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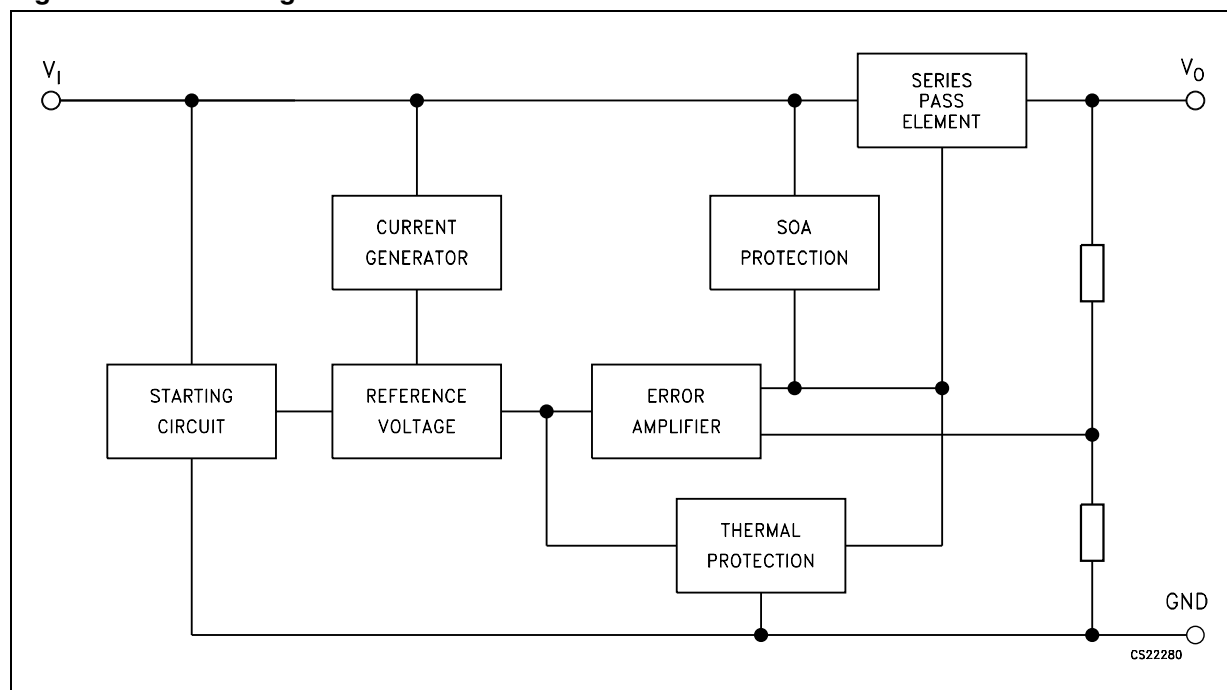
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# 1 Diagram

Figure 1. Block diagram



## 2 Pin configuration

Figure 2. Pin connections (top view)

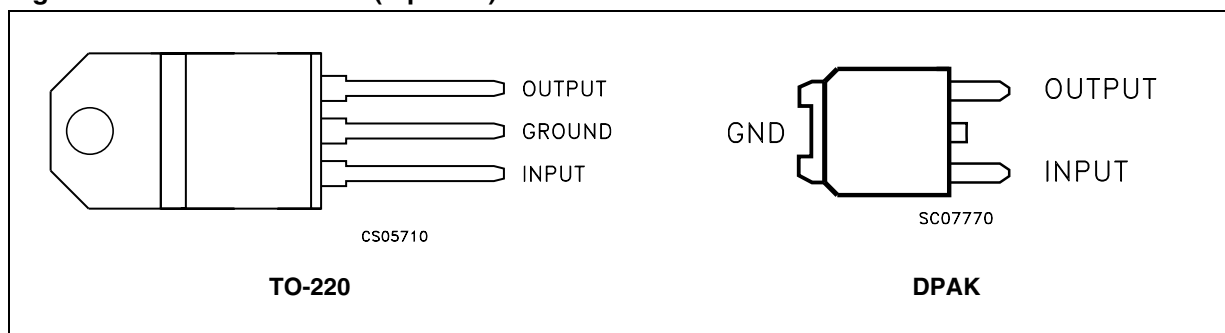
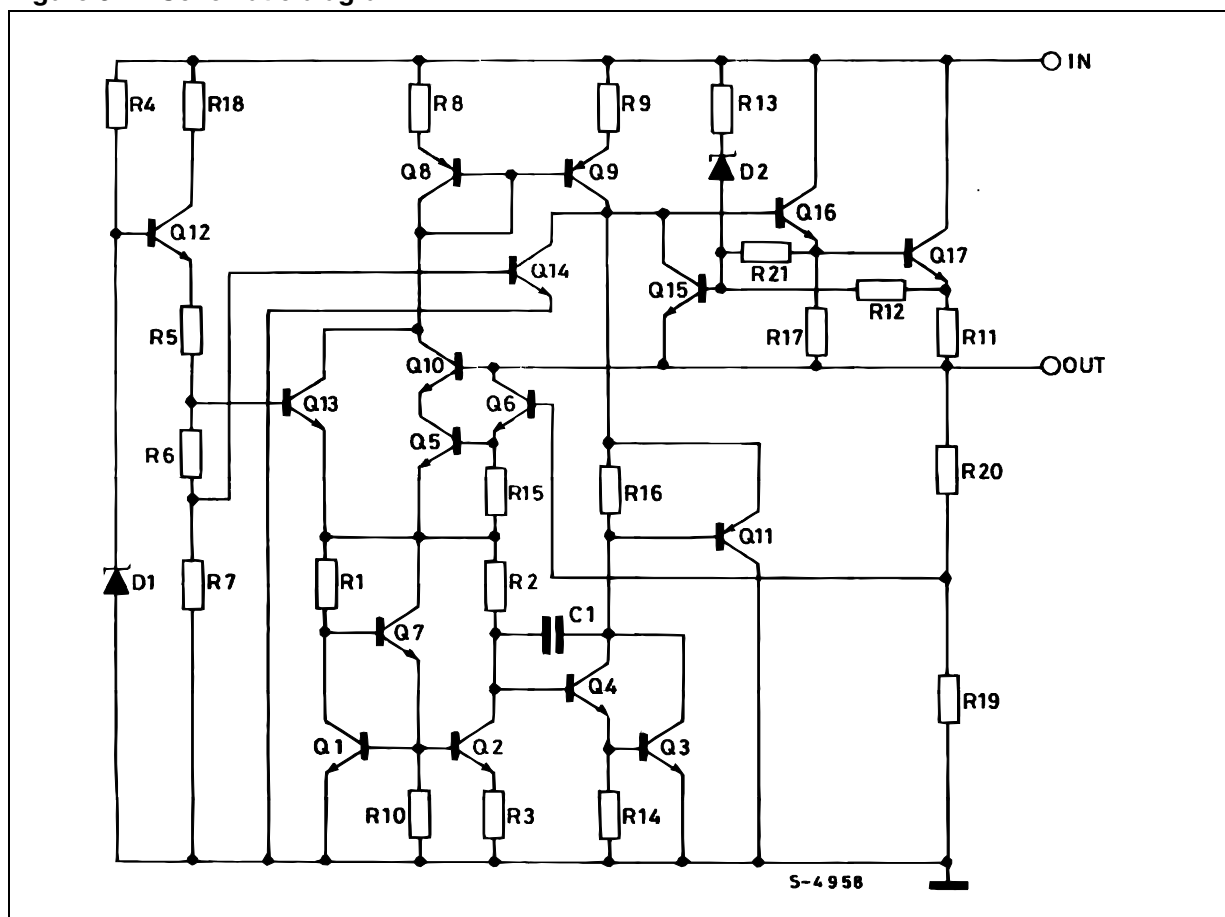


