

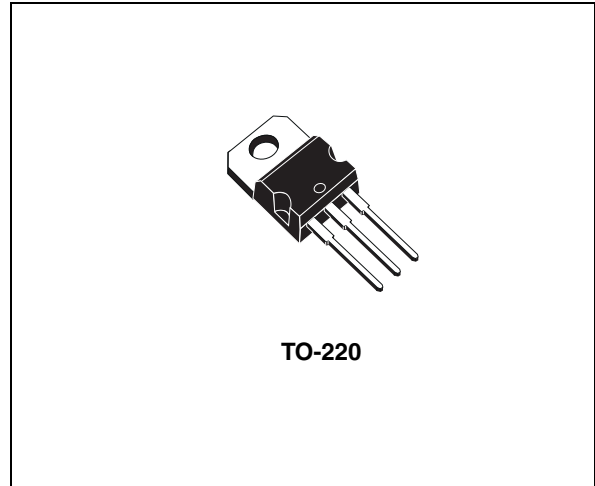
## Positive voltage regulator for battery charger

### Features

- Reverse leakage current less than 10  $\mu$ A
- Three terminal fixed version (13.7 V) output current in excess of 1.5 A
- Available in  $\pm 1\%$  (AC) selection at 25 °C
- Typical dropout voltage 2 V
- Temperature range 0 to 150 °C

### Description

The PB137 is a positive voltage regulator able to provide 1.5 A, at  $V_O = 13.7$  V and is intended as a charger for lead acid battery. The main feature is a reverse leakage current (Max 10  $\mu$ A at  $T_J = 0$  to 40 °C  $V_I$  = floating and  $V_O = 13.7$  V). It is available in TO-220 and it employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat-sinking is provided, they can deliver over 1 A output current.



**Table 1. Device summary**

| Order code | Package | Output voltage |
|------------|---------|----------------|
| PB137ACV   | TO-220  | 1.5 V          |

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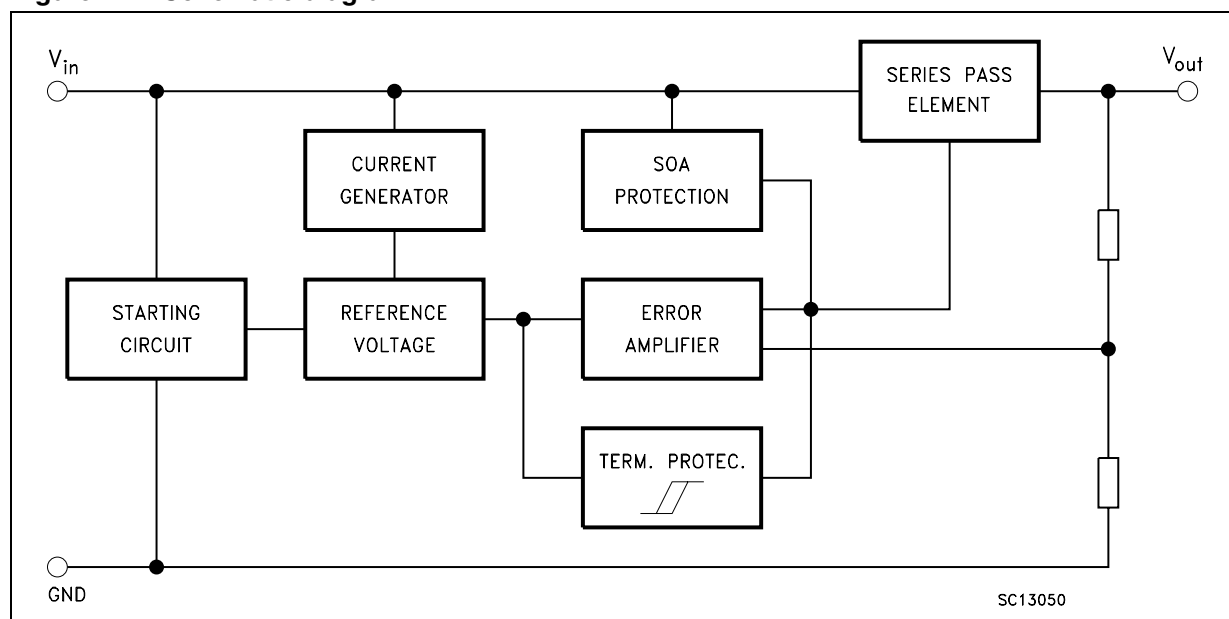
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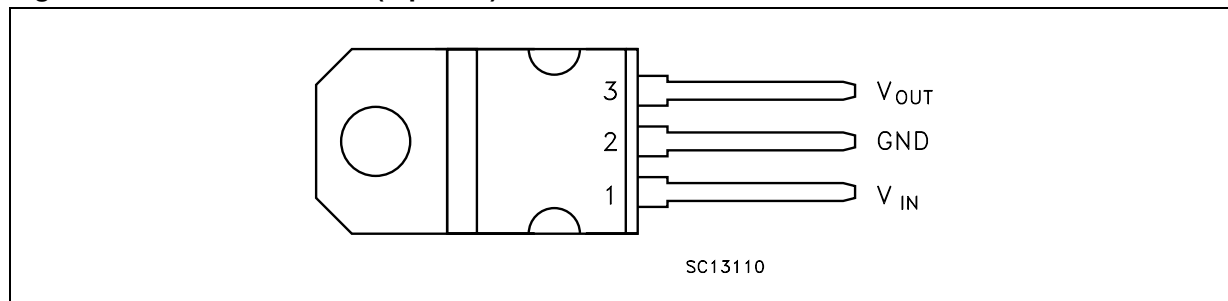
# 1 Diagram

