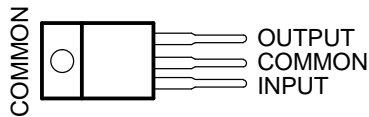


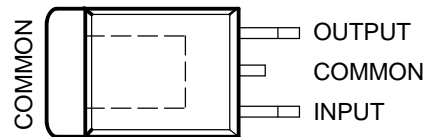
FEATURES

- 3-Terminal Regulators
- Output Current up to 500 mA
- No External Components
- Internal Thermal-Overload Protection
- High Power-Dissipation Capability
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation

**KC (TO-220) PACKAGE
(TOP VIEW)**

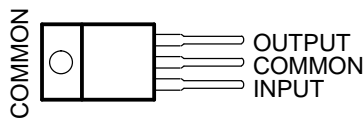


**KTP (PowerFLEX™/TO-252*) PACKAGE
(TOP VIEW)**

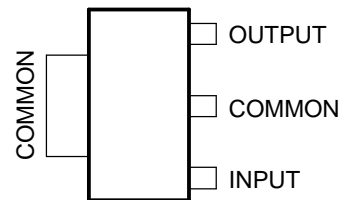


* Complies with JEDEC TO-252, variation AC

**KCS (TO-220) PACKAGE
(TOP VIEW)**



**DCY (SOT-223) PACKAGE
(TOP VIEW)**



DESCRIPTION/ORDERING INFORMATION

This series of fixed-voltage integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. Each of these regulators can deliver up to 500 mA of output current. The internal current-limiting and thermal-shutdown features of these regulators essentially make them immune to overload. In addition to use as fixed-voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents and also as the power-pass element in precision regulators.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PowerFLEX, PowerPAD are trademarks of Texas Instruments.