Figure 3. Schematic diagram



### 3 Maximum ratings

Table 2. Absolute maximum ratings

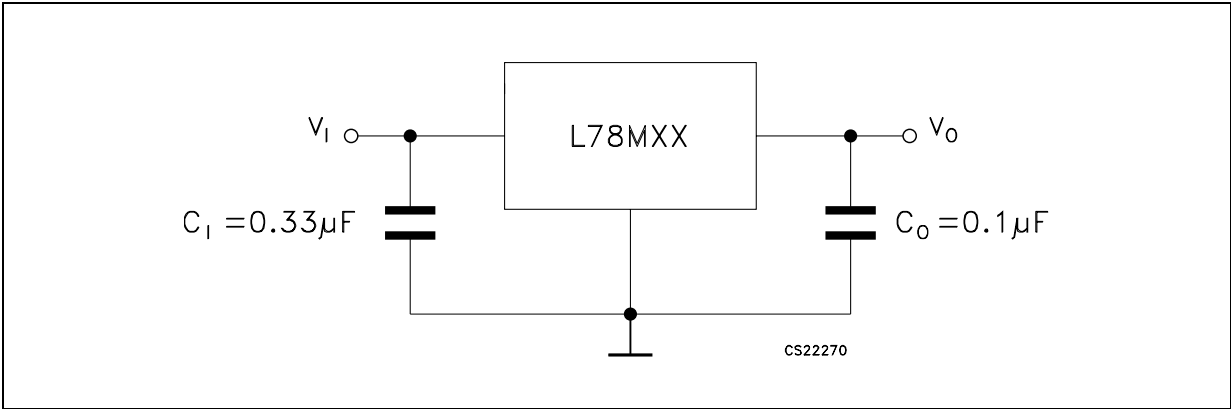
| Symbol    | Parameter                            |                       | Value              | Unit |
|-----------|--------------------------------------|-----------------------|--------------------|------|
| $V_I$     | DC input voltage                     | for $V_O= 5$ to $18V$ | 35                 | V    |
|           |                                      | for $V_O= 20, 24V$    | 40                 |      |
| $I_O$     | Output current                       |                       | Internally limited | mA   |
| $P_D$     | Power dissipation                    |                       | Internally limited | mW   |
| $T_{STG}$ | Storage temperature range            |                       | -65 to 150         | °C   |
| $T_{OP}$  | Operating junction temperature range | for L78M00AC          | 0 to 125           | °C   |
|           |                                      | for L78M00AB          | -40 to 125         |      |

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                           | TO-220 | DPAK | Unit |
|------------|-------------------------------------|--------|------|------|
| $R_{thJC}$ | Thermal resistance junction-case    | 3      | 8    | °C/W |
| $R_{thJA}$ | Thermal resistance junction-ambient | 50     | 100  | °C/W |

Figure 4. Application circuit



## 4 Test circuits

Figure 5. DC parameter

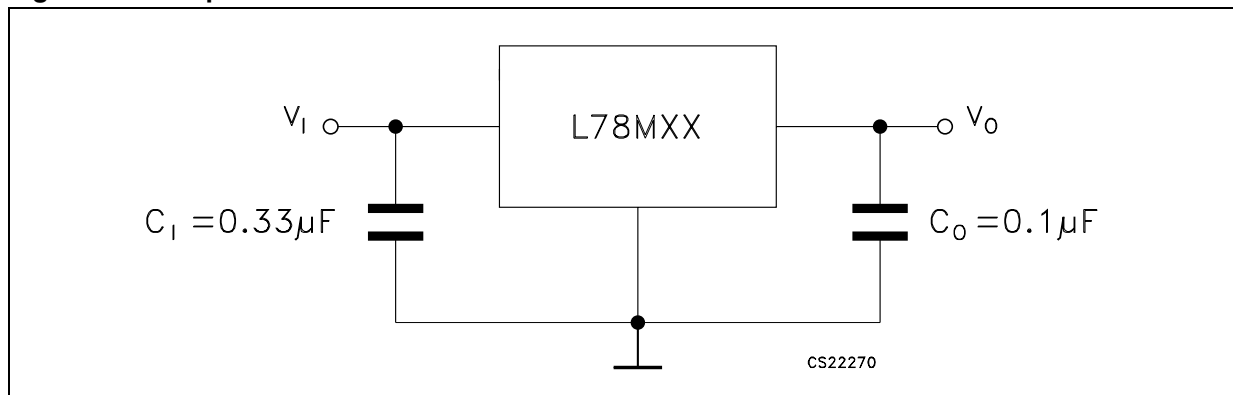


Figure 6. Load regulation

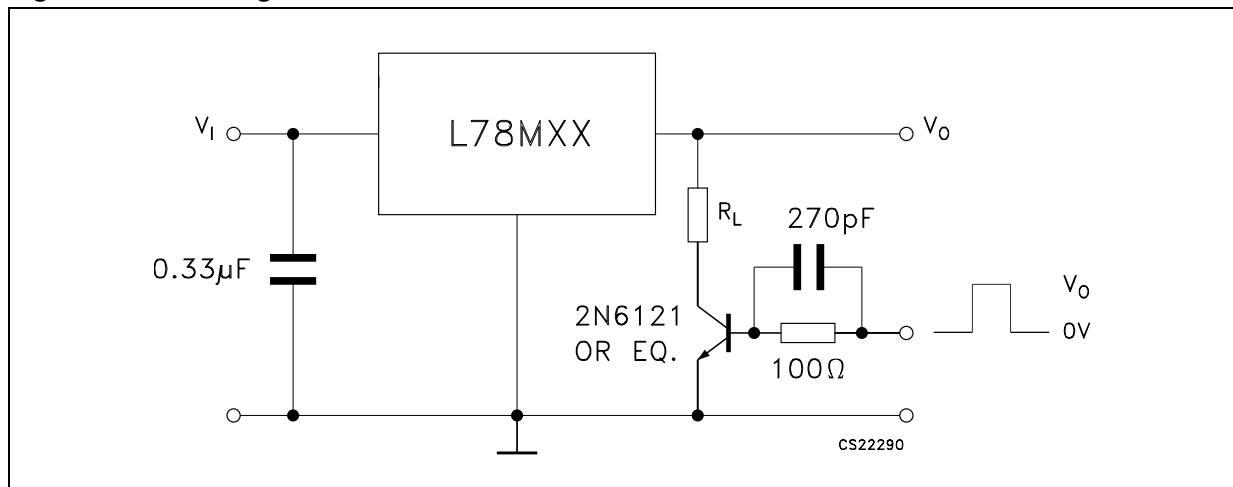
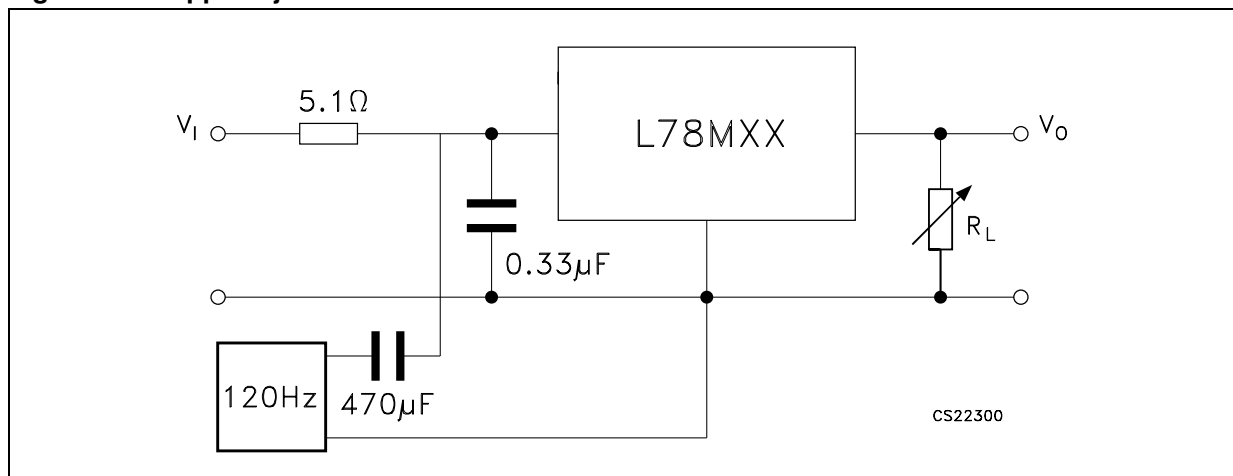


Figure 7. Ripple rejection



## 5 Electrical characteristics

**Table 4. Electrical characteristics of L78M05XX** (refer to the test circuits,  $V_I = 10\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified)

| Symbol                | Parameter                  | Test conditions                                                                                          | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|----------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                                                 | 4.9  | 5    | 5.1  | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 7\text{ to }20\text{ V}$                                      | 4.8  | 5    | 5.2  | V                    |
| $\Delta V_O$          | Line regulation            | $V_I = 7\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                       |      |      | 100  | mV                   |
|                       |                            | $V_I = 8\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                       |      |      | 50   |                      |
| $\Delta V_O$          | Load regulation            | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25^\circ\text{C}$                                             |      |      | 100  | mV                   |
|                       |                            | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25^\circ\text{C}$                                             |      |      | 50   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                                                 |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ to }350\text{ mA}$                                                                        |      |      | 0.5  | mA                   |
|                       |                            | $I_O = 200\text{ mA}$ , $V_I = 8\text{ to }25\text{ V}$                                                  |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                                                      |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection   | $V_I = 8\text{ to }18\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25^\circ\text{C}$ | 62   |      |      | dB                   |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25^\circ\text{C}$                                          |      | 40   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage            | $T_J = 25^\circ\text{C}$                                                                                 |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current      | $T_J = 25^\circ\text{C}$ , $V_I = 35\text{ V}$                                                           |      | 300  |      | mA                   |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                                                 |      | 700  |      | mA                   |