Figure 1. Schematic diagram



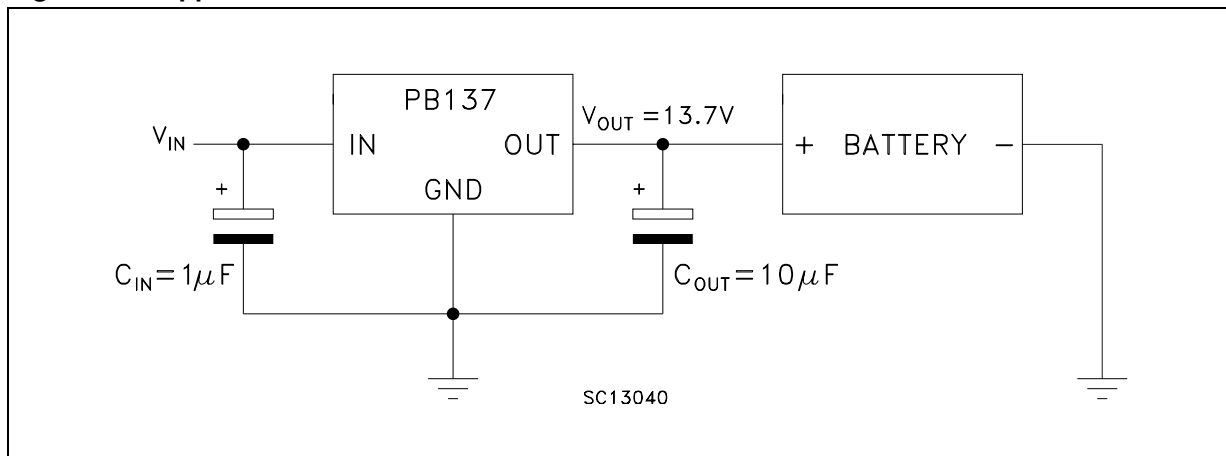
## 2 Pin configuration

Figure 2. Pin connections (top view)



### 3 Application

Figure 3. Application circuit



## 4 Maximum ratings

**Table 2. Absolute maximum ratings**

| Symbol    | Parameter                            | Value              | Unit |
|-----------|--------------------------------------|--------------------|------|
| $V_I$     | DC input voltage                     | 40                 | V    |
| $I_O$     | Output current                       | Internally limited | mA   |
| $P_{TOT}$ | Power dissipation                    | Internally limited | mW   |
| $T_{STG}$ | Storage temperature range            | - 65 to 150        | °C   |
| $T_{OP}$  | Operating junction temperature range | 0 to 150           | °C   |

*Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.*

**Table 3. Thermal data**

| Symbol     | Parameter                           | Value | Unit |
|------------|-------------------------------------|-------|------|
| $R_{thJC}$ | Thermal resistance junction-case    | 5     | °C/W |
| $R_{thJA}$ | Thermal resistance junction-ambient | 50    | °C/W |

## 5 Electrical characteristics

Refer to the test circuits,  $V_I = 18\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $T_J = 0\text{ to }150\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$  unless otherwise specified.

