Great Mixed Signal Technologies

# GMT72xx FAMILY
## LOW DROP-OUT VOLTAGE REGULATORS

### DESCRIPTION

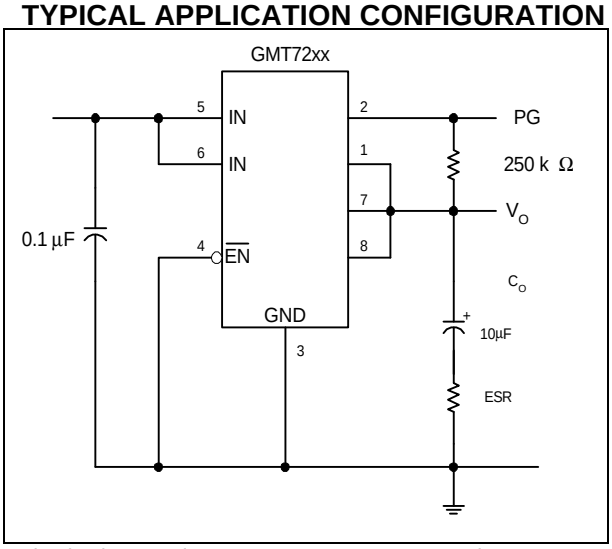
The GMT72xx Family of Micropower, low dropout (LDO) voltage regulators offer efficient, low-dropout performance as required by modern portable applications such as palmtop computers, two-way paging, portable telephones, and global positioning equipment (GPS). Compared to conventional LDO IC's, these regulators perform at low quiescent operating current with significantly lower dropout voltages. Available in 8-pin SOIC and DIP packages, these devices provide reliable, low cost solutions for contemporary mobile system needs. The GMT7201 provides additional flexibility by allowing a user to set the output voltage with the use of an external resistor feedback-divider. System power management control is permitted with the use of an enable pin.

Enhanced LDO performance is provided by the use of an advanced PMOS pass transistor design and is a significant improvement over conventional bipolar technology. Similarly, parasitic substrate or ground currents are virtually eliminated by the improved design. The PMOS pass element behaves as a low-value resistor, the drop-out voltage is very low with a maximum of 85 mV at 100 mA of load current. The improved CMOS architecture significantly reduces the operating current which aids in extending the life expectancy of on-board, replaceable or rechargeable power sources.

### FEATURES

- Available in 5.0 Volt, 4.85 Volt, and 3.3 Volt Fixed Output and Adjustable Product Options.
- When $I_O$ = 100 mA, Maximum Dropout Voltage is < 85 mVolts (GMT7250).
- Typical Quiescent Current is 180 µA, Independent of Load.
- 8 Pin Plastic DIP and SOIC Package Options Available.
- Fixed Output Versions* Output Regulated to +/- 2% Over Entire Operating Range.
- Logic Enabled Sleep Mode Results in Sleep-State Current of 0.5 uA.

### TYPICAL APPLICATION CONFIGURATION




*Fixed voltage options: GMT7233, GMT7248 and GMT7250

### Table 1: GMT72xx FAMILY

| PART NO. | DESCRIPTION |
|---|---|
| 7201 | ADJUSTABLE REGULATOR |
| 7233 | 3.3 V REGULATOR |
| 7248 | 4.85 V REGULATOR |
| 7250 | 5.0 V REGULATOR |

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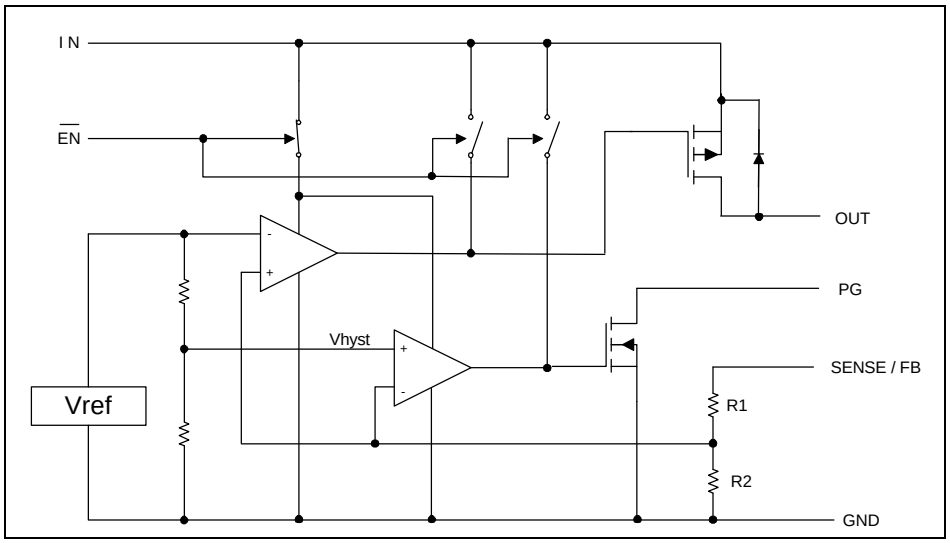
FUNCTIONAL BLOCK DIAGRAM