**Table 5. Electrical characteristics of L78M06XX** (refer to the test circuits,  $V_I = 11\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified)

| Symbol                | Parameter                  | Test conditions                                                                                          | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|----------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                                                 | 5.88 | 6    | 6.12 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 8\text{ to }21\text{ V}$                                      | 5.75 | 6    | 6.3  | V                    |
| $\Delta V_O$          | Line regulation            | $V_I = 8\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                       |      |      | 100  | mV                   |
|                       |                            | $V_I = 9\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                       |      |      | 30   |                      |
| $\Delta V_O$          | Load regulation            | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25^\circ\text{C}$                                             |      |      | 120  | mV                   |
|                       |                            | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25^\circ\text{C}$                                             |      |      | 60   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                                                 |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ to }350\text{ mA}$                                                                        |      |      | 0.5  | mA                   |
|                       |                            | $I_O = 200\text{ mA}$ , $V_I = 9\text{ to }25\text{ V}$                                                  |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                                                      |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection   | $V_I = 9\text{ to }19\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25^\circ\text{C}$ | 59   |      |      | dB                   |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$                                                                     |      | 45   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage            | $T_J = 25^\circ\text{C}$                                                                                 |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current      | $T_J = 25^\circ\text{C}$ , $V_I = 35\text{ V}$                                                           |      | 270  |      | mA                   |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                                                 |      | 700  |      | mA                   |

**Table 6. Electrical characteristics of L78M08XX** (refer to the test circuits,  $V_I = 14\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified)

| Symbol                | Parameter                  | Test conditions                                                                                               | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|---------------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                                                      | 7.84 | 8    | 8.16 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 10.5\text{ to }23\text{ V}$                                        | 7.7  | 8    | 8.3  | V                    |
| $\Delta V_O$          | Line regulation            | $V_I = 10.5\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                         |      |      | 100  | mV                   |
|                       |                            | $V_I = 11\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                           |      |      | 30   |                      |
| $\Delta V_O$          | Load regulation            | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25^\circ\text{C}$                                                  |      |      | 160  | mV                   |
|                       |                            | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25^\circ\text{C}$                                                  |      |      | 80   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                                                      |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ to }350\text{ mA}$                                                                             |      |      | 0.5  | mA                   |
|                       |                            | $I_O = 200\text{ mA}$ , $V_I = 10.5\text{ to }25\text{ V}$                                                    |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                                                           |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection   | $V_I = 11.5\text{ to }21.5\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25^\circ\text{C}$ | 56   |      |      | dB                   |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25^\circ\text{C}$                                               |      | 52   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage            | $T_J = 25^\circ\text{C}$                                                                                      |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current      | $T_J = 25^\circ\text{C}$ , $V_I = 35\text{ V}$                                                                |      | 250  |      | mA                   |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                                                      |      | 700  |      | mA                   |

**Table 7. Electrical characteristics of L78M09XX** (refer to the test circuits,  $V_I = 15\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified)

| Symbol                | Parameter                  | Test conditions                                                                                             | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|-------------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                                                    | 8.82 | 9    | 9.18 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 11.5\text{ to }24\text{ V}$                                      | 8.64 | 9    | 9.36 | V                    |
| $\Delta V_O$          | Line regulation            | $V_I = 11.5\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                       |      |      | 100  | mV                   |
|                       |                            | $V_I = 12\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                         |      |      | 30   |                      |
| $\Delta V_O$          | Load regulation            | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25^\circ\text{C}$                                                |      |      | 180  | mV                   |
|                       |                            | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25^\circ\text{C}$                                                |      |      | 90   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                                                    |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ to }350\text{ mA}$                                                                           |      |      | 0.5  | mA                   |
|                       |                            | $I_O = 200\text{ mA}$ , $V_I = 11.5\text{ to }25\text{ V}$                                                  |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                                                         |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection   | $V_I = 12.5\text{ to }23\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25^\circ\text{C}$ | 56   |      |      | dB                   |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25^\circ\text{C}$                                             |      | 52   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage            | $T_J = 25^\circ\text{C}$                                                                                    |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                                                              |      | 250  |      | mA                   |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                                                    |      | 700  |      | mA                   |

**Table 8. Electrical characteristics of L78M10XX** (refer to the test circuits,  $V_I = 16\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified)

| Symbol                | Parameter                  | Test conditions                                                                                             | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|-------------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                                                    | 9.8  | 10   | 10.2 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 12.5\text{ to }25\text{ V}$                                      | 9.6  | 10   | 10.4 | V                    |
| $\Delta V_O$          | Line regulation            | $V_I = 12.5\text{ to }30\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                       |      |      | 100  | mV                   |
|                       |                            | $V_I = 13\text{ to }30\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                         |      |      | 30   |                      |
| $\Delta V_O$          | Load regulation            | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25^\circ\text{C}$                                                |      |      | 200  | mV                   |
|                       |                            | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25^\circ\text{C}$                                                |      |      | 100  |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                                                    |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ to }350\text{ mA}$                                                                           |      |      | 0.5  | mA                   |
|                       |                            | $I_O = 200\text{ mA}$ , $V_I = 12.5\text{ to }30\text{ V}$                                                  |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                                                         |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection   | $V_I = 13.5\text{ to }24\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25^\circ\text{C}$ | 56   |      |      | dB                   |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25^\circ\text{C}$                                             |      | 64   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage            | $T_J = 25^\circ\text{C}$                                                                                    |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                                                              |      | 245  |      | mA                   |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                                                    |      | 700  |      | mA                   |

**Table 9. Electrical characteristics of L78M12XX** (refer to the test circuits,  $V_I = 19\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified)

| Symbol                | Parameter                  | Test conditions                                                                                           | Min.  | Typ. | Max.  | Unit                 |
|-----------------------|----------------------------|-----------------------------------------------------------------------------------------------------------|-------|------|-------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                                                  | 11.75 | 12   | 12.25 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 14.5\text{ to }27\text{ V}$                                    | 11.5  | 12   | 12.5  | V                    |
| $\Delta V_O$          | Line regulation            | $V_I = 14.5\text{ to }30\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                     |       |      | 100   | mV                   |
|                       |                            | $V_I = 16\text{ to }30\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                       |       |      | 30    |                      |
| $\Delta V_O$          | Load regulation            | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25^\circ\text{C}$                                              |       |      | 240   | mV                   |
|                       |                            | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25^\circ\text{C}$                                              |       |      | 120   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                                                  |       |      | 6     | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ to }350\text{ mA}$                                                                         |       |      | 0.5   | mA                   |
|                       |                            | $I_O = 200\text{ mA}$ , $V_I = 14.5\text{ to }30\text{ V}$                                                |       |      | 0.8   |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                                                       |       | -1   |       | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection   | $V_I = 15\text{ to }25\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25^\circ\text{C}$ | 55    |      |       | dB                   |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25^\circ\text{C}$                                           |       | 75   |       | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage            | $T_J = 25^\circ\text{C}$                                                                                  |       | 2    |       | V                    |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                                                            |       | 240  |       | mA                   |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                                                  |       | 700  |       | mA                   |

**Table 10. Electrical characteristics of L78M15XX** (refer to the test circuits,  $V_I = 23\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified)

| Symbol                | Parameter                  | Test conditions                                                                                               | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|---------------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                                                      | 14.7 | 15   | 15.3 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 17.5\text{ to }30\text{ V}$                                        | 14.4 | 15   | 15.6 | V                    |
| $\Delta V_O$          | Line regulation            | $V_I = 17.5\text{ to }30\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                         |      |      | 100  | mV                   |
|                       |                            | $V_I = 20\text{ to }30\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                           |      |      | 30   |                      |
| $\Delta V_O$          | Load regulation            | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25^\circ\text{C}$                                                  |      |      | 300  | mV                   |
|                       |                            | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25^\circ\text{C}$                                                  |      |      | 150  |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                                                      |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ to }350\text{ mA}$                                                                             |      |      | 0.5  | mA                   |
|                       |                            | $I_O = 200\text{ mA}$ , $V_I = 17.5\text{ to }30\text{ V}$                                                    |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                                                           |      | -1   |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection   | $V_I = 18.5\text{ to }28.5\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25^\circ\text{C}$ | 54   |      |      | dB                   |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25^\circ\text{C}$                                               |      | 90   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage            | $T_J = 25^\circ\text{C}$                                                                                      |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                                                                |      | 240  |      | mA                   |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                                                      |      | 700  |      | mA                   |

**Table 11. Electrical characteristics of L78M24XX** (refer to the test circuits,  $V_I = 33\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified)

| Symbol                | Parameter                  | Test conditions                                                                                           | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|-----------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                                                  | 23.5 | 24   | 24.5 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 27\text{ to }38\text{ V}$                                      | 23   | 24   | 25   | V                    |
| $\Delta V_O$          | Line regulation            | $V_I = 27\text{ to }38\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                       |      |      | 100  | mV                   |
|                       |                            | $V_I = 28\text{ to }38\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25^\circ\text{C}$                       |      |      | 30   |                      |
| $\Delta V_O$          | Load regulation            | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25^\circ\text{C}$                                              |      |      | 480  | mV                   |
|                       |                            | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25^\circ\text{C}$                                              |      |      | 240  |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                                                  |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ to }350\text{ mA}$                                                                         |      |      | 0.5  | mA                   |
|                       |                            | $I_O = 200\text{ mA}$ , $V_I = 27\text{ to }38\text{ V}$                                                  |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                                                       |      | -1.2 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection   | $V_I = 28\text{ to }38\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25^\circ\text{C}$ | 50   |      |      | dB                   |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25^\circ\text{C}$                                           |      | 170  |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage            | $T_J = 25^\circ\text{C}$                                                                                  |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                                                            |      | 240  |      | mA                   |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                                                  |      | 700  |      | mA                   |

## 6 Typical performance

Figure 8. Dropout voltage vs junction temp.