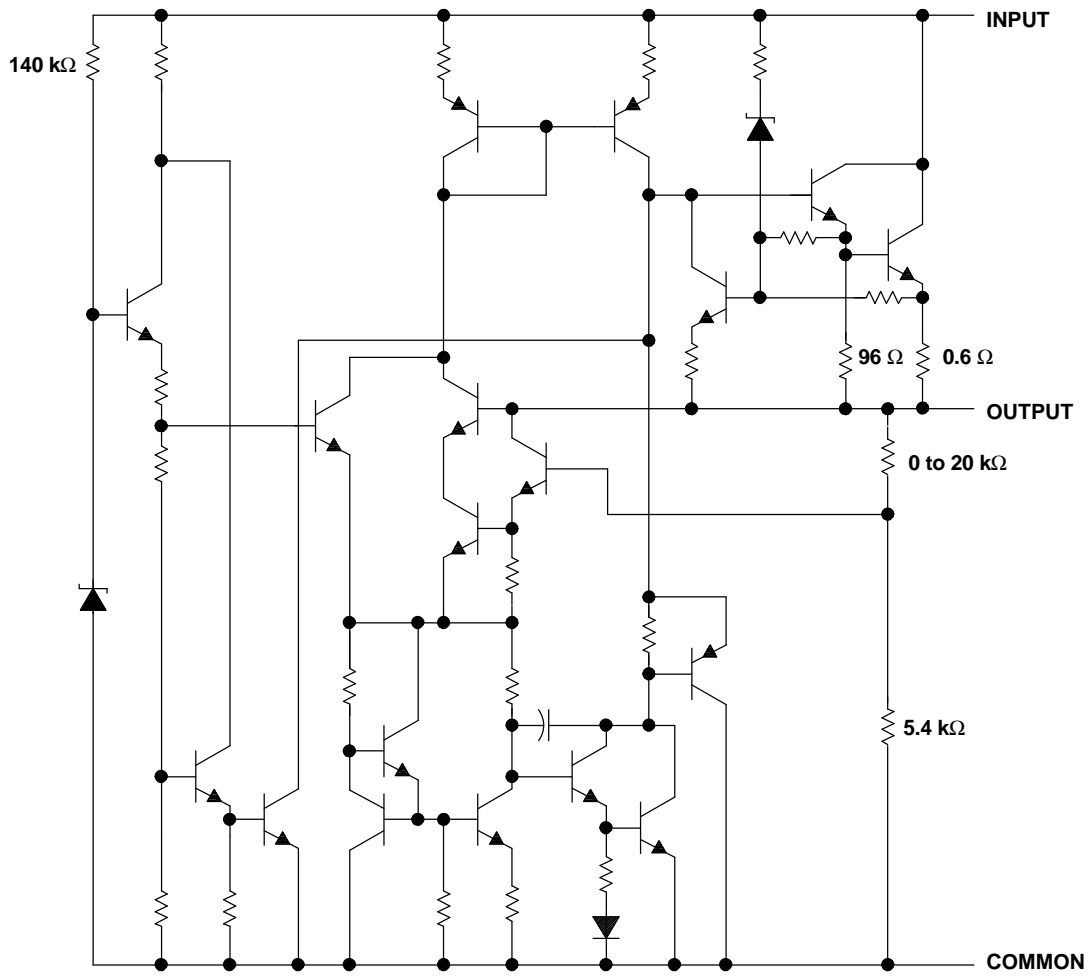
ORDERING INFORMATION

| T_A | $V_O(NOM)$ (V) | PACKAGE ⁽¹⁾ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|------------------------------|---------------------------------------|--|--------------|--------------------------|---------------------|
| 0°C to 125°C | 3.3 | PowerFLEX™/TO-252 ⁽²⁾ – KTP | Reel of 3000 | μA78M33CKTPR | UA78M33C |
| | | SOT-223 – DCY | Tube of 80 | μA78M33CDCY | C3 |
| | | | Reel of 2500 | μA78M33CDCYR | |
| | | TO-220 – KC | Tube of 50 | μA78M33CKC | UA78M33C |
| | 5 | PowerFLEX/TO-252 ⁽²⁾ – KTP | Reel of 3000 | μA78M05CKTPR | UA78M05C |
| | | SOT-223 – DCY | Tube of 80 | μA78M05CDCY | C5 |
| | | | Reel of 2500 | μA78M05CDCYR | |
| | | TO-220 – KC | Tube of 50 | μA78M05CKC | UA78M05C |
| | TO-220, short shoulder – KCS | Tube of 20 | μA78M05CKCS | | |
| | 6 | PowerFLEX/TO-252 ⁽²⁾ – KTP | Reel of 3000 | μA78M06CKTPR | UA78M06C |
| | 8 | PowerFLEX/TO-252 ⁽²⁾ – KTP | Reel of 3000 | μA78M08CKTPR | UA78M08C |
| | | SOT-223 – DCY | Tube of 80 | μA78M08CDCY | C8 |
| | | | Reel of 2500 | μA78M08CDCYR | |
| | TO-220 – KC | Tube of 50 | μA78M08CKC | UA78M08C | |
| | 9 | PowerFLEX/TO-252 ⁽²⁾ – KTP | Reel of 3000 | μA78M09CKTPR | UA78M09C |
| | 10 | PowerFLEX/TO-252 ⁽²⁾ – KTP | Reel of 3000 | μA78M10CKTPR | UA78M10C |
| 12 | PowerFLEX/TO-252 ⁽²⁾ – KTP | Reel of 3000 | μA78M12CKTPR | UA78M12C | |
| | TO-220 – KC | Tube of 50 | μA78M12CKC | UA78M12C | |
| –40°C to 125°C | 5 | PowerFLEX/TO-252 ⁽²⁾ – KTP | Reel of 3000 | μA78M05IKTPR | UA78M05I |
| | | SOT-223 – DCY | Tube of 80 | μA78M05IDCY | J5 |
| | | | Reel of 2500 | μA78M05IDCYR | |
| | | TO-220 – KC | Tube of 50 | μA78M05IKC | UA78M05I |
| TO-220, short shoulder – KCS | Tube of 20 | μA78M05IKCS | | | |

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

(2) Complies with JEDEC TO-252, variation AC

SCHEMATIC



Resistor values shown are nominal.

μA78M00 SERIES POSITIVE-VOLTAGE REGULATORS

SLVS059P–JUNE 1976–REVISED OCTOBER 2005



Absolute Maximum Ratings⁽¹⁾

over virtual junction temperature range (unless otherwise noted)

| | | MIN | MAX | UNIT |
|-----------|--|-----|-----|------|
| V_I | Input voltage | | 35 | V |
| T_J | Operating virtual junction temperature | | 150 | °C |
| T_{stg} | Storage temperature range | –65 | 150 | °C |

(1) Stresses beyond those listed under "absolute maximum ratings" 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" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Package Thermal Data⁽¹⁾

| PACKAGE | BOARD | θ_{JP} ⁽²⁾ | θ_{JC} | θ_{JA} |
|------------------------|-------------------|------------------------------|---------------|---------------|
| PowerFLEX/TO-252 – KTP | High K, JESD 51-5 | 1.4°C/W | 19°C/W | 28°C/W |
| SOT-223 – DCY | High K, JESD 51-7 | | 30.6°C/W | 53°C/W |
| TO-220 – KC/KCS | High K, JESD 51-5 | 3°C/W | 17°C/W | 19°C/W |

- (1) Maximum power dissipation is a function of $T_J(\text{max})$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\text{max}) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
- (2) For packages with exposed thermal pads, such as QFN, PowerPAD™, or PowerFLEX, θ_{JP} is defined as the thermal resistance between the die junction and the bottom of the exposed pad.

Recommended Operating Conditions

| | | MIN | MAX | UNIT | |
|-------|--|----------|------|------|----|
| V_I | Input voltage | μA78M33 | 5.3 | 25 | V |
| | | μA78M05 | 7 | 25 | |
| | | μA78M06 | 8 | 25 | |
| | | μA78M08 | 10.5 | 25 | |
| | | μA78M09 | 11.5 | 26 | |
| | | μA78M10 | 12.5 | 28 | |
| | | μA78M12 | 14.5 | 30 | |
| | | μA78M15 | 17.5 | 30 | |
| I_O | Output current | | 500 | mA | |
| T_J | Operating virtual junction temperature | μA78MxxC | 0 | 125 | °C |
| | | μA78MxxI | –40 | 125 | |