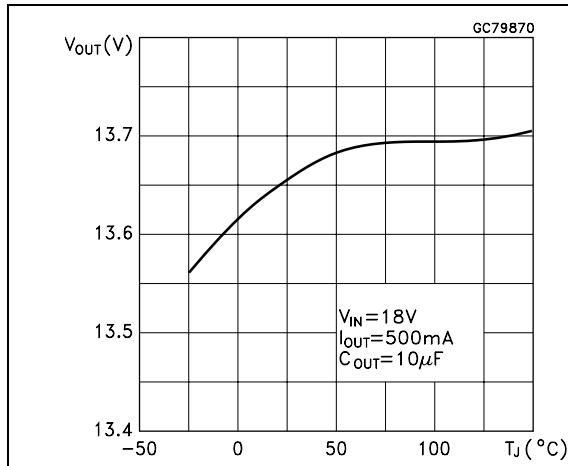
**Table 4. Electrical characteristics**

| Symbol       | Parameter                        | Test conditions                                                                                  | Min.  | Typ. | Max.  | Unit             |
|--------------|----------------------------------|--------------------------------------------------------------------------------------------------|-------|------|-------|------------------|
| $V_O$        | Output voltage                   | $T_J = 25\text{ }^{\circ}\text{C}$                                                               | 13.56 | 13.7 | 13.84 | V                |
|              |                                  |                                                                                                  | 13.43 | 13.7 | 13.97 |                  |
| $\Delta V_O$ | Line regulation                  | $V_I = 16\text{ to }28.7\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                          |       | 60   | 150   | mV               |
| $\Delta V_O$ | Load regulation                  | $I_O = 5\text{ to }1500\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                          |       | 65   | 100   | mV               |
| $I_d$        | Quiescent current                | $T_J = 25\text{ }^{\circ}\text{C}$                                                               |       | 4    | 8     | mA               |
| $\Delta I_d$ | Delta quiescent current vs. line | $V_I = 16\text{ to }28.7\text{ V}$                                                               |       |      | 4     | mA               |
| $\Delta I_d$ | Delta quiescent current vs. load | $I_O = 5\text{ to }1000\text{ mA}$                                                               |       |      | 1.2   | mA               |
| $V_d$        | Dropout voltage                  | $I_O = 1\text{ A}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                          |       | 2.1  | 2.6   | V                |
| $I_{sc}$     | Short circuit current            | $V_I - V_O = 5\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                    |       | 2.2  |       | A                |
| eN           | Output noise voltage             | $B = 10\text{ Hz to }10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                         |       | 300  |       | $\mu\text{Vrms}$ |
| SVR          | Supply voltage rejection         | $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                         |       | 58   |       | dB               |
| $I_{REV}$    | Reverse leakage current          | $V_O = 13.7\text{ V}$ , $V_I = \text{floating}$ , $T_J = 0\text{ to }40\text{ }^{\circ}\text{C}$ |       | 0.1  | 10    | $\mu\text{A}$    |
| S            | Long term stability              | $T_J = 125\text{ }^{\circ}\text{C}$ , 1000 Hrs                                                   |       |      | 0.5   | %                |

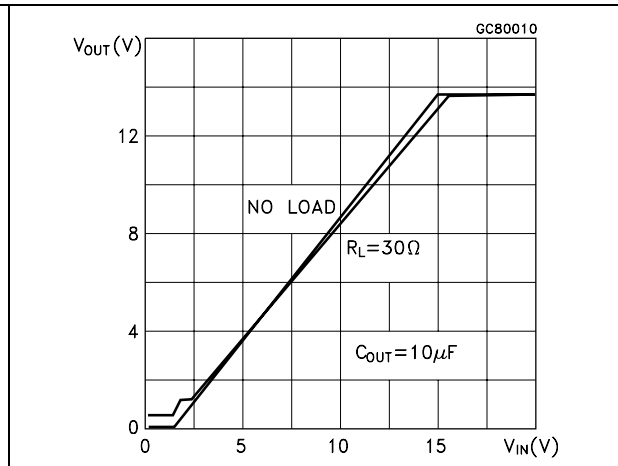
## 6 Typical characteristics

$T_J = 25^\circ\text{C}$ .