**RESISTOR DIVIDER OPTIONS**

| DEVICE | R1 | R2 | Unit |
|---|---|---|---|
| GMT7201 | 0 | ∞ | Ω |
| GMT7233 | 420 | 233 | KΩ |
| GMT7248 | 726 | 233 | KΩ |
| GMT7250 | 756 | 233 | KΩ |

**Resistor values are nominal**

**Note: Out and Sense must be tied together as close as possible to the device.**

### Table 2: ABSOLUTE MAXIMUM RATINGS OVER OPERATING TEMPERATURE RANGE
**(FREE AIR UNLESS OTHERWISE NOTED)**[1]

Input Voltage Range[2], $V_I$, PG, SENSE, $\overline{EN}$..... -0.3 V to 11 V

Output Current, $I_O$.....1.5 A

Continuous Total Power Dissipation..... See Dissipation Rating Tables 1 and 2

Operating Virtual Junction Temperature Range, $T_J$..... $-55^oC$ to $150^oC$

Storage Temperature Range $T_{stg}$..... $-65^oC$ to $150^oC$

Lead Temperature, 1, 6 mm, (1/16 inch) from case for 10 sec..... $260^oC$

[1] Stresses beyond those listed in this table may cause permanent damage to the device. These are stress ratings only and functional operation of the device, at these or any other conditions beyond those indicated under Recommended Operating Conditions (Table 2), is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

[2] All voltage values are with respect to network ground terminal.

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**PACKAGE TYPES**

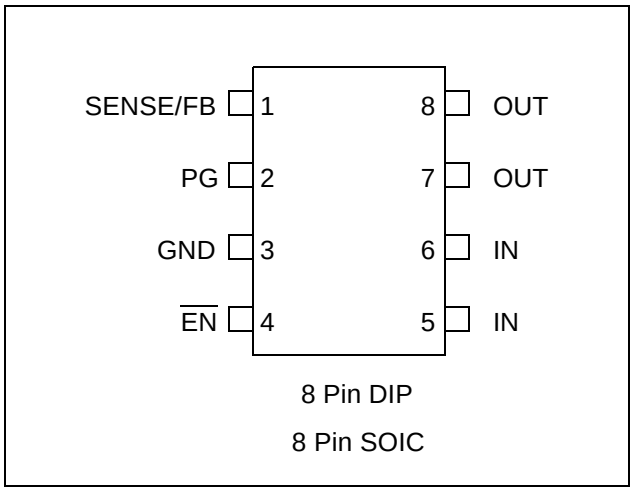


**Table 3: AVAILABLE OPTIONS**

| $T_J$ | OUTPUT VOLTAGE | | | PACKAGE TYPES | |
|---|---|---|---|---|---|
| | MIN | TYPICAL | MAX | SOIC | DIP |
| -55°C to 150°C | 4.9 | 5.0 | 5.1 | GMT7250M | GMT7250N |
| | 4.75 | 4.85 | 4.95 | GMT7248M | GMT7248N |
| | 3.23 | 3.3 | 3.37 | GMT7233M | GMT7233N |
| | Adjustable: 1.2 V to 9.75 V | | | GMT7201M | GMT7201N |
| The ANM package is available in tape and reel; add T to the part number. | | | | | |

**Table 4: USAGE DESCRIPTIONS**

| PIN | NAME | USAGE DESCRIPTION |
|---|---|---|
| 1 | SENSE/FB | Normally tied to Vout except for adjustable version. Refer to the Applications section. |
| 2 | PG | Power Good indicator; normally tied to Vout with a 250 K resistor. Pulls low when Vout drops below 0.95 of regulated output voltage. |
| 3 | GND | Reference point and return of circuit. |
| 4 | $\overline{EN}$ | Allows control of the LDO with TTL compatible signal. LOW = REG ON |
| 5,6 | Vin | Input voltage and filter capacitor are applied here. |

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**Table 4: USAGE DESCRIPTIONS**

| PIN | NAME | USAGE DESCRIPTION |
|---|---|---|
| 7,8 | | Vout output voltage appears here. Filter capacitor is also applied here. |