Electrical Characteristics

at specified virtual junction temperature, $V_I = 8\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS ⁽¹⁾ | | μA78M33C | | | UNIT |
|---|--|--|----------|-----|-----|-------|
| | | | MIN | TYP | MAX | |
| Output voltage ⁽²⁾ | $I_O = 5\text{ mA to }350\text{ mA}$, $V_I = 8\text{ V to }20\text{ V}$ | | 3.2 | 3.3 | 3.4 | V |
| | | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 3.1 | 3.3 | 3.5 | |
| Input voltage regulation | $I_O = 200\text{ mA}$ | $V_I = 5.3\text{ V to }25\text{ V}$ | | 9 | 100 | mV |
| | | $V_I = 8\text{ V to }25\text{ V}$ | | 3 | 50 | |
| Ripple rejection | $V_I = 8\text{ V to }18\text{ V}$, $f = 120\text{ Hz}$ | $I_O = 100\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 62 | | | dB |
| | | $I_O = 300\text{ mA}$ | 62 | 80 | | |
| Output voltage regulation | $V_I = 8\text{ V}$, | $I_O = 5\text{ mA to }500\text{ mA}$ | | 20 | 100 | mV |
| Temperature coefficient of output voltage | $I_O = 5\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | -1 | | mV/°C |
| Output noise voltage | $f = 10\text{ Hz to }100\text{ kHz}$ | | | 40 | 200 | μV |
| Dropout voltage | | | | 2 | | V |
| Bias current | | | | 4.5 | 6 | mA |
| Bias current change | $I_O = 200\text{ mA}$, $V_I = 8\text{ V to }25\text{ V}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | | | 0.8 | mA |
| | $I_O = 5\text{ mA to }350\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | | 0.5 | |
| Short-circuit output current | $V_I = 35\text{ V}$ | | | 300 | | mA |
| Peak output current | | | | 700 | | mA |

(1) All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.

(2) This specification applies only for dc power dissipation permitted by absolute maximum ratings

Electrical Characteristics

at specified virtual junction temperature, $V_I = 10\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS ⁽¹⁾ | | μA78M05C | | | UNIT |
|---|--|--|----------|-----|------|-------|
| | | | MIN | TYP | MAX | |
| Output voltage | $I_O = 5\text{ mA to }350\text{ mA}$, $V_I = 7\text{ V to }20\text{ V}$ | | 4.8 | 5 | 5.2 | V |
| | | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 4.75 | | 5.25 | |
| Input voltage regulation | $I_O = 200\text{ mA}$ | $V_I = 7\text{ V to }25\text{ V}$ | | 3 | 100 | mV |
| | | $V_I = 8\text{ V to }25\text{ V}$ | | 1 | 50 | |
| Ripple rejection | $V_I = 8\text{ V to }18\text{ V}$, $f = 120\text{ Hz}$ | $I_O = 100\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 62 | | | dB |
| | | $I_O = 300\text{ mA}$ | 62 | 80 | | |
| Output voltage regulation | $I_O = 5\text{ mA to }500\text{ mA}$ | | | 20 | 100 | mV |
| | $I_O = 5\text{ mA to }200\text{ mA}$ | | | 10 | 50 | |
| Temperature coefficient of output voltage | $I_O = 5\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | -1 | | mV/°C |
| Output noise voltage | $f = 10\text{ Hz to }100\text{ kHz}$ | | | 40 | 200 | μV |
| Dropout voltage | | | | 2 | | V |
| Bias current | | | | 4.5 | 6 | mA |
| Bias current change | $I_O = 200\text{ mA}$, $V_I = 8\text{ V to }25\text{ V}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | | | 0.8 | mA |
| | $I_O = 5\text{ mA to }350\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | | 0.5 | |
| Short-circuit output current | $V_I = 35\text{ V}$ | | | 300 | | mA |
| Peak output current | | | | 0.7 | | A |

(1) All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.

Electrical Characteristics

at specified virtual junction temperature, $V_I = 10\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS ⁽¹⁾ | | μA78M051 | | | UNIT |
|---|--|--|----------|-----|------|-------|
| | | | MIN | TYP | MAX | |
| Output voltage | $I_O = 5\text{ mA to }350\text{ mA}$, $V_I = 7\text{ V to }20\text{ V}$ | | 4.8 | 5 | 5.2 | V |
| | | $T_J = -40^\circ\text{C to }125^\circ\text{C}$ | 4.75 | | 5.25 | |
| Input voltage regulation | $I_O = 200\text{ mA}$ | $V_I = 7\text{ V to }25\text{ V}$ | | 3 | 100 | mV |
| | | $V_I = 8\text{ V to }25\text{ V}$ | | 1 | 50 | |
| Ripple rejection | $V_I = 8\text{ V to }18\text{ V}$, $f = 120\text{ Hz}$ | $I_O = 100\text{ mA}$, $T_J = -40^\circ\text{C to }125^\circ\text{C}$ | 62 | | | dB |
| | | $I_O = 300\text{ mA}$ | 62 | 80 | | |
| Output voltage regulation | $I_O = 5\text{ mA to }500\text{ mA}$ | | | 20 | 100 | mV |
| | $I_O = 5\text{ mA to }200\text{ mA}$ | | | 10 | 50 | |
| Temperature coefficient of output voltage | $I_O = 5\text{ mA}$, | $T_J = -40^\circ\text{C to }125^\circ\text{C}$ | | -1 | | mV/°C |
| Output noise voltage | $f = 10\text{ Hz to }100\text{ kHz}$ | | | 40 | 200 | μV |
| Dropout voltage | | | | 2 | | V |
| Bias current | | | | 4.5 | 6 | mA |
| Bias current change | $I_O = 200\text{ mA}$, $V_I = 8\text{ V to }25\text{ V}$, $T_J = -40^\circ\text{C to }125^\circ\text{C}$ | | | | 0.8 | mA |
| | $I_O = 5\text{ mA to }350\text{ mA}$, $T_J = -40^\circ\text{C to }125^\circ\text{C}$ | | | | 0.5 | |
| Short-circuit output current | $V_I = 35\text{ V}$ | | | 300 | | mA |
| Peak output current | | | | 0.7 | | A |