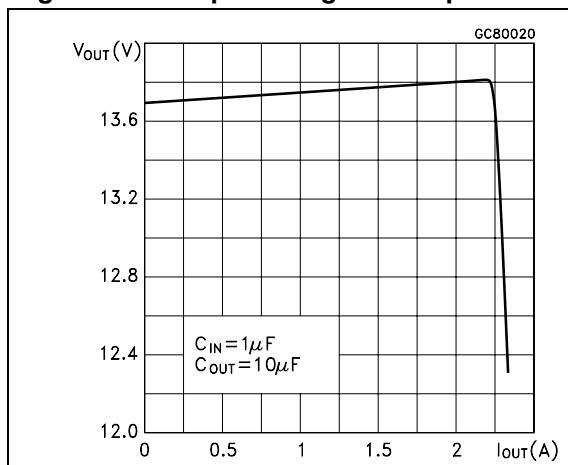
**Figure 4. Output voltage vs. temperature**



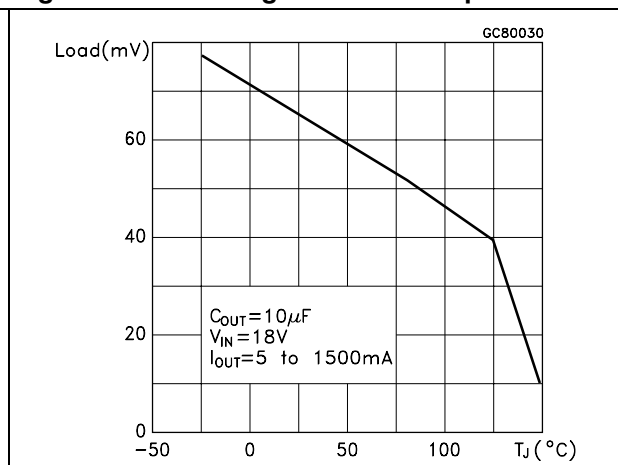
**Figure 5. Output voltage vs. input voltage**



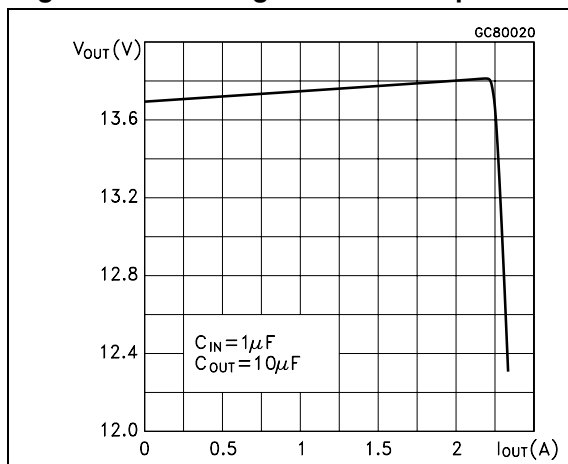
**Figure 6. Output voltage vs. output current**



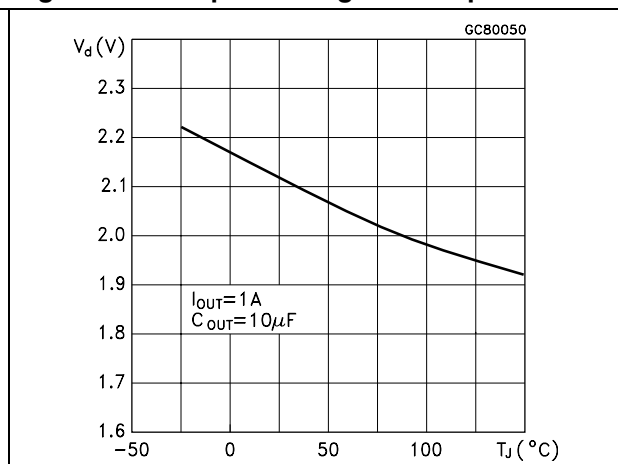
**Figure 7. Load regulation vs. temperature**