**Table 5: RECOMMENDED OPERATING CONDITIONS**

| | | MIN | MAX | UNITS |
|---|---|---|---|---|
| Input Voltage, $V_I$ † | GMT7201 | 3.0 | 10 | V |
| | GMT7233 | 3.98 | 10 | V |
| | GMT7248 | 5.24 | 10 | V |
| | GMT7250 | 5.41 | 10 | V |
| High-level input voltage at $\overline{EN}$, $V_{IH}$ | | 2.0 | | V |
| Low-level input voltage at $\overline{EN}$, $V_{IL}$ | | | 0.5 | V |
| Output Current, $I_O$ | | 0.0 | 250 | mA |
| Operating virtual junction Temperature, $T_J$ | | -40 | 125 | $^oC$ |

†Minimum input voltage defined in the recommended operating conditions is the maximum specified output voltage plus dropout voltage at the maximum specified load range. Since dropout voltage is a function of output current, the usable range can be extended for lighter loads. To calculate the minumum input voltage for the maximum load current used in a given application, use the following equation:

$$V_{I(min)} = V_{O(max)} + V_{DO(max\ load)}$$

Because the GMT7201 is programmable, $r_{DS(on)}$ should be used to calculate $V_{DO}$ before applying the above equation. The equation for calculating $V_{DO}$ from $r_{DS(on)}$ is given in Note 2, Page 6 under GMT7201 electrical characteristics table. The minimum value of 3.0 V is the absolute lower limit for the recommended input-voltage range for the GMT7201.

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### Table 6: ELECTRICAL CHARACTERISTICS (PACKAGED DEVICES)

$I_O$ = 10 mA, $\overline{EN}$ = 0 V, $C_O$ = 4.7 µF(CSR = 1 Ω), $T_J$ = 25°C, SENSE/FB shorted to OUT (unless otherwise noted). CSR refers to the total of capacitor ESR lead resistance and PWB trace resistance.

| PARAMETER | TEST CONDITIONS† | $T_J$ | GMT7201, GMT7233, GMT7248,GMT7250 | | | UNITS |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Ground Current (active mode) | $\overline{EN} \le$ 0.5 V, $V_I = V_O$ + 1.0 V, 0.0 mA $\le I_O \le$ 250 mA | 25°C | | 180 | 225 | µA |
| | | -40°C to 125°C | | | 325 | |
| Input Current (standby mode) | $\overline{EN}$ = $V_I$, 2.7 V $\le V_I \le$ 10 V | 25°C | | | 0.5 | µA |
| | | -40°C to 125°C | | | 1.0 | |
| Output Current Limit Threshold | $V_O$ = 0.0 V, $V_I$ = 10 V | 25°C | | 0.6 | 1.0 | A |
| | | -40°C to 125°C | | | 1.5 | |
| Pass-element Leakage Current in Standby Mode | $\overline{EN}$ = $V_I$, 3.0 V $\le V_I \le$ 10 V. | 25°C | | | 0.5 | µA |
| | | -40°C to 125°C | | | 1.0 | |
| PG Leakage Current | $V_{PG}$ = 10 V Normal Operation | 25°C | | | 0.5 | µA |
| | | -40°C to 125°C | | | 0.5 | |
| Output Voltage Temperature Coefficient | | -40°C to 125°C | | 31 | 75 | ppm/°C |
| Thermal Shutdown Junction Temperature | | | | 150 | | °C |
| $\overline{EN}$ Logic High (Standby Mode) | 3.0 V ≤ $V_I$ ≤ 6.0 V | -40°C to 125°C | 2.0 | | | V |
| | 6.0 V ≤ $V_I$ ≤ 10 V | | 2.7 | | | |
| $\overline{EN}$ Logic Low (Active Mode) | 3.0 V ≤ $V_I$ ≤ 10 V | 25°C | | | 0.5 | V |
| | | -40°C to 125°C | | | 0.5 | |
| $\overline{EN}$ Hysteresis Voltage | | 25°C | | 50 | | mV |
| $\overline{EN}$ Input Current | 0.0 V ≤ $V_I$ ≤ 10 V | 25°C | -0.5 | | 0.5 | µA |
| | | -40°C to 125°C | -0.5 | | 0.5 | |
| Minimum $V_I$ for active pass element | | 25°C | | 1.9 | 2.5 | V |
| | | -40°C to 125°C | | | 2.5 | |
| Minimum $V_I$ for valid PG | IPG = 300 µA | 25°C | | 0.95 | 1.5 | V |
| | | -40°C to 125°C | | | 1.9 | |

†Pulse-testing techniques are used to maintain Ta=Tj.