(1) All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.

Electrical Characteristics

at specified virtual junction temperature, $V_I = 11\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS ⁽¹⁾ | | μA78M06C | | | UNIT | |
|---|--|--|---|--|-----|-------|----|
| | | | MIN | TYP | MAX | | |
| Output voltage | $I_O = 5\text{ mA to }350\text{ mA}$, | $V_I = 8\text{ V to }21\text{ V}$ | | 5.75 | 6 | 6.25 | V |
| | | | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 5.7 | | 6.3 | |
| Input voltage regulation | $I_O = 200\text{ mA}$ | $V_I = 8\text{ V to }25\text{ V}$ | | 5 | 100 | mV | |
| | | $V_I = 9\text{ V to }25\text{ V}$ | | 1.5 | 50 | | |
| Ripple rejection | $V_I = 8\text{ V to }18\text{ V}$, | $f = 120\text{ Hz}$ | $I_O = 100\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 59 | | | dB |
| | | | $I_O = 300\text{ mA}$ | 59 | 80 | | |
| Output voltage regulation | $I_O = 5\text{ mA to }500\text{ mA}$ | | | 20 | 120 | mV | |
| | $I_O = 5\text{ mA to }200\text{ mA}$ | | | 10 | 60 | | |
| Temperature coefficient of output voltage | $I_O = 5\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | -1 | | mV/°C | |
| Output noise voltage | $f = 10\text{ Hz to }100\text{ kHz}$ | | | 45 | | μV | |
| Dropout voltage | | | | 2 | | V | |
| Bias current | | | | 4.5 | 6 | mA | |
| Bias current change | $V_I = 9\text{ V to }25\text{ V}$, | | $I_O = 200\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 0.8 | mA | |
| | $I_O = 5\text{ mA to }350\text{ mA}$, | | | | 0.5 | | |
| Short-circuit output current | $V_I = 35\text{ V}$ | | | 270 | | mA | |
| Peak output current | | | | 0.7 | | A | |

(1) All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.

Electrical Characteristics

at specified virtual junction temperature, $V_I = 14\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS ⁽¹⁾ | | μA78M08C | | | UNIT | |
|---|---|--|--|-----|-----|-------|---|
| | | | MIN | TYP | MAX | | |
| Output voltage | $V_I = 10.5\text{ V to }23\text{ V}$, | $I_O = 5\text{ mA to }350\text{ mA}$ | | 7.7 | 8 | 8.3 | V |
| | | | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 7.6 | | 8.4 | |
| Input voltage regulation | $I_O = 200\text{ mA}$ | $V_I = 10.5\text{ V to }25\text{ V}$ | | 6 | 100 | mV | |
| | | $V_I = 11\text{ V to }25\text{ V}$ | | 2 | 50 | | |
| Ripple rejection | $V_I = 11\text{ V to }21.5\text{ V}$, $f = 120\text{ Hz}$ | $I_O = 100\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | 56 | dB | |
| | | $I_O = 300\text{ mA}$ | | 56 | 80 | | |
| Output voltage regulation | $I_O = 5\text{ mA to }500\text{ mA}$ | | | 25 | 160 | mV | |
| | $I_O = 5\text{ mA to }200\text{ mA}$ | | | 10 | 80 | | |
| Temperature coefficient of output voltage | $I_O = 5\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | -1 | | mV/°C | |
| Output noise voltage | $f = 10\text{ Hz to }100\text{ kHz}$ | | | 52 | | μV | |
| Dropout voltage | | | | 2 | | V | |
| Bias current | | | | 4.6 | 6 | mA | |
| Bias current change | $V_I = 10.5\text{ V to }25\text{ V}$, | $I_O = 200\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | 0.8 | mA | |
| | $I_O = 5\text{ mA to }350\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | | 0.5 | | |
| Short-circuit output current | $V_I = 35\text{ V}$ | | | 250 | | mA | |
| Peak output current | | | | 0.7 | | A | |

(1) All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.