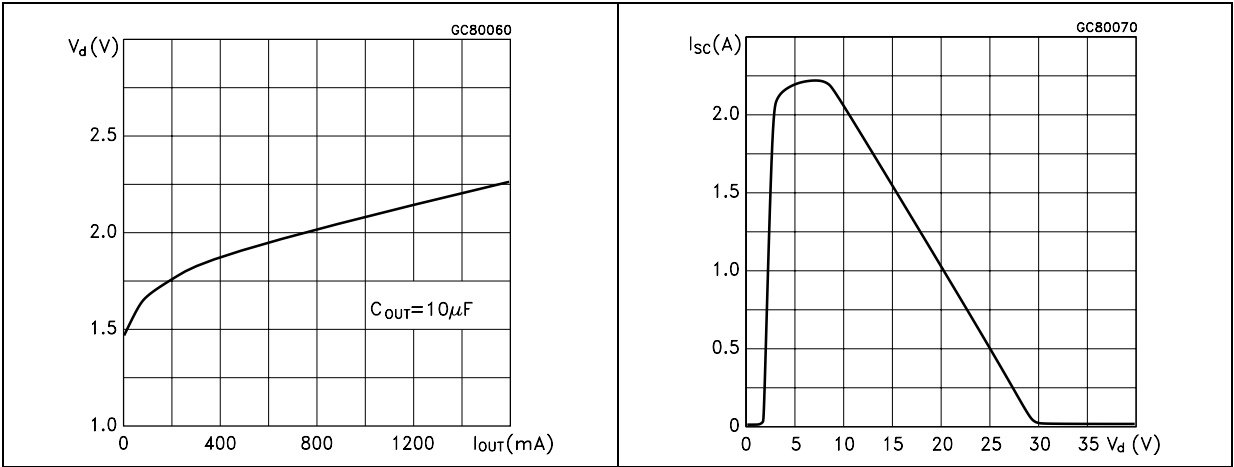
**Figure 8. Line regulation vs. temperature**



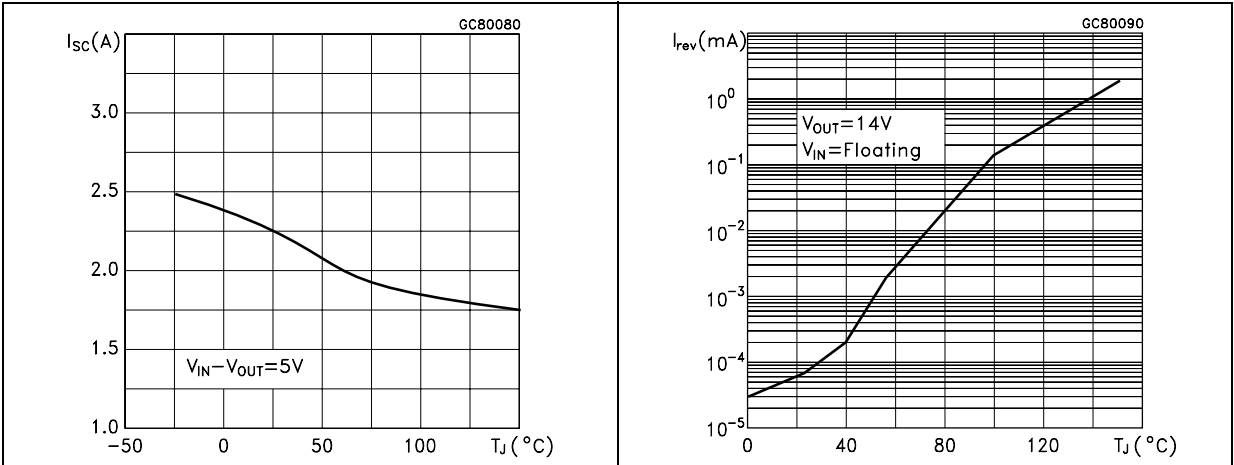
**Figure 9. Dropout voltage vs. temperature**