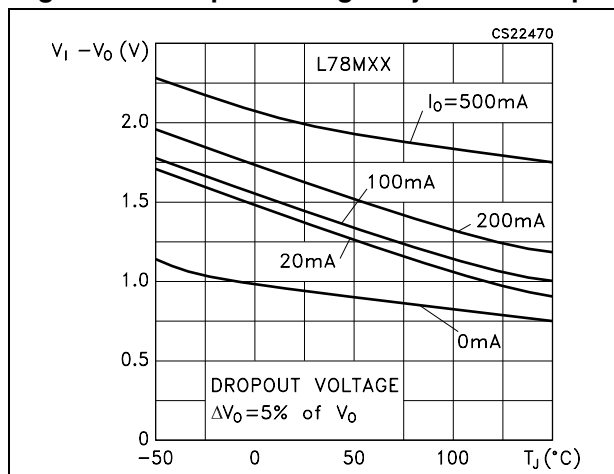


Figure 9. Dropout characteristics

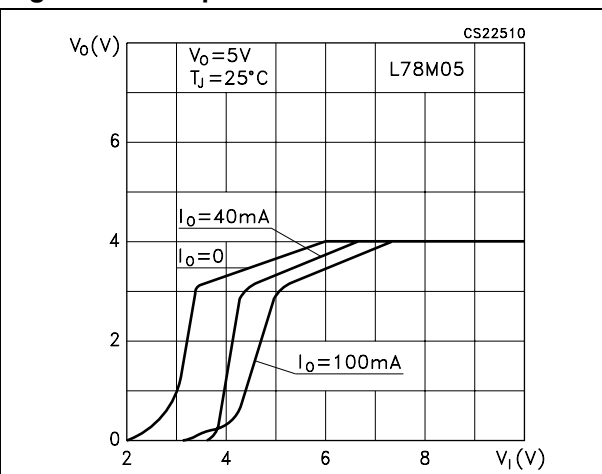


Figure 10. Peak output current vs input-output differential voltage

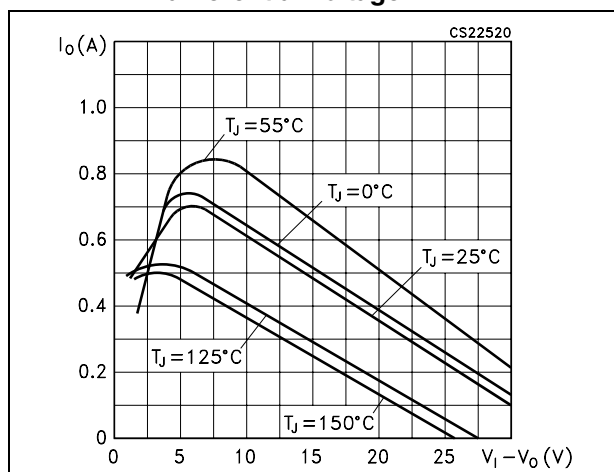


Figure 11. Output voltage vs junction temperature

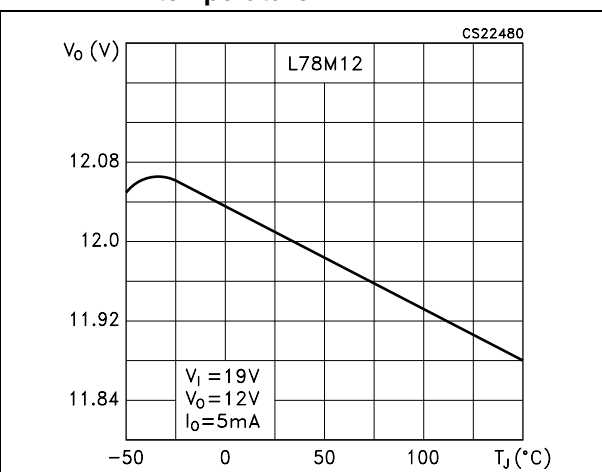


Figure 12. Supply voltage rejection vs freq.

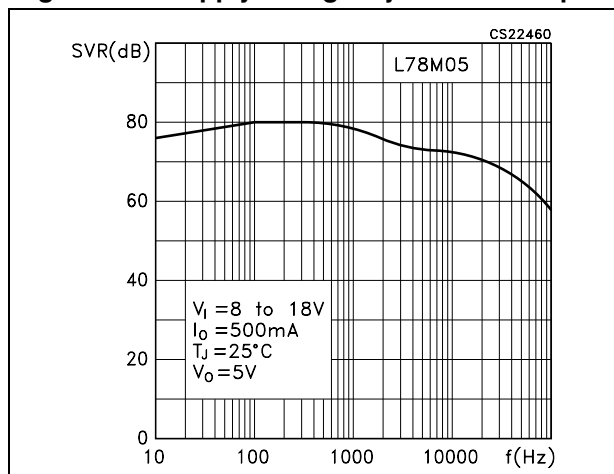


Figure 13. Quiescent current vs junction temp.

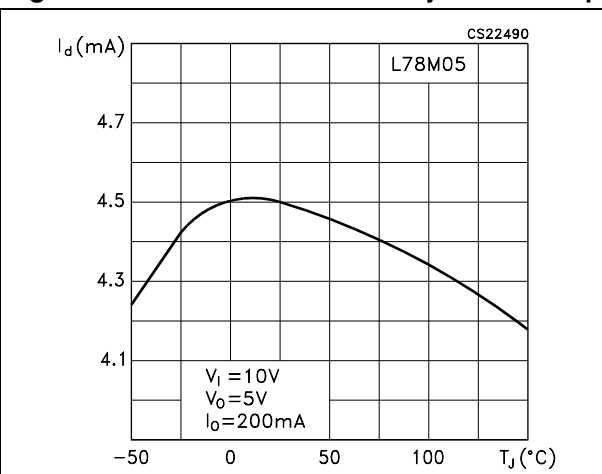


Figure 14. Load transient response

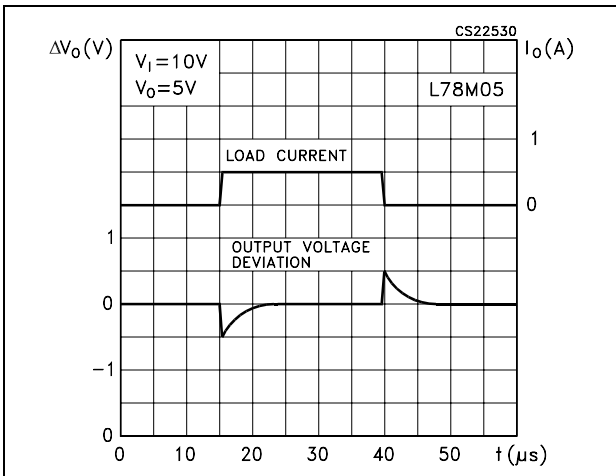


Figure 15. Line transient response

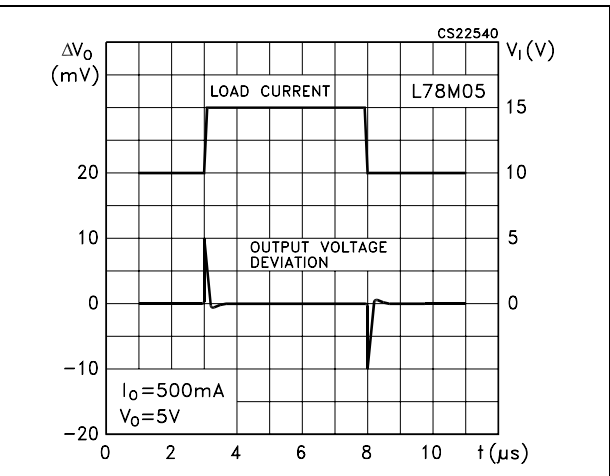
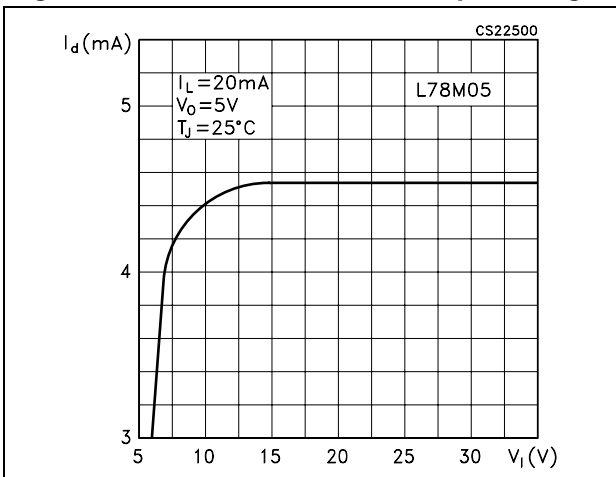