Electrical Characteristics

at specified virtual junction temperature, $V_I = 16\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS ⁽¹⁾ | | μA78M09C | | | UNIT | |
|---|---|--|--|-----|-----|-------|---|
| | | | MIN | TYP | MAX | | |
| Output voltage | $V_I = 11.5\text{ V to }24\text{ V}$, | $I_O = 5\text{ mA to }350\text{ mA}$ | | 8.6 | 9 | 9.4 | V |
| | | | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 8.5 | | 9.5 | |
| Input voltage regulation | $I_O = 200\text{ mA}$ | $V_I = 11.5\text{ V to }26\text{ V}$ | | 6 | 100 | mV | |
| | | $V_I = 12\text{ V to }26\text{ V}$ | | 2 | 50 | | |
| Ripple rejection | $V_I = 13\text{ V to }23\text{ V}$, $f = 120\text{ Hz}$ | $I_O = 100\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | 56 | dB | |
| | | $I_O = 300\text{ mA}$ | | 56 | 80 | | |
| Output voltage regulation | $I_O = 5\text{ mA to }500\text{ mA}$ | | | 25 | 180 | mV | |
| | $I_O = 5\text{ mA to }200\text{ mA}$ | | | 10 | 90 | | |
| Temperature coefficient of output voltage | $I_O = 5\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | -1 | | mV/°C | |
| Output noise voltage | $f = 10\text{ Hz to }100\text{ kHz}$ | | | 58 | | μV | |
| Dropout voltage | | | | 2 | | V | |
| Bias current | | | | 4.6 | 6 | mA | |
| Bias current change | $V_I = 11.5\text{ V to }26\text{ V}$, | $I_O = 200\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | 0.8 | mA | |
| | $I_O = 5\text{ mA to }350\text{ mA}$, | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | | 0.5 | | |
| Short-circuit output current | $V_I = 35\text{ V}$ | | | 250 | | mA | |
| Peak output current | | | | 0.7 | | A | |

(1) All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.

Electrical Characteristics

at specified virtual junction temperature, $V_I = 17\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS ⁽¹⁾ | | μA78M10C | | | UNIT |
|---|--|--|----------|-----|-------|------|
| | | | MIN | TYP | MAX | |
| Output voltage | $V_I = 12.5\text{ V to }25\text{ V}$, $I_O = 5\text{ mA to }350\text{ mA}$ | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 9.6 | 10 | 10.4 | V |
| | | | 9.5 | | 10.5 | |
| Input voltage regulation | $I_O = 200\text{ mA}$ | $V_I = 12.5\text{ V to }28\text{ V}$ | 7 | 100 | mV | |
| | | $V_I = 14\text{ V to }28\text{ V}$ | 2 | 50 | | |
| Ripple rejection | $V_I = 15\text{ V to }25\text{ V}$, $f = 120\text{ Hz}$ | $I_O = 100\text{ mA}$, $I_O = 300\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 59 | | dB | |
| | | | 55 | 80 | | |
| Output voltage regulation | $I_O = 5\text{ mA to }500\text{ mA}$ | | 25 | 200 | mV | |
| | $I_O = 5\text{ mA to }200\text{ mA}$ | | 10 | 100 | | |
| Temperature coefficient of output voltage | $I_O = 5\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | -1 | | mV/°C | |
| Output noise voltage | $f = 10\text{ Hz to }100\text{ kHz}$ | | 64 | | μV | |
| Dropout voltage | | | 2 | | V | |
| Bias current | | | 4.7 | 6 | mA | |
| Bias current change | $V_I = 12.5\text{ V to }28\text{ V}$, $I_O = 5\text{ mA to }350\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | $I_O = 200\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | 0.8 | mA | |
| | | | | 0.5 | | |
| Short-circuit output current | $V_I = 35\text{ V}$ | | 245 | | mA | |
| Peak output current | | | 0.7 | | A | |

(1) All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.

Electrical Characteristics

at specified virtual junction temperature, $V_I = 19\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS ⁽¹⁾ | | μA78M12C | | | UNIT |
|---|--|--|----------|-----|-------|------|
| | | | MIN | TYP | MAX | |
| Output voltage | $V_I = 14.5\text{ V to }27\text{ V}$, $I_O = 5\text{ mA to }350\text{ mA}$ | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 11.5 | 12 | 12.5 | V |
| | | | 11.4 | | 12.6 | |
| Input voltage regulation | $I_O = 200\text{ mA}$ | $V_I = 14.5\text{ V to }30\text{ V}$ | 8 | 100 | mV | |
| | | $V_I = 16\text{ V to }30\text{ V}$ | 2 | 50 | | |
| Ripple rejection | $V_I = 15\text{ V to }25\text{ V}$, $f = 120\text{ Hz}$ | $I_O = 100\text{ mA}$, $I_O = 300\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 55 | | dB | |
| | | | 55 | 80 | | |
| Output voltage regulation | $I_O = 5\text{ mA to }500\text{ mA}$ | | 25 | 240 | mV | |
| | $I_O = 5\text{ mA to }200\text{ mA}$ | | 10 | 120 | | |
| Temperature coefficient of output voltage | $I_O = 5\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | -1 | | mV/°C | |
| Output noise voltage | $f = 10\text{ Hz to }100\text{ kHz}$ | | 75 | | μV | |
| Dropout voltage | | | 2 | | V | |
| Bias current | | | 4.8 | 6 | mA | |
| Bias current change | $V_I = 14.5\text{ V to }30\text{ V}$, $I_O = 5\text{ mA to }350\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | $I_O = 200\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | 0.8 | mA | |
| | | | | 0.5 | | |
| Short-circuit output current | $V_I = 35\text{ V}$ | | 240 | | mA | |
| Peak output current | | | 0.7 | | A | |

(1) All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.