**Figure 10. Dropout voltage vs. output current**      **Figure 11. Short circuit current vs. dropout voltage**



**Figure 12. Short circuit current vs. temperature**      **Figure 13. Reverse leakage current vs. temperature**



**Figure 14. Quiescent current vs. temperature**      **Figure 15. Quiescent current vs. output current**

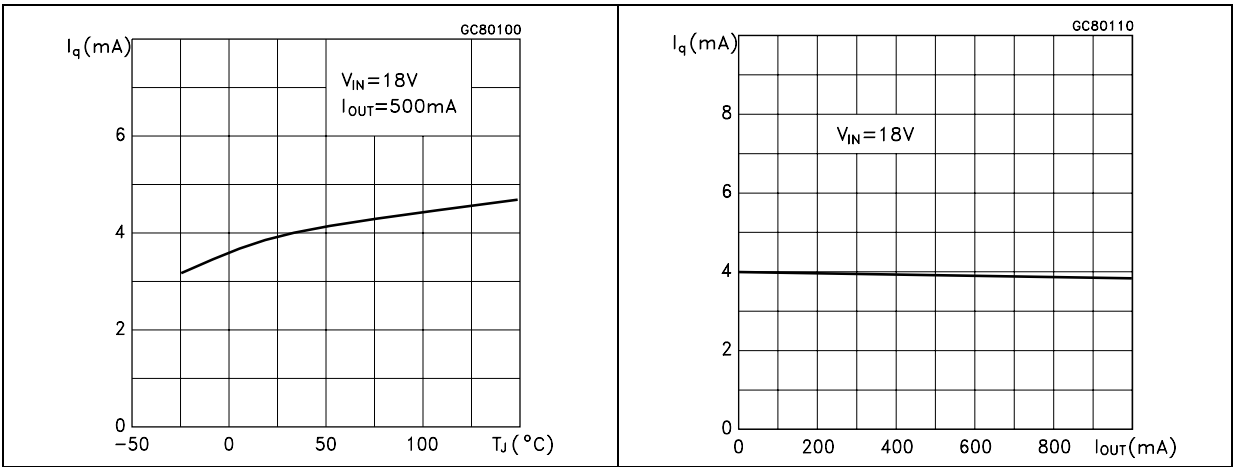


Figure 16. Quiescent current vs. input voltage Figure 17. Thermal protection

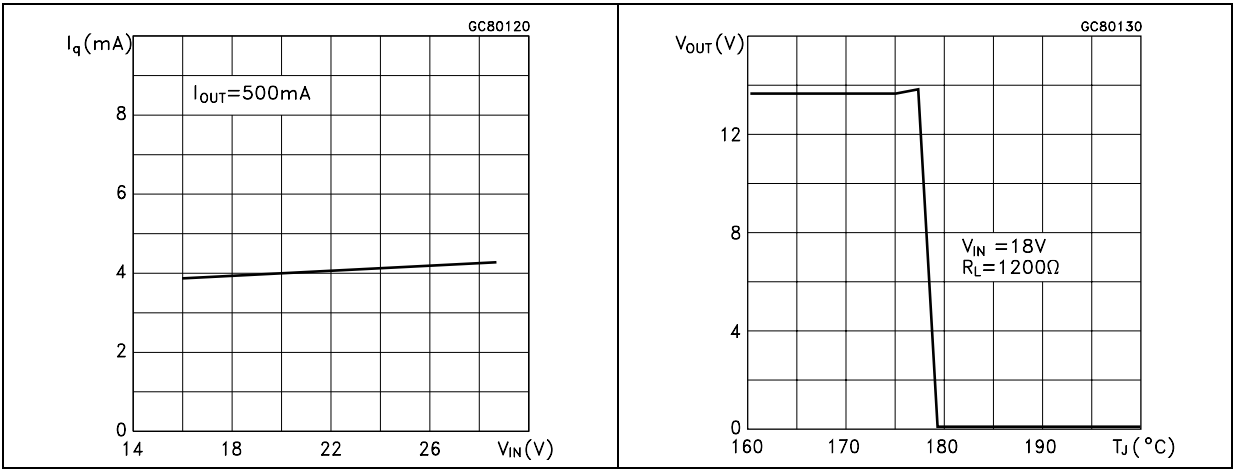


Figure 18. Supply voltage rejection vs. output current Figure 19. Supply voltage rejection vs. temperature