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**Table 7: ELECTRICAL CHARACTERISTICS (DIE FORM)**

$I_O$ = 10 mA, $\overline{EN}$ = 0 V, $C_O$ = 4.7 µF(CSR = 1 Ω), $T_J$ = 25°C, SENSE/FB shorted to OUT (unless otherwise noted). CSR refers to the total of capacitor ESR lead resistance and PWB trace resistance.

| PARAMETER | TEST CONDITIONS† | GMT7201,GMT7233, GMT7248,GMT7250 | | | UNITS |
|---|---|---|---|---|---|
| | | MIN | TYP | MAX | |
| Ground Current (Active Mode) | $\overline{EN} \leq 0.5$ V, $V_I = V_O + 1.0$ V, 0.0 mA $\leq I_O \leq$ 250 mA | | 180 | | µA |
| Output Current Limit Threshold | $V_O$ = 0.0 V, $V_I$ = 10 V | | 0.6 | | A |
| Thermal Shutdown Junction Temperature | | | 165 | | °C |
| $\overline{EN}$ Hysteresis Voltage | | | 50 | | mV |
| Minimum $V_I$ for active pass element | | | 1.9 | | V |
| Minimum $V_I$ for valid PG | $I_{PG}$ - 300 µA | | 0.95 | | V |

†Pulse-testing techniques are used to maintain Ta=Tj.

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## LOW DROP-OUT VOLTAGE REGULATORS

### Table 8: ELECTRICAL CHARACTERISTICS (GMT7201)

$I_O$ = 10 mA, $\overline{EN}$ = 0 V, $C_O$ = 4.7 µF(CSR = 1 Ω), $T_J$ = 25°C, SENSE/FB shorted to OUT (unless otherwise noted). CSR refers to the total of capacitor ESR lead resistance and PWB trace resistance.

| PARAMETER | TEST CONDITIONS† | $T_J$ | GMT7201 | | | UNITS |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Reference voltage (measured at FB with OUT connected to FB) | $V_I$ = 3.5 V, $I_O$ = 10 mA | 25°C | | 1.168 | | V |
| | 2.5 V ≤ $V_I$ ≤ 10 V, 5.0 mA ≤ $I_O$ ≤ 250 mA See Note 1 | -40°C to 125°C | 1.152 | | 1.224 | V |
| Reference voltage temperature coefficient | | -40°C to 125°C | | 31 | 75 | ppm/°C |
| Pass-element series resistance (see Note 2) | $V_I$ = 2.4 V, 50 µA ≤ $I_O$ ≤ 100 mA | 25°C | | 2.1 | 4.2 | Ω |
| | | -40°C to 125°C | | | 4.8 | |
| | $V_I$ = 2.4 V, 100 µA ≤ $I_O$ ≤ 200 mA | 25°C | | 2.9 | 4.4 | |
| | | -40°C to 125°C | | | 4.6 | |
| | $V_I$ = 2.9 V, 50 µA ≤ $I_O$ ≤ 250 mA | 25°C | | 1.6 | 2.7 | |
| | | -40°C to 125°C | | | 4.5 | |
| | $V_I$ = 3.9 V, 50 µA ≤ $I_O$ ≤ 250 mA | 25°C | | 1.0 | | |
| | $V_I$ = 5.9 V, 50 µA ≤ $I_O$ ≤ 250 mA | 25°C | | 0.8 | | |
| Input regulation | $V_I$ = 2.5 V, 50 µA ≤ $I_O$ ≤ 250 mA | 25°C | | | 23 | mV |
| | See Note 1 | -40°C to 125°C | | | 36 | |
| Output regulation | $I_O$ = 5.0 mA to 250 mA, 2.5 V ≤ $V_I$ ≤ 10 V | 25°C | | 15 | 25 | mV |
| | See Note 1 | -40°C to 125°C | | | 36 | |
| | $I_O$ = 50 µA to 250 mA, 2.5 V ≤ $V_I$ ≤ 10 V | 25°C | | 17 | 27 | |
| | See Note 1 | -40°C to 125°C | | | 43 | |
| Ripple rejection | $I_O$ = 50 µA | 25°C | 49 | 60 | | dB |
| | | -40°C to 125°C | 32 | | | |
| | $I_O$ = 250 mA, See Note 1 | 25°C | 45 | 50 | | |
| | | -40°C to 125°C | 30 | | | |
| Output noise spectral density | 1.0 = 120 Hz | 25°C | | 2.0 | | µV/√Hz |

†Pulse-testing techniques are used to maintain Ta=Tj.