Figure 16. Quiescent current vs input voltage



## 7 Applications information

### 7.1 Design considerations

The L78MxxAB series of fixed voltage regulators are designed with thermal overload protection that shuts down the circuit when subjected to an excessive power overload condition, internal short-circuit protection that limits the maximum current the circuit will pass, and output transistor Safe-Area compensation that reduces the output short-circuit as the voltage across the pass transistor is increased. In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high-frequency characteristics to insure stable operation under all load conditions. A  $0.33\ \mu\text{F}$  or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

Figure 17. Current regulator

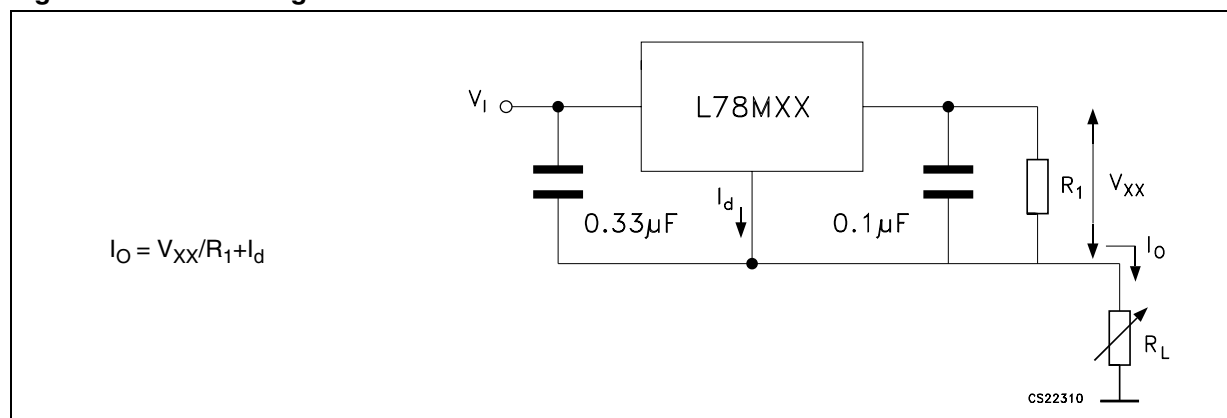
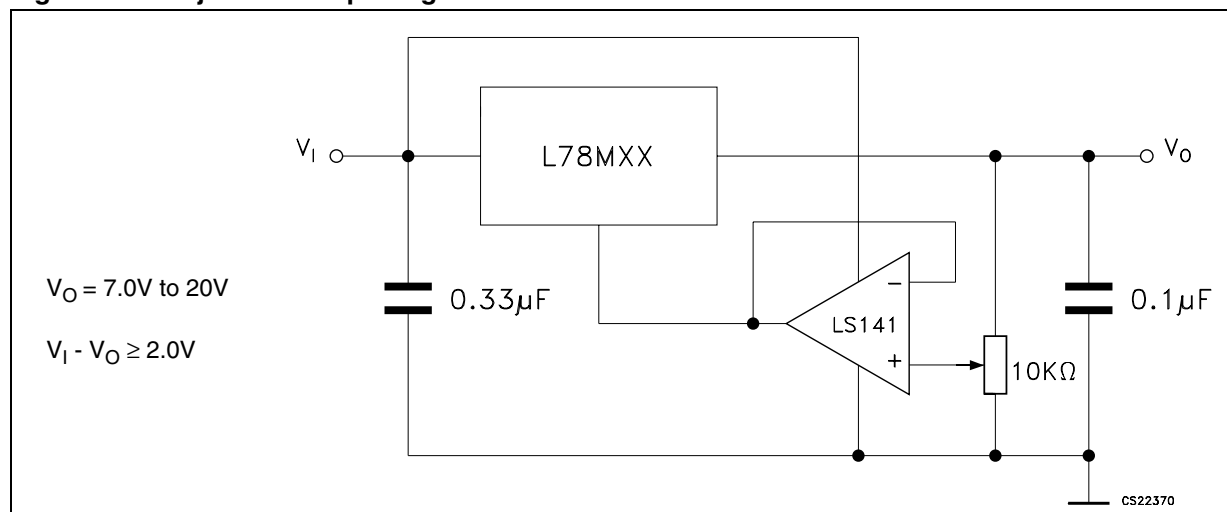
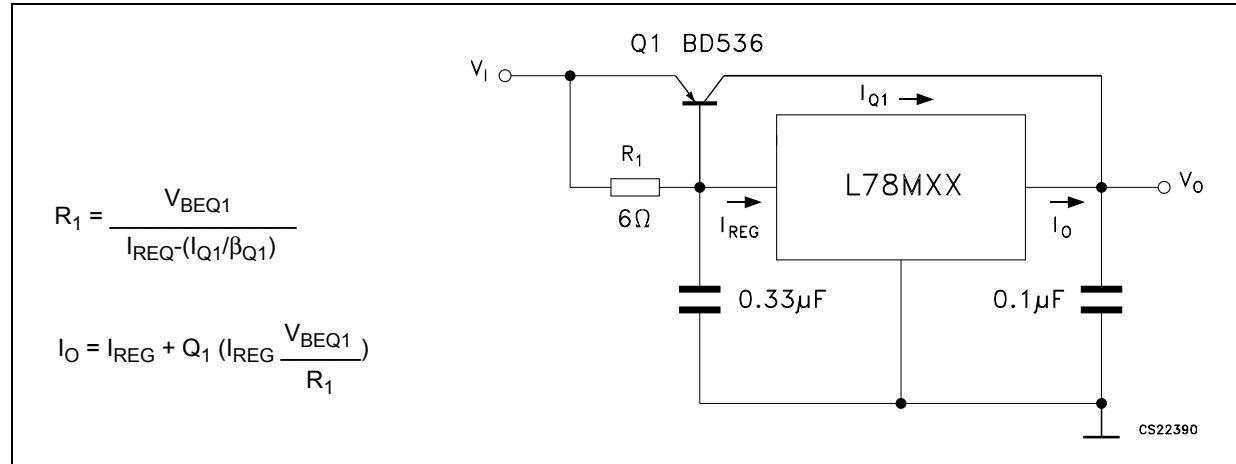
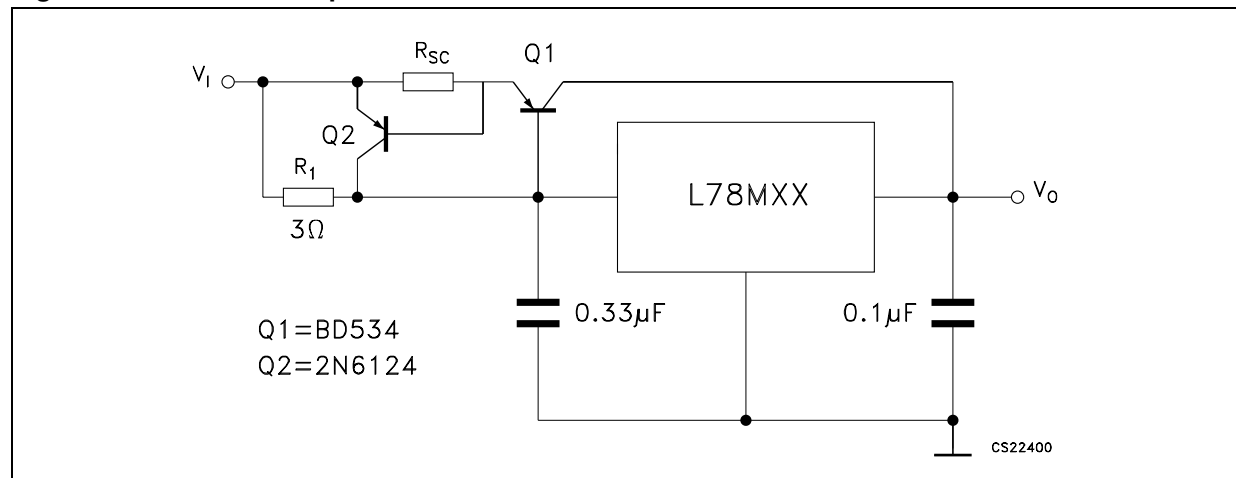


Figure 18. Adjustable output regulator



**Figure 19. Current boost regulator****Figure 20. Short-circuit protection**

**Note:** The circuit of [Figure 19](#) can be modified to provide supply protection against short circuits by adding a short-circuit sense resistor,  $R_{SC}$ , and an additional PNP transistor. The current sensing PNP must be able to handle the short-circuit current of the three-terminal regulator. Therefore, a four-ampere plastic power transistor is specified.