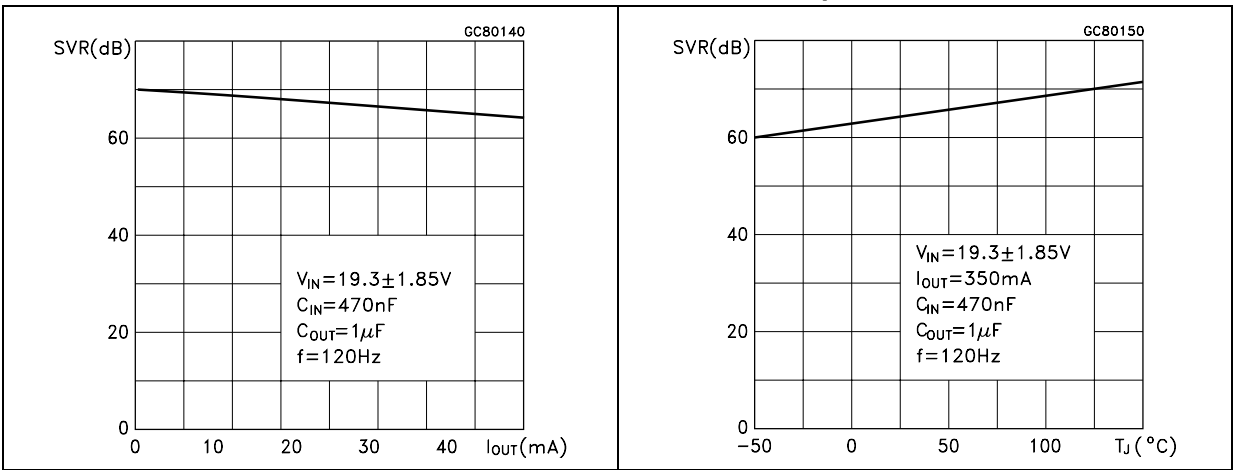
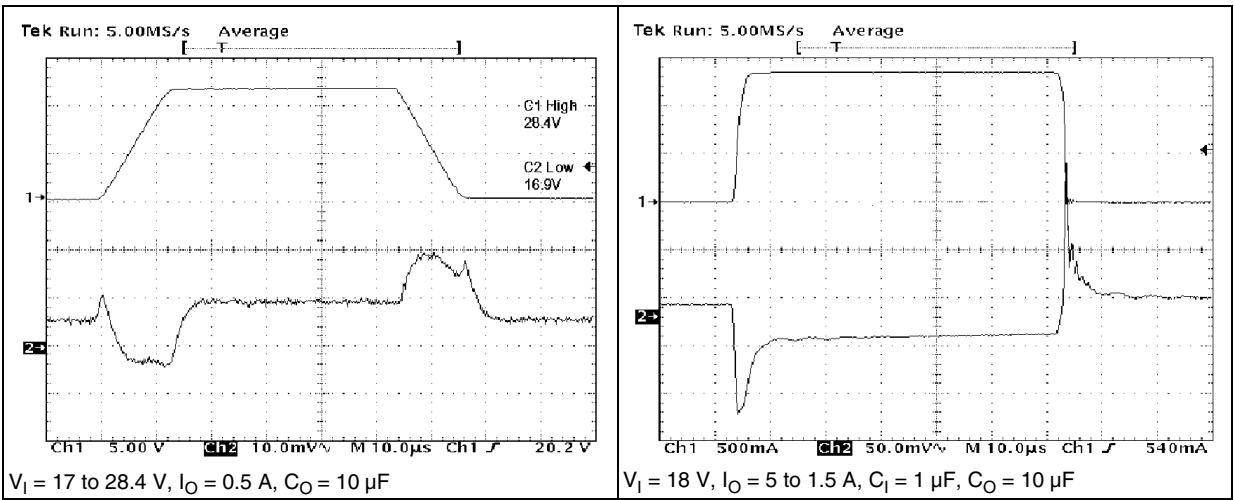


