ICS1735 Evaluation Board

General Description

Galaxy Power, Inc.'s ICS1735 Evaluation Board helps provide a practical way of evaluating the ICS1735 conditioning/charge method on lead acid batteries. The evaluation board provides some circuit options for interfacing to an external regulating current to voltage charging source or for building an adjustable regulating source for charging 6V, 12V, and 24V lead acid batteries.

The board provides a constant current discharge circuit, so R1, R2, and R3 are jumpers. The added .51Ω, 1W resistor and 2N3903 NPN transistor provides constant amplitude 1.25A discharge pulses for conditioning the battery through out the charging process. The amplitude of the discharge current is independent of battery voltage and may be increased or decreased by changing the value of the .51Ω resistor. The amplitude of the current is typically 0.64V/.XXΩ. Jumper provisions are provided for selecting a charge time for performance improvement evaluations. The board includes a bread- boarding area consisting of a matrix of holes for user added components.

Before using the **ICS1735 Evaluation Board**, the user should review the ICS1735 data sheet to become familiar with the operation of the IC. The board can be purchased either as an **ICS1735EB** or an **ICS1735EB/CVR**. The **CVR** version provides a parts kit for the user to make an adjustable, regulating charging source.

Setting-up for Your Application

Refer to the evaluation board schematic diagram. If the **ICS1735EB** is to interface to an external regulating current to voltage source, both the current and the voltage of the external source must be set according to the battery manufacturer's requirements. Two charge signal options are provided to control an external charging source. There is a CHG output which uses a logic high for switching on an external charging source and another signal which uses a logic low for switching on an external charging source. If the **CVR** kit is installed to provide an on-board adjustable current to voltage regulator, a 1N52XXB type diode must be installed by the user per Table 1. A regulated input supply is required per Table 2 when using the on board charging source.

Table 1

Cells	Battery Type	* ZD (V)
3	6V	1N5231B (5.1V)
6	12V	1N5242B (12V)
12	24V	1N5252B (24V)

*User provides ZD1 and associated components (SD103A schottky diode is made by Diodes Inc.)

The **ICS1735EB/CVR** contains a parts kit for configuring an LM317T as an adjustable current to voltage regulating charging source on the board. The charging current is set by the value of R15 and the forward voltage drop of D5 1N5822. The maximum current the LM317T provides for this on-board application is 1.25A. In this application with R13 = 3K, U3 LM317 regulates a voltage difference of about 1.35 volts between its OUT and ADJ pins. With the 1N5822 D5 voltage drop equal to .4V at 1.25A, (1.35V-.4V)/1.25A makes R15 a .75Ω, 2W resistor.

With all of the **ICS1735EB/CVR** kit and user provided components installed, connect only a voltmeter between +BAT terminal and a GND terminal of the board and apply regulated input power per Table 2 below. About 3.5 minutes after the CHG LED lights, adjust the 500Ω potentiometer until the pulsed voltage on the +BAT terminal reads the required end of charge voltage per the battery manufacturer.

Table 2

Cells	Battery Type	+V (Reg. Input)
3	6V	12V
6	12V	18V
12	24V	30V

Whenever input power is applied to the board, the ICS1735 starts a charge sequence. A logic low applied to the RESET terminal of the board holds the ICS1735 in reset and all of its outputs stay off. When RESET is removed by a logic high or an open, or by releasing the board's push button reset switch SW1, a new charge sequence begins.

The amplitude of the discharge current may be increased or decreased by changing the value of the .51Ω resistor. The amplitude of the current is typically 0.64V/.XXΩ. Normally the amplitude of the discharge pulse is set to the same amplitude as the current setting of the charging source.

Table 3: Charge Stages

Max. Fast Charge	Jumper S0	Float Charge Duty Cycle	Maint. Charge Duty Cycle
* 40 min	1 & 2	1 pulse, 40 rests	1 pulse, 160 rests
145 min	2 & 3	1 pulse, 10 rests	1 pulse, 40 rests
400 min	None	1 pulse, 4 rests	1 pulse, 16 rests

*The 35 minute charge time option is intended for charging a battery that is already at least ¾ full. Charging a lead acid battery from empty to full in this short of a time involves considerations beyond the scope of this document.

Table 4: Termination Select

Termination Method	Jumper DTSEL
*Voltage slope termination	None
Timer termination only	2 & 3

* Requires additional circuitry-contact Galaxy Power

Operation

Before running evaluations with the board, ensure that the board is initialized as required.

- Set S0 jumper for the desired fast charge time.
- Set the DTSEL jumper per Table 4
- If applicable, calculate another value for R15 using the procedure described on page 1.
- Set the amplitude of the discharge current to be the same amplitude as the current setting of the charging source.

PC Board Design Considerations

When designing a current to voltage regulator battery charger, there are several important considerations to address before starting the design and the PC board layout. In general, linear chargers are less complex and more cost effective, but less efficient than switch mode chargers. Size or power dissipation restraints may warrant a switch mode type.

For the input power supply, the charging source, and the pulse discharge power circuit, keep the physical separation between power and return (ground) to a minimum to minimize field effects, particularly if switch mode type circuits are used for the input supply and/or current source. Keep the ICS1735 and all control circuits outside the power and return loops described above. These precautions prevent fields and coupled noise from disturbing normal operation.