The μA78M15 is obsolete and no longer supplied.

Electrical Characteristics

at specified virtual junction temperature, $V_I = 23\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS ⁽¹⁾ | | μA78M15C | | | UNIT |
|---|--|---|----------|-----|-------|-------|
| | | | MIN | TYP | MAX | |
| Output voltage | $V_I = 17.5\text{ V to }30\text{ V}$, $I_O = 5\text{ mA to }350\text{ mA}$ | $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 14.4 | 15 | 15.6 | V |
| | | | 14.25 | | 15.75 | |
| Input voltage regulation | $I_O = 200\text{ mA}$ | $V_I = 17.5\text{ V to }30\text{ V}$ | | 10 | 100 | mV |
| | | $V_I = 20\text{ V to }30\text{ V}$ | | 3 | 50 | |
| Ripple rejection | $V_I = 18.5\text{ V to }28.5\text{ V}$, $f = 120\text{ Hz}$ | $I_O = 100\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | 54 | | | dB |
| | | $I_O = 300\text{ mA}$ | 54 | 70 | | |
| Output voltage regulation | $I_O = 5\text{ mA to }500\text{ mA}$ | | | 25 | 300 | mV |
| | $I_O = 5\text{ mA to }200\text{ mA}$ | | | 10 | 150 | |
| Temperature coefficient of output voltage | $I_O = 5\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | | –1 | | mV/°C |
| Output noise voltage | $f = 10\text{ Hz to }100\text{ kHz}$ | | | 90 | | μV |
| Dropout voltage | | | | 2 | | V |
| Bias current | | | | 4.8 | 6 | mA |
| Bias current change | $V_I = 17.5\text{ V to }30\text{ V}$, $I_O = 5\text{ mA to }350\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | $I_O = 200\text{ mA}$, $T_J = 0^\circ\text{C to }125^\circ\text{C}$ | | | 0.8 | mA |
| | | | | | 0.5 | |
| Short-circuit output current | $V_I = 35\text{ V}$ | | | 240 | | mA |
| Peak output current | | | | 0.7 | | A |

(1) All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| UA78M05CDCY | ACTIVE | SOT-223 | DCY | 4 | 80 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M05CDCYG3 | ACTIVE | SOT-223 | DCY | 4 | 80 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M05CDCYR | ACTIVE | SOT-223 | DCY | 4 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M05CDCYRG3 | ACTIVE | SOT-223 | DCY | 4 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M05CKC | NRND | TO-220 | KC | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M05CKCS | ACTIVE | TO-220 | KCS | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M05CKCSE3 | ACTIVE | TO-220 | KCS | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M05CKTPR | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M05CKTPRG3 | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M05CKVURG3 | ACTIVE | PFM | KVU | 3 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-3-260C-168 HR |
| UA78M05IDCY | ACTIVE | SOT-223 | DCY | 4 | 80 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M05IDCYG3 | ACTIVE | SOT-223 | DCY | 4 | 80 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M05IDCYR | ACTIVE | SOT-223 | DCY | 4 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M05IDCYRG3 | ACTIVE | SOT-223 | DCY | 4 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M05IKC | NRND | TO-220 | KC | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M05IKCE3 | NRND | TO-220 | KC | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M05IKCS | ACTIVE | TO-220 | KCS | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M05IKCSE3 | ACTIVE | TO-220 | KCS | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M05IKTPR | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M05IKTPRG3 | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M05IKVURG3 | ACTIVE | PFM | KVU | 3 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-3-260C-168 HR |
| UA78M06CKC | OBSOLETE | TO-220 | KC | 3 | | TBD | Call TI | Call TI |
| UA78M06CKTPR | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M06CKTPRG3 | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M06CKVURG3 | ACTIVE | PFM | KVU | 3 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-3-260C-168 HR |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| UA78M08CDCY | ACTIVE | SOT-223 | DCY | 4 | 80 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M08CDCYG3 | ACTIVE | SOT-223 | DCY | 4 | 80 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M08CDCYR | ACTIVE | SOT-223 | DCY | 4 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M08CDCYRG3 | ACTIVE | SOT-223 | DCY | 4 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M08CKC | NRND | TO-220 | KC | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M08CKCE3 | NRND | TO-220 | KC | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M08CKCS | ACTIVE | TO-220 | KCS | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M08CKCSE3 | ACTIVE | TO-220 | KCS | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M08CKTPR | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M08CKTPRG3 | NRND | PFM | KTP | 2 | 3000 | TBD | Call TI | Call TI |
| UA78M08CKVURG3 | ACTIVE | PFM | KVU | 3 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-3-260C-168 HR |
| UA78M09CKC | OBSOLETE | TO-220 | KC | 3 | | TBD | Call TI | Call TI |
| UA78M09CKTP | OBSOLETE | PFM | KTP | 2 | | TBD | Call TI | Call TI |
| UA78M09CKTPR | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M09CKTPRG3 | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M09CKVURG3 | ACTIVE | PFM | KVU | 3 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-3-260C-168 HR |
| UA78M10CKC | OBSOLETE | TO-220 | KC | 3 | | TBD | Call TI | Call TI |
| UA78M10CKTPR | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M10CKTPRG3 | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M10CKVURG3 | ACTIVE | PFM | KVU | 3 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-3-260C-168 HR |
| UA78M12CKC | NRND | TO-220 | KC | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M12CKCS | ACTIVE | TO-220 | KCS | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M12CKCSE3 | ACTIVE | TO-220 | KCS | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M12CKTPR | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M12CKTPRG3 | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M12CKVURG3 | ACTIVE | PFM | KVU | 3 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-3-260C-168 HR |
| UA78M33CDCY | ACTIVE | SOT-223 | DCY | 4 | 80 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M33CDCYG3 | ACTIVE | SOT-223 | DCY | 4 | 80 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| | | | | | | no Sb/Br) | | |
| UA78M33CDCYR | ACTIVE | SOT-223 | DCY | 4 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M33CDCYRG3 | ACTIVE | SOT-223 | DCY | 4 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78M33CKC | NRND | TO-220 | KC | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M33CKCE3 | NRND | TO-220 | KC | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M33CKCS | ACTIVE | TO-220 | KCS | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M33CKCSE3 | ACTIVE | TO-220 | KCS | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78M33CKTPR | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M33CKTPRG3 | NRND | PFM | KTP | 2 | 3000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM |
| UA78M33CKVURG3 | ACTIVE | PFM | KVU | 3 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-3-260C-168 HR |