Figure 20. Line transient response Figure 21. Load transient response

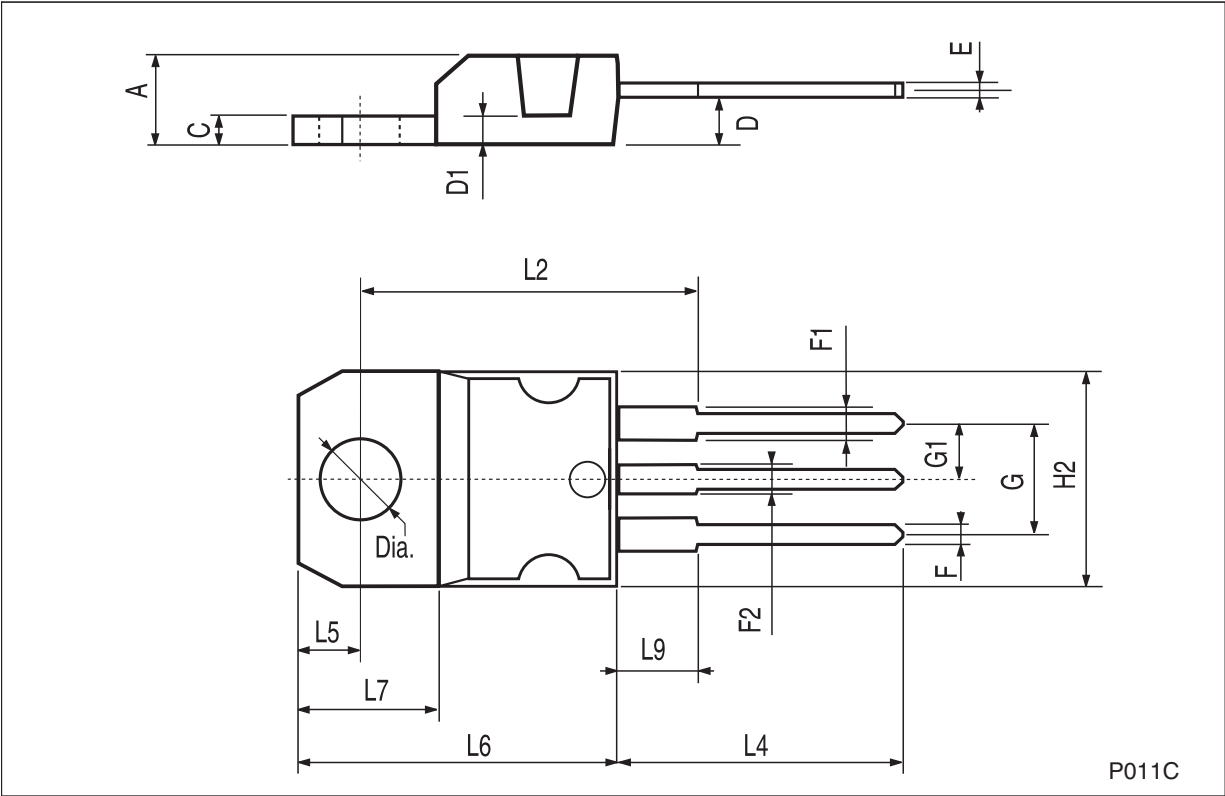


## 7 Package mechanical data

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

TO-220 mechanical data

| Dim. | mm.   |      |       | inch. |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | Min.  | Typ. | Max.  | Min.  | Typ.  | Max.  |
| A    | 4.40  |      | 4.60  | 0.173 |       | 0.181 |
| C    | 1.23  |      | 1.32  | 0.048 |       | 0.051 |
| D    | 2.40  |      | 2.72  | 0.094 |       | 0.107 |
| D1   |       | 1.27 |       |       | 0.050 |       |
| E    | 0.49  |      | 0.70  | 0.019 |       | 0.027 |
| F    | 0.61  |      | 0.88  | 0.024 |       | 0.034 |
| F1   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| F2   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| G    | 4.95  |      | 5.15  | 0.194 |       | 0.203 |
| G1   | 2.4   |      | 2.7   | 0.094 |       | 0.106 |
| H2   | 10.0  |      | 10.40 | 0.393 |       | 0.409 |
| L2   |       | 16.4 |       |       | 0.645 |       |
| L4   | 13.0  |      | 14.0  | 0.511 |       | 0.551 |
| L5   | 2.65  |      | 2.95  | 0.104 |       | 0.116 |
| L6   | 15.25 |      | 15.75 | 0.600 |       | 0.620 |
| L7   | 6.2   |      | 6.6   | 0.244 |       | 0.260 |
| L9   | 3.5   |      | 3.93  | 0.137 |       | 0.154 |
| DIA. | 3.75  |      | 3.85  | 0.147 |       | 0.151 |



## 8 Revision history

Table 5. Document revision history

| Date        | Revision | Changes                                                                   |
|-------------|----------|---------------------------------------------------------------------------|
| 21-Jun-2004 | 4        |                                                                           |
| 18-Nov-2010 | 5        | Modified: $R_{thJC}$ value for TO-220 <a href="#">Table 3 on page 6</a> . |

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