Normal care must be exercised to minimize noise coupling and ground bounce. Prevent wires and connector locations from adding excessive resistance and inductance to both power and control circuits. When designing a printed circuit board, make sure power and control grounds and power traces are wide as practical. Locate bypass and noise reduction capacitors right at or very close to IC pins and their ground pin(s). Be sure to connect power and control grounds together at or close to the negative terminal that connects to the negative lead of the battery.

Galaxy Power Incorporated wants to help create a successful battery charging solution using the ICS1735. If you need assistance from sales, technical help, or applications information please contact at our headquarters:

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REV 0 120800

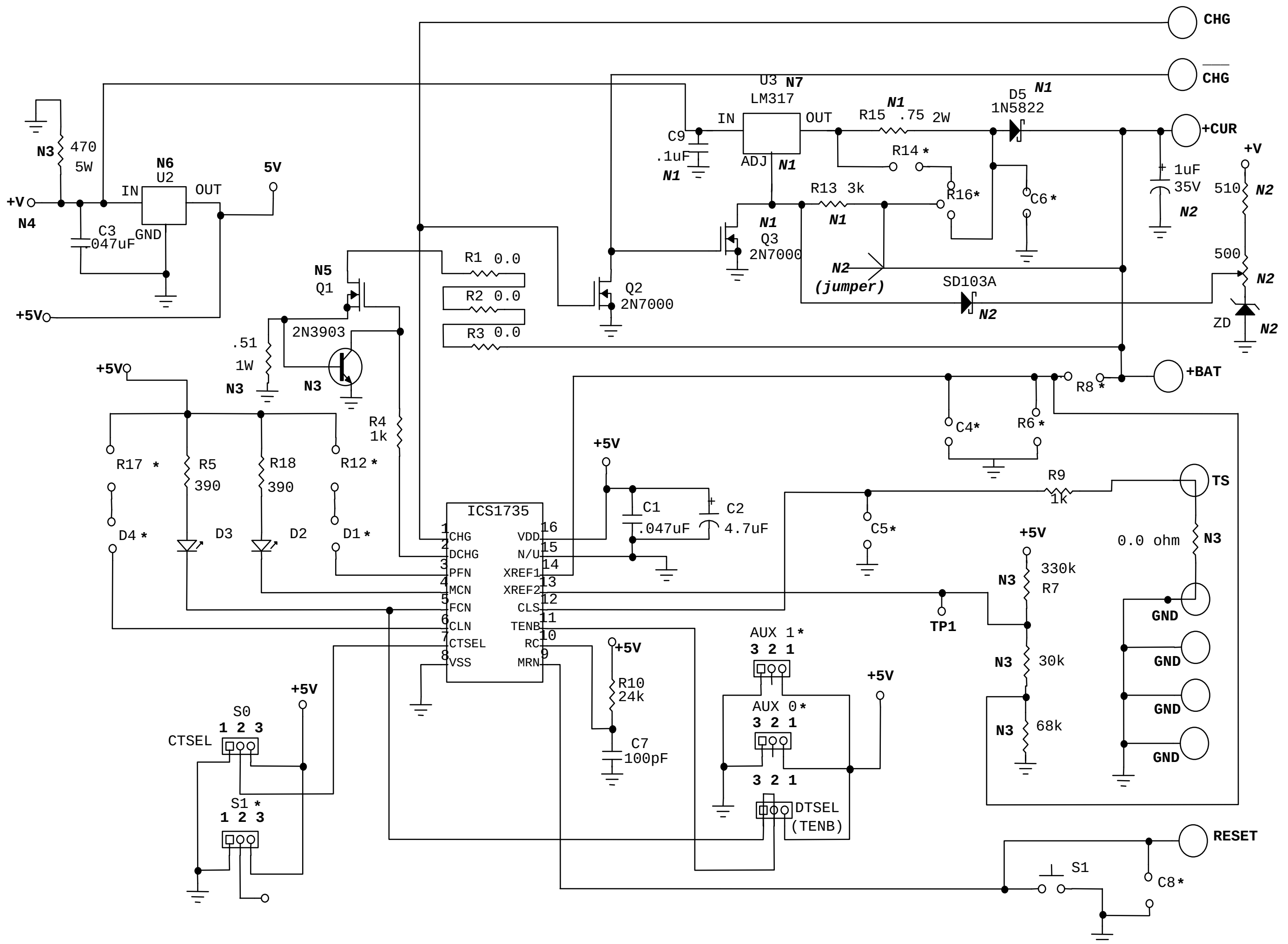
Ordering Information

ICS1735EB/CVR

Ordering Option
blank = populated board
/CVR = populated board with regulator parts kit for user installation

Device type:
ICS1735 Evaluation Board

ICS1735EB AND ICS1735EB/CVR SCHEMATIC DIAGRAM



NOTES:

N1. CVR Kit,user installs in locations provided

N2. User provides/installs. (see Table 1 for Zener ZD type)

N3. Galaxy Power installed component.

N4. Reg. input per Table 2.

N5. 5V logic level FET

N6. LM340,AN7805 or equivalent

N7. U3 requires Heat Sink.

*Component not used in this application.

NOTES