## 8 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK<sup>®</sup> packages. These packages have a lead-free second level interconnect. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com).

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 |

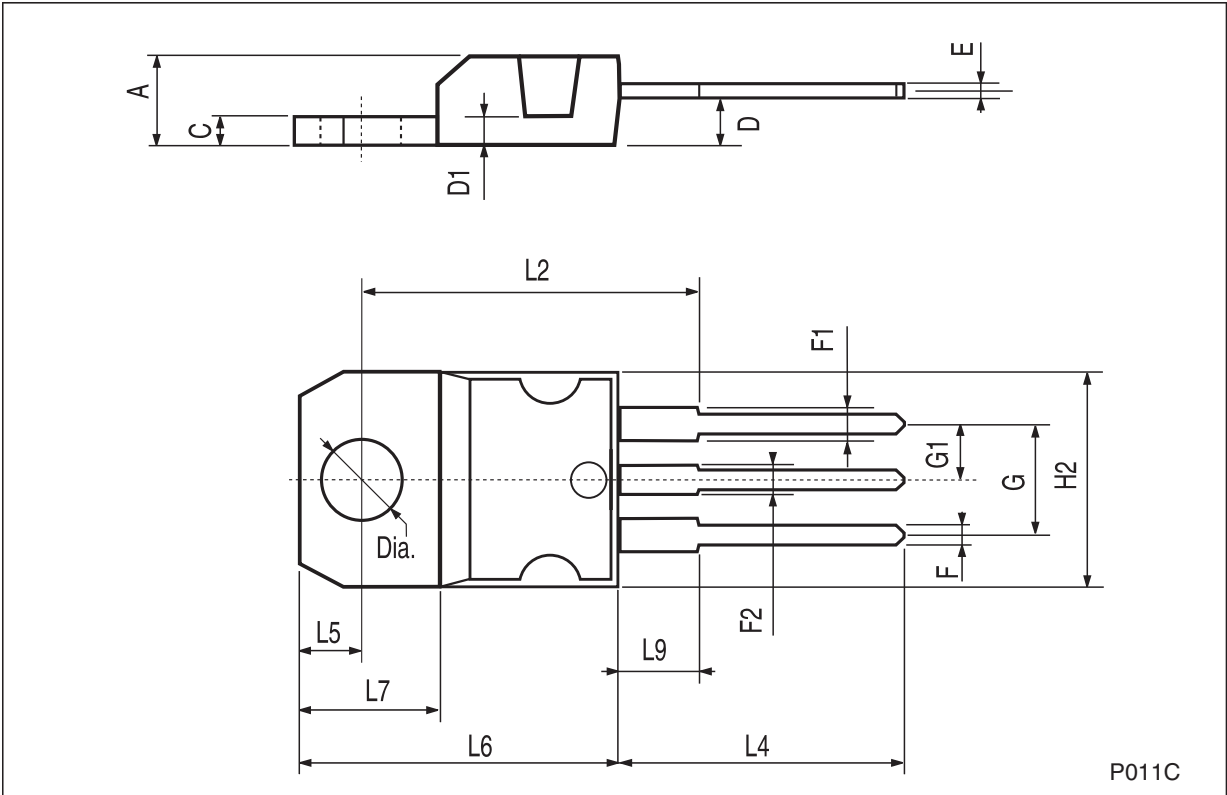


Figure 21. Drawing dimension DPAK type STD-ST

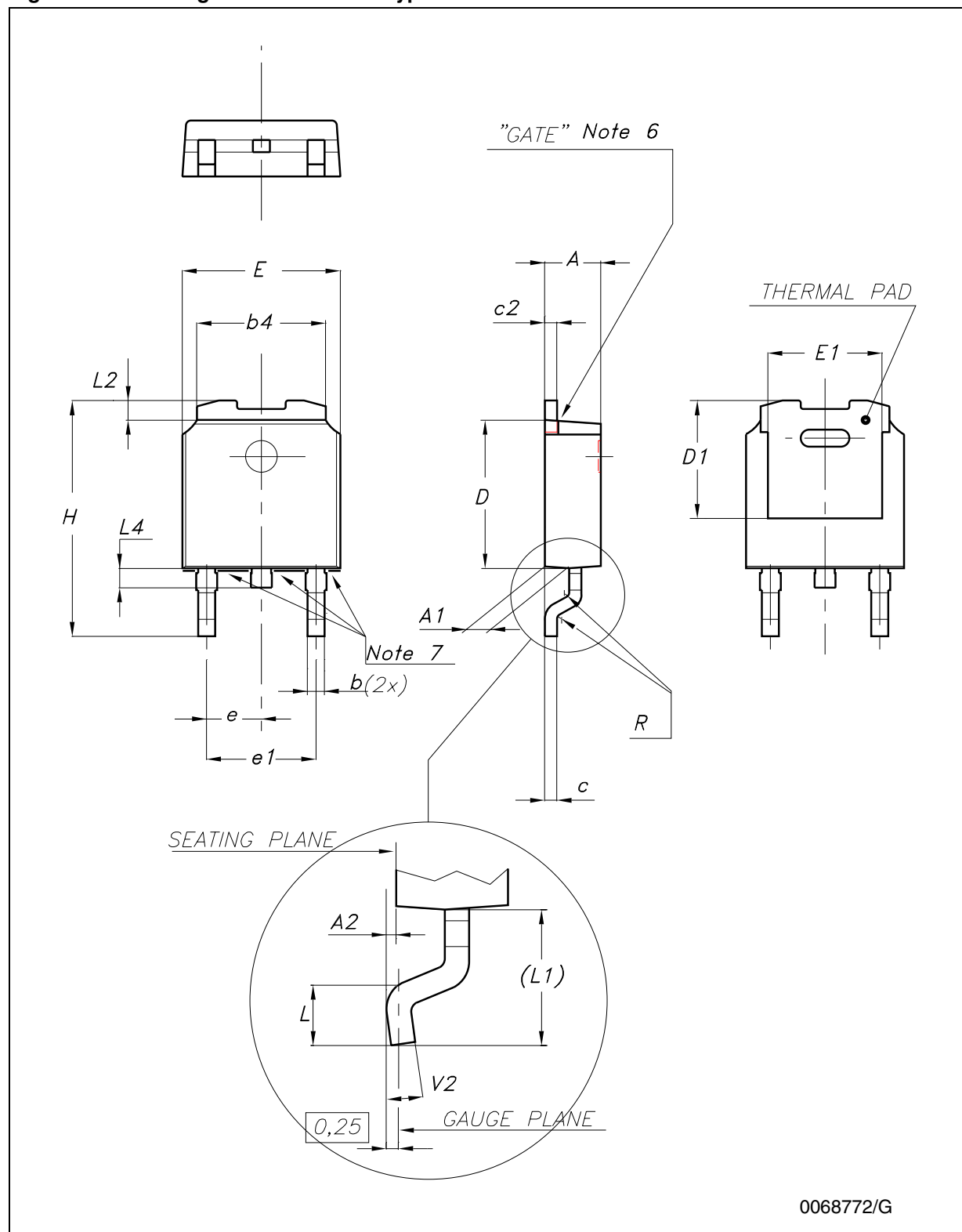


Figure 22. Drawing dimension DPAK type FUJITSU-Subcon.