1 When $V_I$<2.9 V and $I_O$>100 mA simultaneously, pass element $r_{DS(on)}$ increases to a point such that the resulting dropout voltage prevents the regulator from maintaining the specified tolerance range.

2 To calculate dropout voltage, use equation: $V_{DO} = I_O \cdot r_{DS(on)}$. $r_{DS(on)}$ is a function of both output current and input voltage. The parametric table lists $r_{DS(on)}$ for $V_I$ = 2.4 V, 2.9 V, 3.9 V and 5.9 V, which corresponds to dropout conditions for programmed output voltages of 2.5 V, 3.0 V, 4.0 V and 6.0 V, respectively.

# GMT72xx FAMILY
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### Table 8: ELECTRICAL CHARACTERISTICS (GMT7201) Cont.

| PARAMETER | TEST CONDITIONS† | $T_J$ | GMT7201 | | | UNITS |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Ouput noise voltage | $C_O$ = 4.7 µF | 25°C | | 235 | | µVrms |
| | $C_O$ = 10 µF | 25°C | | 190 | | |
| | $C_O$ = 100 µF | 25°C | | 195 | | |
| PG trip-threshold voltage | $V_{FB}$ voltage decreasing from above $V_{PG}$ | -40°C to 125°C | | 0.95 x $V_{FB(nom)}$ | | V |
| PG hysteresis voltage | Measured at $V_{FB}$ | 25°C | | 12 | | mV |
| PG output low voltage | $I_{PG}$ = 400 µA, $V_I$ = 2.13 V | 25°C | | 0.1 | 0.4 | V |
| | | -40°C to 125°C | | | 0.4 | |
| FB input current | | 25°C | -10 | 0.1 | 10 | nA |
| | | -40°C to 125°C | -20 | | 20 | |

†Pulse-testing techniques are used to maintain Ta=Tj.

### Table 9: ELECTRICAL CHARACTERISTICS (GMT7233)

$I_O$ = 10 mA, $\overline{EN}$ = 0 V, $C_O$ = 4.7 µF (CSR = 1 Ω), $T_J$ = 25°C, SENSE/FB shorted to OUT (unless otherwise noted. CSR refers to the total of capacitor ESR lead resistance and PWB trace resistance.

| PARAMETER | TEST CONDITIONS† | $T_J$ | GMT7233 | | | UNITS |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 4.3 V, $I_O$ = 10 mA | 25°C | | 3.3 | | V |
| | 4.3 V ≤ $V_I$ ≤ 10 V, 5.0 mA≤ $I_O$ ≤ 250 mA | -40°C to 125°C | 3.23 | | 3.37 | |
| Dropout voltage | $I_O$ = 10 mA, $V_I$ = 3.23 V | 25°C | | 14 | 20 | mV |
| | | -40°C to 125°C | | | 30 | |
| | $I_O$ = 100 mA, $V_I$ = 3.23 V | 25°C | | 140 | 180 | |
| | | -40°C to 125°C | | | 232 | |
| | $I_O$ = 250 mA, $V_I$ = 3.23 V | 25°C | | 360 | 460 | |
| | | -40°C to 125°C | | | 610 | |
| Pass-element series resistance | (3.23 V - $V_O$)/$I_O$,$V_I$ = 3.23 V, $I_O$= 250 mA | 25°C | | 1.5 | 1.84 | Ω |
| | | -40°C to 125°C | | | 2.5 | |
| Input regulation | $V_I$ = 4.3 V to 10 V, 50 µA ≤ $I_O$ ≤ 250 mA | 25°C | | 8.0 | 25 | mV |
| | | -40°C to 125°C | | | 33 | |

†Pulse-testing techniques are used to maintain Ta=Tj.

# GMT72xx FAMILY
## LOW DROP-OUT VOLTAGE REGULATORS

### Table 9: ELECTRICAL CHARACTERISTICS (GMT7233) Cont.

| PARAMETER | TEST CONDITIONS† | $T_J$ | GMT7233 | | | UNITS |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Output regulation | $I_O$ = 5.0 mA to 250 mA, 4.3 V≤ $V_I$ ≤ 10 V | 25°C | | 32 | 42 | mV |
| | | -40°C to 125°C | | | 71 | |
| | $I_O$ = 50 µA to 250 mA, 4.3 V≤ $V_I$ ≤ 10 V | 25°C | | 41 | 55 | |
| | | -40°C to 125°C | | | 98 | |
| Ripple rejection | $I_O$ = 50 µA | 25°C | 40 | 52 | | dB |
| | | -40°C to 125°C | 38 | | | |
| | $I_O$ = 250 mA | 25°C | 35 | 44 | | |
| | | -40°C to 125°C | 33 | | | |
| Output noise spectral density | f = 120 Hz | 25°C | | 2.0 | | µV/√Hz |
| Output noise voltage | $C_O$ = 4.7 µF | 25°C | | 265 | | µVrms |
| | $C_O$ = 10 µF | 25°C | | 212 | | |
| | $C_O$ = 100 µF | 25°C | | 135 | | |
| PG trip-threshold voltage | $V_O$ voltage decreasing from above $V_{PG}$ | -40°C to 125°C | | 0.95 x $V_{O(nom)}$ | | V |
| PG hysteresis voltage | | 25°C | | 32 | | mV |
| PG output low voltage | $1.0_{PG}$ = 1.2 mA, $V_I$ = 2.8 V | 25°C | | 0.22 | 0.4 | V |
| | | -40°C to 125°C | | | 0.4 | |