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSELETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

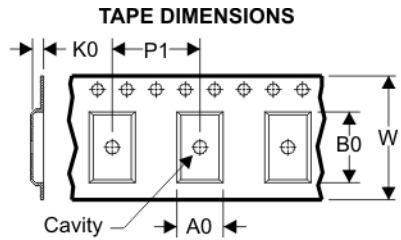
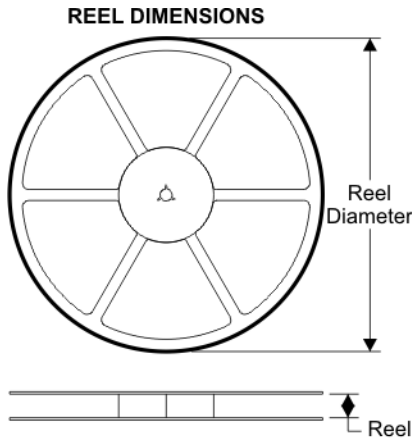
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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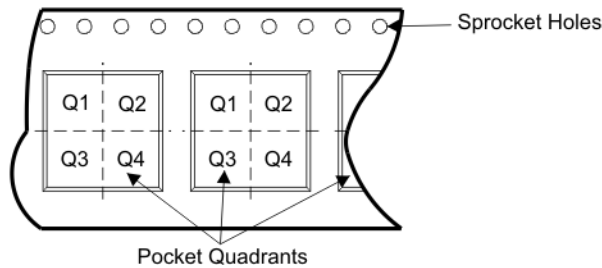
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TAPE AND REEL BOX INFORMATION



| | |
|----|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



| Device | Package | Pins | Site | Reel Diameter (mm) | Reel Width (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|----------------|---------|------|---------|--------------------|-----------------|---------|---------|---------|---------|--------|---------------|
| UA78M05CKVURG3 | KVU | 3 | SITE 45 | 330 | 16 | 6.9 | 10.5 | 2.7 | 8 | 16 | Q2 |
| UA78M051KVURG3 | KVU | 3 | SITE 45 | 330 | 16 | 6.9 | 10.5 | 2.7 | 8 | 16 | Q2 |
| UA78M06CKVURG3 | KVU | 3 | SITE 45 | 330 | 16 | 6.9 | 10.5 | 2.7 | 8 | 16 | Q2 |
| UA78M08CKVURG3 | KVU | 3 | SITE 45 | 330 | 16 | 6.9 | 10.5 | 2.7 | 8 | 16 | Q2 |
| UA78M09CKVURG3 | KVU | 3 | SITE 45 | 330 | 16 | 6.9 | 10.5 | 2.7 | 8 | 16 | Q2 |
| UA78M10CKVURG3 | KVU | 3 | SITE 45 | 330 | 16 | 6.9 | 10.5 | 2.7 | 8 | 16 | Q2 |
| UA78M12CKVURG3 | KVU | 3 | SITE 45 | 330 | 16 | 6.9 | 10.5 | 2.7 | 8 | 16 | Q2 |
| UA78M33CKVURG3 | KVU | 3 | SITE 45 | 330 | 16 | 6.9 | 10.5 | 2.7 | 8 | 16 | Q2 |

