rated to 8-amps. The +5V output is supplied to three terminals and parallel wires should be used to remain under the 8-amp limit and to lower any voltage losses.

Note: A Common (0VDC) return wire should be used for each power wire used.

Output Power Connector CN5	
Terminal Identification	Description
+3.3V	+3.3V output
COM	Common (0VDC)
5VSB	+5VSB (standby 5V)
COM	Common (0VDC)
+5V	+5VDC output
+5V	+5VDC output
+5V	+5VDC output
COM	Common (0VDC)
COM	Common (0VDC)
+12V	+12VDC output



## 2.4 Control Signal Interface Connector CN6

Control Signal Interface Connector CN6		
Terminal Identification	Description	I/O Architecture
COM	Common	0-VDC
PD	Power Disable	Open Drain with 20K pull-up
PF	Power Fail	Open Drain with 2K pull-up
IGN	Maintained Contact Input	Opto-isolated with 5K series resistance
SD	Pushbutton Contact Input	Opto-isolated with 5K series resistance

Note: All outputs are active low. The active state of the IGN signal is programmable. The SCU.exe utility can be used to change the polarity.

## 2.5 RS232 Serial Port Interface CN4

The HPS3512 provides an RS232 serial port for remote control, monitoring and data-logging. The serial port connector is a two row by five-pin header connector, CN9.

- CN4-1: PL, Low Power signal output (TTL level)
- CN4-2: Not used
- CN4-3: TX-Out, RS232 output signal
- CN4-4: Not used
- CN4-5: RX-IN, RS232 input signal
- CN4-6: PF-232, Power Fail signal output, RS232 signal levels
- CN4-7: SD-232, Shut Down signal input, RS232 signal levels
- CN4-8: Not used
- CN4-9: Common
- CN4-10: Common

## CHAPTER 3 - Using HPS-UPS Power Management Features.

Note: In order to use the advanced power management features, the HPS3512 must have the HPS-UPS Firmware loaded. Please refer to the HPS-UPS manual for details.

By monitoring and activating the following inputs and outputs, the HPS3512 power supply is capable of responding to changes in Main and Secondary input supply and to alert the host CPU of such conditions. TRI-M's Windows based Smart Charger Utility (SCU.exe) allows monitoring various HPS3512 functions, and can change the operational profile.

The active state of IGN can be programmed for either signal applied or absence of signal (6 – 40 VDC). The SD signal responds to a “momentarily” applied 6-40V DC signal.

PL is driven low when the Secondary voltage is below the set point value of Minimum Secondary Input Voltage EEPROM variable.

PF (available on the serial port connector) is driven active after the main input power is removed and the “debounce” interval is completed or whenever there is a pending shutdown of the main outputs.

IGN, SD, and PF can be used to signal the host CPU to prepare for shutdown. It is critical that operating systems such as Linux and Windows are shutdown gracefully otherwise corruption of the OS and the file system may result.

After any of the three signals (IGN, SD, PF) becomes active, the corresponding counter will start counting down to zero. When the counter reaches zero, a shutdown command is issued to switch off the HPS3512 outputs immediately.

### 3.1 ATX compatibility

The HPS3512 can be configured to be signal compatible to an ATX power supply. However, the HPS3512 does not provide the -5V and -12V that standard ATX supplies include. The active state of the IGN will have to be configured to start-up the supply when the applied PS-ONOFF signal is low (ie: connected to ground or common). To configure the IGN pin to act in this manner, set the Ign-HiOffEn bit in the ChFlags register to “0”.

Power Supply Wiring	
ATX connector	HPS3512
+12 V	+12 V
+5 V	+5 V
+3 V	+3 V
-5 V	Not Connected
-12 V	Not Connected
+ 5 VSB	+ 5 VSB
PS_On#	IGN