†Pulse-testing techniques are used to maintain Ta=Tj.

### Table 10: PACKAGE THERMAL COEFFICIENTS

| | |
|---|---|
| 8 PIN DIP | 8.5mW/ deg.C |
| 8 PIN SOIC | 5.8mW/ deg.C |

# GMT72xx FAMILY
## LOW DROP-OUT VOLTAGE REGULATORS

### Table 11: ELECTRICAL CHARACTERISTICS (GMT7248)

$I_O$ = 10 mA, $\overline{EN}$ = 0 V, $C_O$ = 4.7 µF (CSR = 1 Ω), $T_J$ = 25°C, SENSE/FB shorted to OUT (unless otherwise noted. CSR refers to the total of capacitor ESR lead resistance and PWB trace resistance.

| PARAMETER | TEST CONDITIONS† | $T_J$ | GMT7248 | | | UNITS |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 5.85 V, $I_O$ = 10 mA | 25°C | | 4.85 | | V |
| | 5.85 V ≤ $V_I$ ≤ 10 V, 5.0 mA≤ $I_O$ ≤ 250 mA | -40°C to 125°C | 4.75 | | 4.95 | |
| Dropout voltage | $I_O$ = 10 mA, $V_I$ = 4.75 V | 25°C | | 10 | 19 | mV |
| | | -40°C to 125°C | | | 30 | |
| | $I_O$ = 100 mA, $V_I$ = 4.75 V | 25°C | | 90 | 100 | |
| | | -40°C to 125°C | | | 150 | |
| | $I_O$ = 250 mA, $V_I$ = 4.75 V | 25°C | | 216 | 250 | |
| | | -40°C to 125°C | | | 285 | |
| Pass-element series resistance | (4.75 V - $V_O$)/$I_O$,$V_I$ = 4.75 V, $I_O$ = 250 mA | 25°C | | 0.8 | 1.0 | Ω |
| | | -40°C to 125°C | | | 1.4 | |
| Input regulation | $V_I$ = 5.85 V to 10 V, 50µA ≤ $I_O$ ≤ 250 mA | 25°C | | | 34 | mV |
| | | -40°C to 125°C | | | 50 | |
| Output regulation | $I_O$ = 5.0 mA to 250 mA, 5.85 V≤ $V_I$ ≤ 10 V | 25°C | | 43 | 55 | mV |
| | | -40°C to 125°C | | | 95 | |
| | $I_O$ = 50 µA to 250 mA, 5.85 V≤ $V_I$ ≤ 10 V | 25°C | | 55 | 75 | |
| | | -40°C to 125°C | | | 135 | |
| Ripple rejection | $I_O$ = 50 µA | 25°C | 42 | 53 | | dB |
| | | -40°C to 125°C | 36 | | | |
| | $I_O$ = 250 mA | 25°C | 36 | 46 | | |
| | | -40°C to 125°C | 34 | | | |
| Output noise spectral density | f = 120 Hz | 25°C | | 2.0 | | µV/√Hz |
| Output noise voltage | $C_O$ = 4.7 µF | 25°C | | 370 | | µVrms |
| | $C_O$ = 10 µF | 25°C | | 290 | | |
| | $C_O$ = 100 µF | 25°C | | 168 | | |
| PG trip-threshold voltage | $V_O$ voltage decreasing from above $V_{PG}$ | -40°C to 125°C | | 0.95 x $V_{O(nom)}$ | | V |

†Pulse-testing techniques are used to maintain Ta=Tj.

### Table 10: ELECTRICAL CHARACTERISTICS (GMT7248) Cont.

| PARAMETER | TEST CONDITIONS† | $T_J$ | GMT7248 | | | UNITS |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| PG hysteresis voltage | | 25°C | | 50 | | mV |
| PG output low voltage | $I_{PG}$ = 1.2 mA, $V_I$ = 4.12 V | 25°C | | 0.2 | 0.4 | V |
| | | -40°C to 125°C | | | 0.4 | |

†Pulse-testing techniques are used to maintain Ta=Tj.