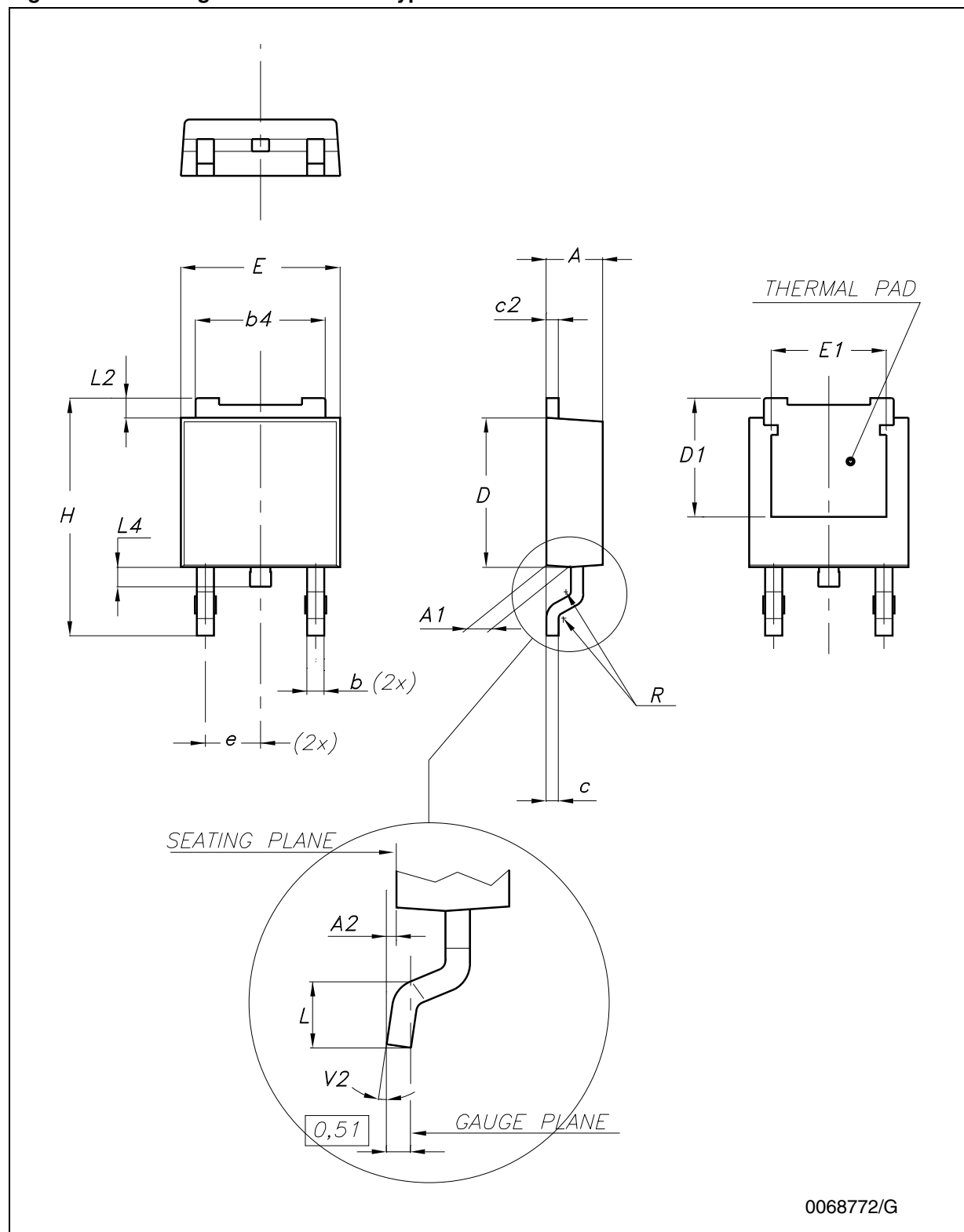


Figure 23. Drawing dimension DPAK TYPE IDS-Subcon.

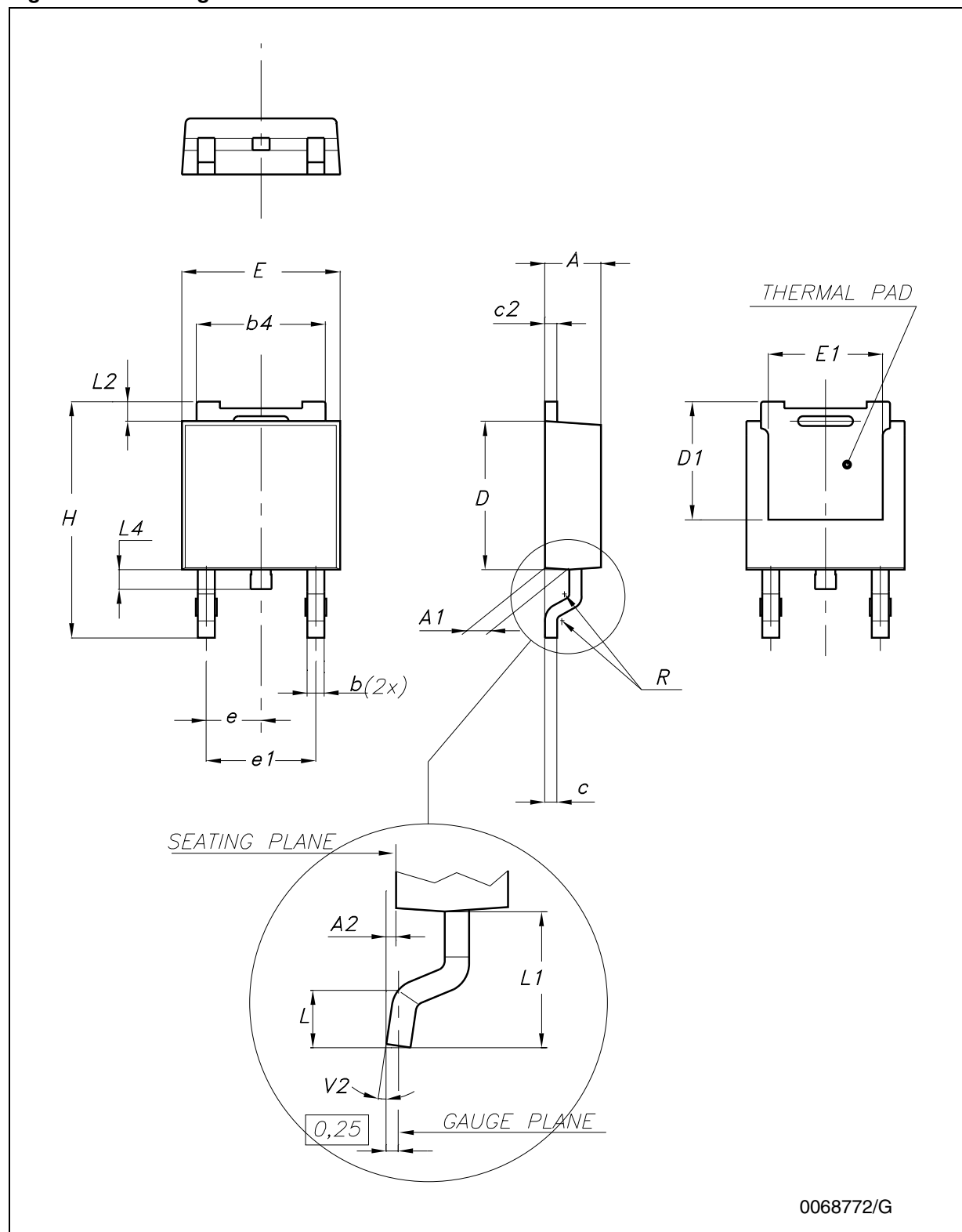


Table 12. DPAK mechanical data

| Dim. | Type STD-ST |      |       | Type FUJITSU-Subcon. |      |       | Type IDS-Subcon. |      |       |
|------|-------------|------|-------|----------------------|------|-------|------------------|------|-------|
|      | mm.         |      |       | mm.                  |      |       | mm.              |      |       |
|      | Min.        | Typ. | Max.  | Min.                 | Typ. | Max.  | Min.             | Typ. | Max.  |
| A    | 2.20        |      | 2.40  | 2.25                 | 2.30 | 2.35  | 2.19             |      | 2.38  |
| A1   | 0.90        |      | 1.10  | 0.96                 |      | 1.06  | 0.89             |      | 1.14  |
| A2   | 0.03        |      | 0.23  | 0                    |      | 0.10  | 0.03             |      | 0.23  |
| b    | 0.64        |      | 0.90  | 0.76                 |      | 0.86  | 0.64             |      | 0.88  |
| b4   | 5.20        |      | 5.40  | 5.28                 |      | 5.38  | 5.21             |      | 5.46  |
| c    | 0.45        |      | 0.60  | 0.46                 |      | 0.56  | 0.46             |      | 0.58  |
| c2   | 0.48        |      | 0.60  | 0.46                 |      | 0.56  | 0.46             |      | 0.58  |
| D    | 6.00        |      | 6.20  | 6.05                 |      | 6.15  | 5.97             |      | 6.22  |
| D1   |             | 5.10 |       | 5.27                 |      | 5.47  |                  | 5.20 |       |
| E    | 6.40        |      | 6.60  | 6.55                 | 6.60 | 6.65  | 6.35             |      | 6.73  |
| E1   |             | 4.70 |       |                      | 4.77 |       |                  | 4.70 |       |
| e    |             | 2.28 |       | 2.23                 | 2.28 | 2.33  |                  | 2.28 |       |
| e1   | 4.40        |      | 4.60  |                      |      |       | 4.51             |      | 4.61  |
| H    | 9.35        |      | 10.10 | 9.90                 |      | 10.30 | 9.40             |      | 10.42 |
| L    | 1.00        |      |       | 1.40                 |      | 1.60  | 0.90             |      |       |
| L1   |             | 2.80 |       |                      |      |       | 2.50             |      | 2.65  |
| L2   |             | 0.80 |       | 1.03                 |      | 1.13  | 0.89             |      | 1.27  |
| L4   | 0.60        |      | 1.00  | 0.70                 |      | 0.90  | 0.64             |      | 1.02  |
| R    |             | 0.20 |       |                      | 0.40 |       |                  | 0.20 |       |
| V2   | 0°          |      | 8°    | 0°                   |      | 8°    | 0°               |      | 8°    |

**Note:** The DPAK package coming from the two subcontractors (Fujitsu and IDS) are fully compatible with the ST's package suggested footprint.