### Table 12: ELECTRICAL CHARACTERISTICS (GMT7250)

$I_O$ = 10 mA, $\overline{EN}$ = 0 V, $C_O$ = 4.7 µF (CSR = 1 Ω), $T_J$ = 25°C, SENSE/FB shorted to OUT (unless otherwise noted. CSR refers to the total of capacitor ESR lead resistance and PWB trace resistance.

| PARAMETER | TEST CONDITIONS† | $T_J$ | GMT7250 | | | UNITS |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 6.0 V, $I_O$ = 10 mA | 25°C | | 5.0 | | V |
| | 6.0 V ≤ $V_I$ ≤ 10 V, 5.0 mA≤ $I_O$ ≤ 250 mA | -40°C to 125°C | 4.9 | | 5.1 | |
| Dropout voltage | $I_O$ = 10 mA, $V_I$ = 4.88 V | 25°C | | 8.0 | 12 | mV |
| | | -40°C to 125°C | | | 30 | |
| | $I_O$ = 100 mA, $V_I$ = 4.88 V | 25°C | | 76 | 85 | |
| | | -40°C to 125°C | | | 136 | |
| | $I_O$ = 250 mA, $V_I$ = 4.88 V | 25°C | | 190 | 206 | |
| | | -40°C to 125°C | | | 312 | |
| Pass-element series resistance | (4.88 V - $V_O$)/$I_O$,$V_I$ = 4.88 V, $I_O$= 250 mA | 25°C | | 0.78 | 0.825 | Ω |
| | | -40°C to 125°C | | | 1.25 | |
| Input regulation | $V_I$ = 6.0 V to 10 V, 50 µA ≤ $I_O$ ≤ 250 mA | 25°C | | | 28 | mV |
| | | -40°C to 125°C | | | 35 | |
| Output regulation | $I_O$ = 5.0 mA to 250 mA, 6.0 V≤ $V_I$ ≤ 10 V | 25°C | | 46 | 61 | mV |
| | | -40°C to 125°C | | | 100 | |
| | $I_O$ = 50 µA to 250 mA, 6.0 V≤ $V_I$ ≤ 10 V | 25°C | | 59 | 79 | |
| | | -40°C to 125°C | | | 150 | |
| Ripple rejection | $I_O$ = 50 µA | 25°C | 41 | 52 | | dB |
| | | -40°C to 125°C | 37 | | | |
| | $I_O$ = 250 mA | 25°C | 36 | 46 | | |
| | | -40°C to 125°C | 32 | | | |

†Pulse-testing techniques are used to maintain Ta=Tj.

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**Table 9: ELECTRICAL CHARACTERISTICS (GMT7250) Cont.**

| PARAMETER | TEST CONDITIONS† | $T_J$ | GMT7250 | | | UNITS |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Output noise spectral density | f = 120 Hz | 25°C | | 2.0 | | $\mu V/\sqrt{Hz}$ |
| Output noise voltage | $C_O$ = 4.7 µF | 25°C | | 390 | | µVrms |
| | $C_O$ = 10 µF | 25°C | | 300 | | |
| | $C_O$ = 100 µF | 25°C | | 175 | | |
| PG trip-threshold voltage | $V_O$ voltage decreasing from above $V_{PG}$ | -40°C to 125°C | | 0.95 x $V_{O(nom)}$ | | V |
| PG hysteresis voltage | | 25°C | | 50 | | mV |
| PG output low voltage | 1.0 $_{PG}$ = 1.2 mA, $V_I$ = 4.25 V | 25°C | | 0.19 | 0.4 | V |
| | | -40°C to 125°C | | | 0.4 | |

†Pulse-testing techniques are used to maintain Ta=Tj.

### GENERAL DEVICE DESCRIPTION

The GMT72xx regulator family has been specifically designed to operate within noise-prone switched mode environments. Line and Load regulation have been substantially improved over competing devices, and the ability of the POWER GOOD (PG) flag to resist switching noise transients has been dramatically improved. A PMOS series pass element is used, which leads to lower Vdropout differentials, which, in turn, eases system design requirements and extends battery utilization time. Current consumption, both in terms of sleep and ground currents, is kept to uA levels, which means that portable applications will benefit from increased battery life. All of these factors make the GMT72xx family an excellent choice for switched-mode, battery-powered portable applications.