Figure 24. DPAK footprint recommended data

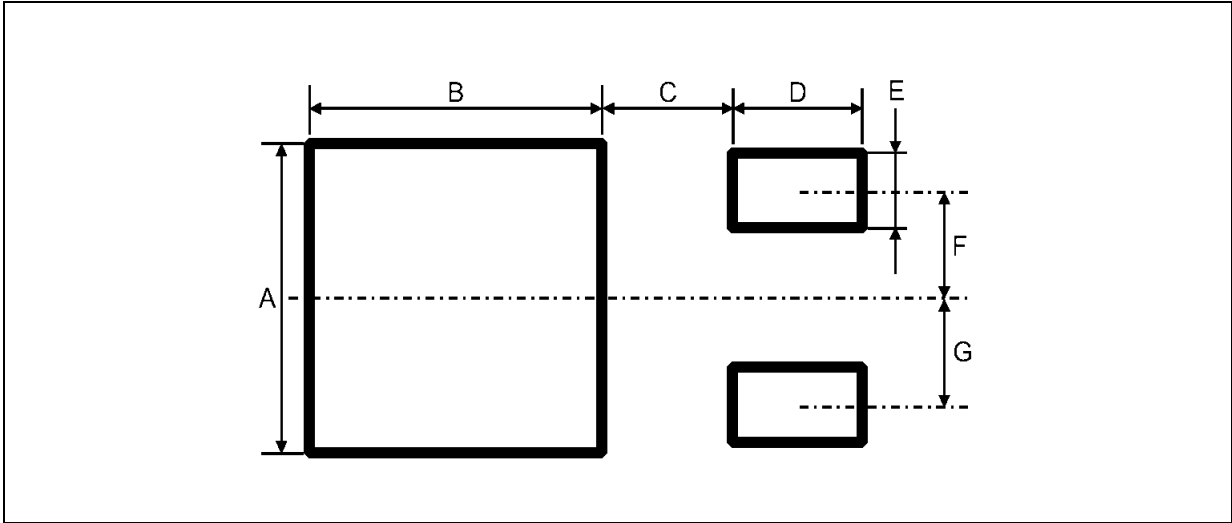
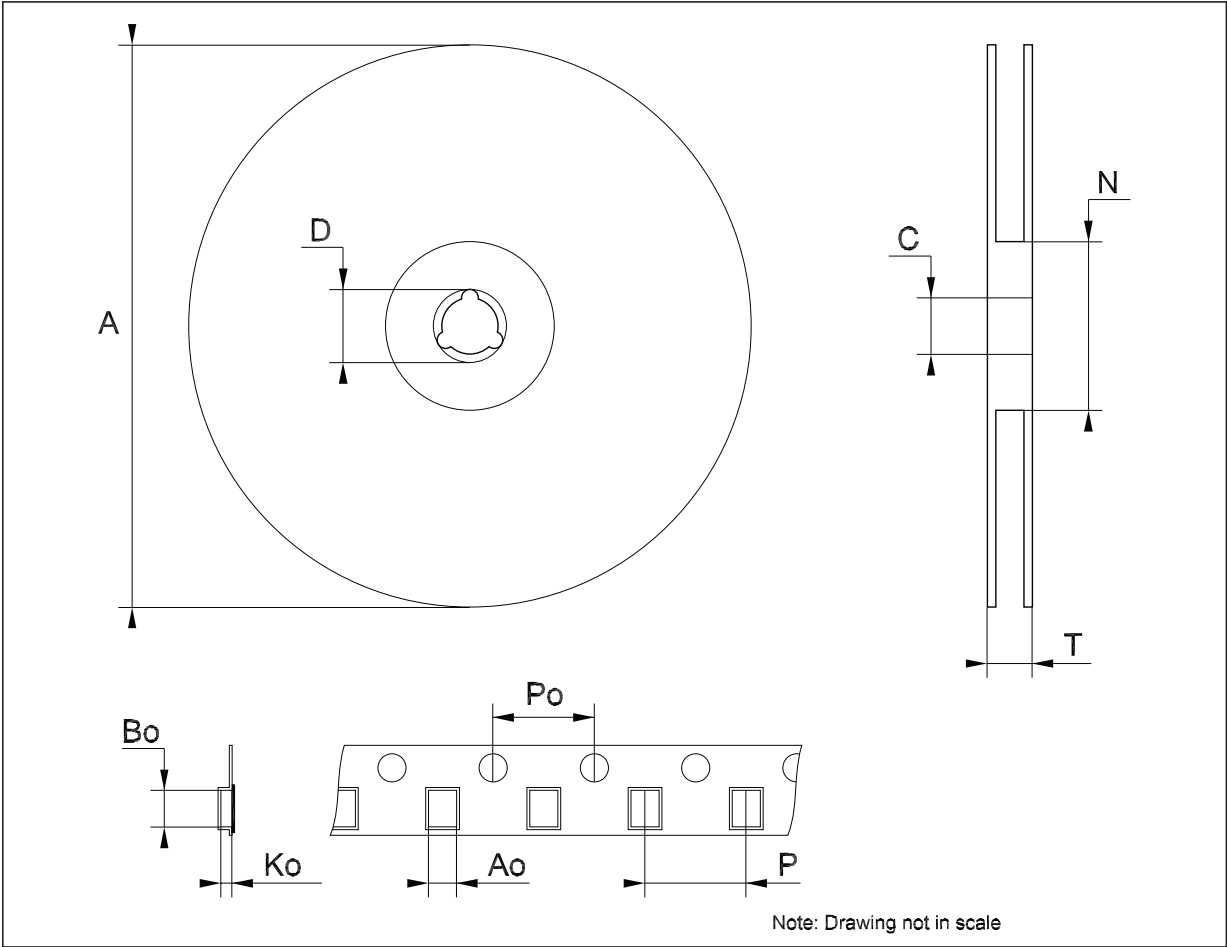


Table 13. Footprint data

| Values |      |       |
|--------|------|-------|
| Dim.   | mm.  | inch. |
| A      | 6.70 | 0.264 |
| B      | 6.70 | 0.64  |
| C      | 1.8  | 0.070 |
| D      | 3.0  | 0.118 |
| E      | 1.60 | 0.063 |
| F      | 2.30 | 0.091 |
| G      | 2.30 | 0.091 |

Tape & reel DPAK-PPAK mechanical data

| Dim. | mm.   |       |       | inch. |       |        |
|------|-------|-------|-------|-------|-------|--------|
|      | Min.  | Typ.  | Max.  | Min.  | Typ.  | Max.   |
| A    |       |       | 330   |       |       | 12.992 |
| C    | 12.8  | 13.0  | 13.2  | 0.504 | 0.512 | 0.519  |
| D    | 20.2  |       |       | 0.795 |       |        |
| N    | 60    |       |       | 2.362 |       |        |
| T    |       |       | 22.4  |       |       | 0.882  |
| Ao   | 6.80  | 6.90  | 7.00  | 0.268 | 0.272 | 0.276  |
| Bo   | 10.40 | 10.50 | 10.60 | 0.409 | 0.413 | 0.417  |
| Ko   | 2.55  | 2.65  | 2.75  | 0.100 | 0.104 | 0.105  |
| Po   | 3.9   | 4.0   | 4.1   | 0.153 | 0.157 | 0.161  |
| P    | 7.9   | 8.0   | 8.1   | 0.311 | 0.315 | 0.319  |



## 9 Order codes

Table 14. Order codes

| Part numbers | Packaging |               |                |
|--------------|-----------|---------------|----------------|
|              | TO-220    | DPAK          | Output voltage |
| L78M05AB     | L78M05ABV | L78M05ABDT-TR | 5 V            |
| L78M05AC     |           | L78M05ACDT-TR | 5 V            |
| L78M06AB     |           | L78M06ABDT-TR | 6 V            |
| L78M08AB     | L78M08ABV | L78M08ABDT-TR | 8 V            |
| L78M08AC     |           | L78M08ACDT-TR | 8 V            |
| L78M09AB     | L78M09ABV | L78M09ABDT-TR | 9 V            |
| L78M10AB     |           | L78M10ABDT-TR | 10 V           |
| L78M12AB     | L78M12ABV | L78M12ABDT-TR | 12 V           |
| L78M12AC     |           | L78M12ACDT-TR | 12 V           |
| L78M15AB     | L78M15ABV | L78M15ABDT-TR | 15 V           |
| L78M24AB     | L78M24ABV | L78M24ABDT-TR | 24 V           |
| L78M24AC     |           | L78M24ACDT-TR | 24 V           |

## 10 Revision history

**Table 15. Document revision history**

| Date        | Revision | Changes                                              |
|-------------|----------|------------------------------------------------------|
| 30-Aug-2006 | 3        | Order Codes updated.                                 |
| 05-Oct-2006 | 4        | DPAK mechanical data updated and add footprint data. |
| 10-Dec-2007 | 5        | Modified: <a href="#">Table 14</a> .                 |
| 20-Feb-2008 | 6        | Modified: <a href="#">Table 14 on page 27</a> .      |

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