As with all CMOS inputs, at no time should the ENABLE pin be floated. It must be either grounded (enabled) or tied to Vcc (off) for all applications. Resistive pull-up is acceptable as well. A 250 K pull-up resistor must be included from PG to Vout when using the PG flag feature.

### SELECTION OF INPUT AND OUTPUT CAPACITORS

Standard design practice dictates that a ceramic input capacitor of approximately 0.1 uF be placed very close to the regulator input. This value may be adjusted to improve transient and ripple performance as needed.

The output capacitor plays an important role in stabilizing the LDO control loop, and should be a minimum value of 4.7 uF. If low ESR capacitor varieties such as Tantalum are used, a series resistor of 0.5 ohm may need to be included.

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If a lower value of output capacitor must be used, it may be necessary to include a series resistance of up to 1.0 ohm in order to ensure stability of the device. The recommended minimum value for the output capacitor is 4.7 uF. Note that the ESR required for device stability is bounded by both upper and lower limits. Please contact GMT for further information.

### SELECTING THE ADJUSTABLE VERSION (7201 SERIES) DIVIDER RESISTORS

When using the adjustable version, the external divider network must be selected to obtain the desired Vout. The first constraint on the divider network is the current draw, which is nominally set at 8.0 uA:

[Vout/ R divider] = 8.0 uA

One Resistor may now be selected, and the other solved for, knowing what Vout value is desired. The fundamental equation **Vo = Vref x (1 +(R1/R2))** is used; therefore, **R1 = R2 x {[Vo/Vref] - 1}**. Please see the following tabulation:

**Figure 1**

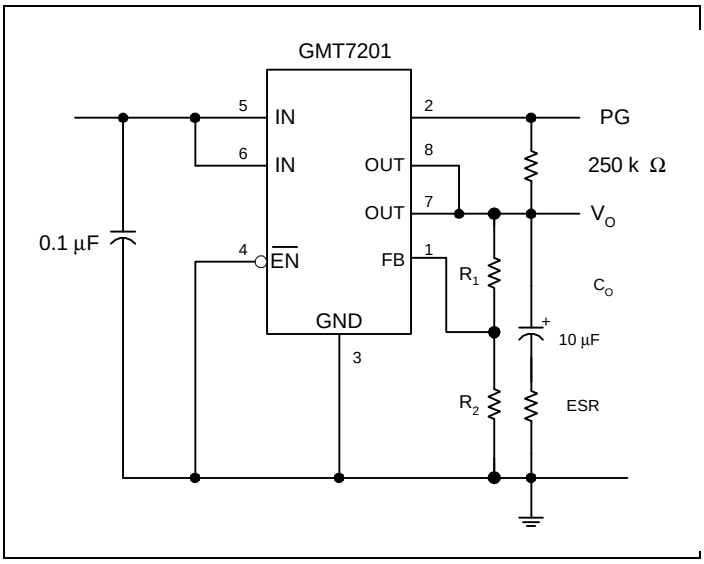

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**Table 13: GMT7201 ADJUSTABLE LDO DIVIDER VALUES**

| OUTPUT VOLTAGE | DIVIDER VALUES; 1% (KOHM) | |
|---|---|---|
| | R1 | R2 |
| 2.5 | 182 K | 165 K |
| 3.0 | 249 K | 165 K |
| 3.3 | 294 K | 165 K |
| 3.6 | 332 K | 165 K |
| 4.0 | 392 K | 165 K |
| 4.5 | 464 K | 165 K |
| 5.0 | 523 K | 165 K |
| 6.4 | 732 K | 165 K |
| The Vout range of the 7201 series may be varied from approximately 1.2 V to 9.0 V. Resistor values may require adjustment to achieve desired set-points. | | |

### THERMAL CONSIDERATIONS

The GMT72xx has been designed with internal over-current limiting, set at approximately 600 mA, as well as junction temperature detection, which limits TJ to approximately 150°C. In the event of a current overload, Vo shuts down when TJ reaches 150°C. The LDO will then turn back on as the junction cools. Even though the device is well protected, the designer must still properly manage the thermal environment in order to maximize efficiency and reduce stress. Maximum power dissipation is given by **Pd (max) = (Tjmax-TA)/ R θJA**. Where Tjmax is maximum allowable junction temperature, TA is the ambient temperature

RθJA is the package thermal coefficient. These numbers are derived under specific, controlled test conditions. Actual thermal performance ultimately depends on the application. Each individual board design must be carefully evaluated over full temperature and operational extremes. Please refer to the package data section for thermal coefficients.

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**LIFE SUPPORT USAGE POLICY:**

GMT's products are not authorized for use as critical components in life support devices or systems without the express written approval of the CEO of GMT. As used herein:
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