TAPE AND REEL BOX DIMENSIONS



| Device | Package | Pins | Site | Length (mm) | Width (mm) | Height (mm) |
|----------------|---------|------|---------|-------------|------------|-------------|
| UA78M05CKVURG3 | KVU | 3 | SITE 45 | 340.0 | 340.0 | 38.0 |
| UA78M05IKVURG3 | KVU | 3 | SITE 45 | 340.0 | 340.0 | 38.0 |
| UA78M06CKVURG3 | KVU | 3 | SITE 45 | 340.0 | 340.0 | 38.0 |
| UA78M08CKVURG3 | KVU | 3 | SITE 45 | 340.0 | 340.0 | 38.0 |
| UA78M09CKVURG3 | KVU | 3 | SITE 45 | 340.0 | 340.0 | 38.0 |
| UA78M10CKVURG3 | KVU | 3 | SITE 45 | 340.0 | 340.0 | 38.0 |
| UA78M12CKVURG3 | KVU | 3 | SITE 45 | 340.0 | 340.0 | 38.0 |
| UA78M33CKVURG3 | KVU | 3 | SITE 45 | 340.0 | 340.0 | 38.0 |

DCY (R-PDSO-G4)

PLASTIC SMALL-OUTLINE



- NOTES: A. All linear dimensions are in millimeters (inches).
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion.
 D. Falls within JEDEC TO-261 Variation AA.

KTP (R-PSFM-G2)

PowerFLEX™ PLASTIC FLANGE-MOUNT PACKAGE



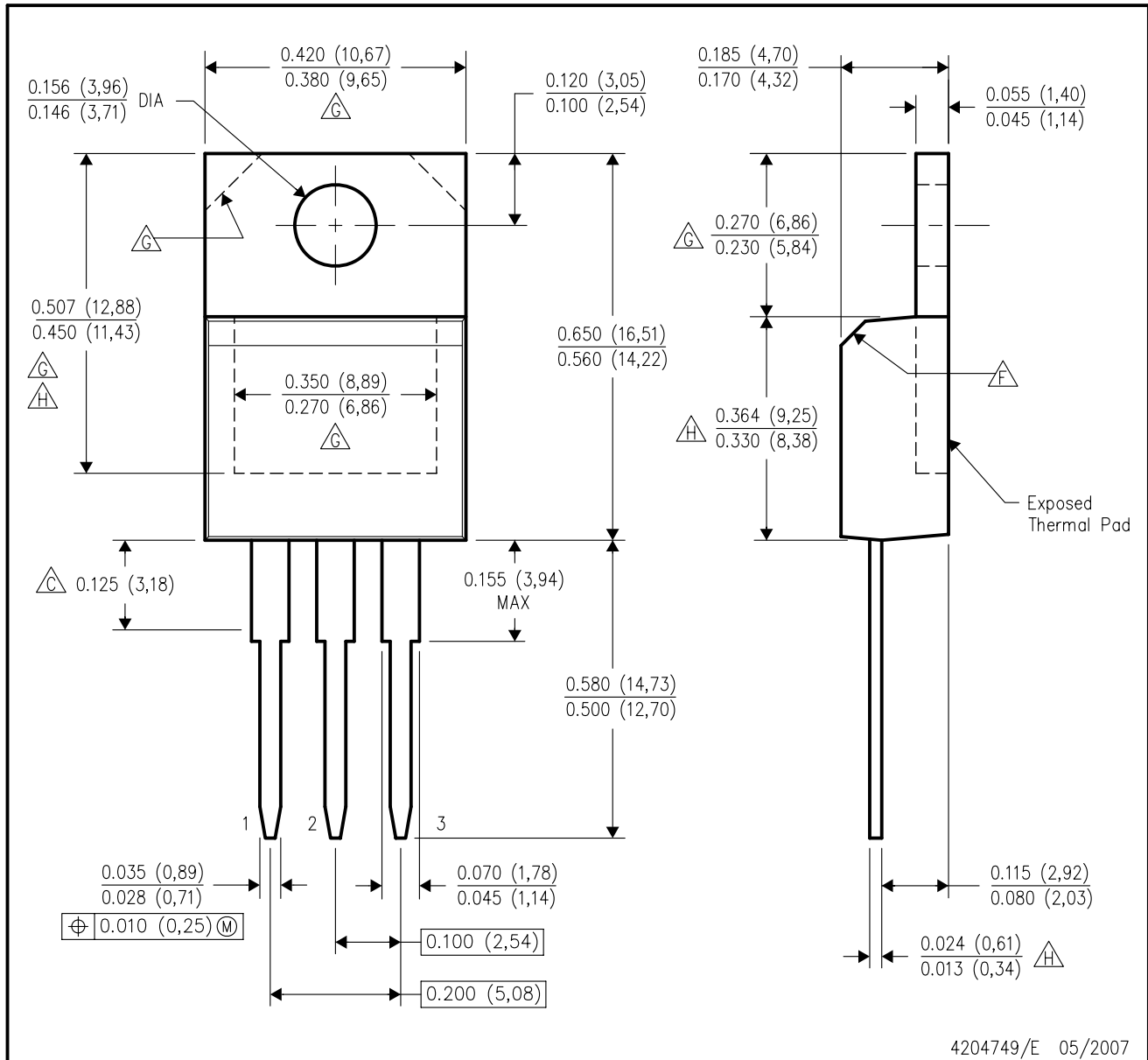
- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. The center lead is in electrical contact with the thermal tab.
 D. Dimensions do not include mold protrusions, not to exceed 0.006 (0,15).
 E. Falls within JEDEC TO-252 variation AC.

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KCS (R-PSFM-T3)

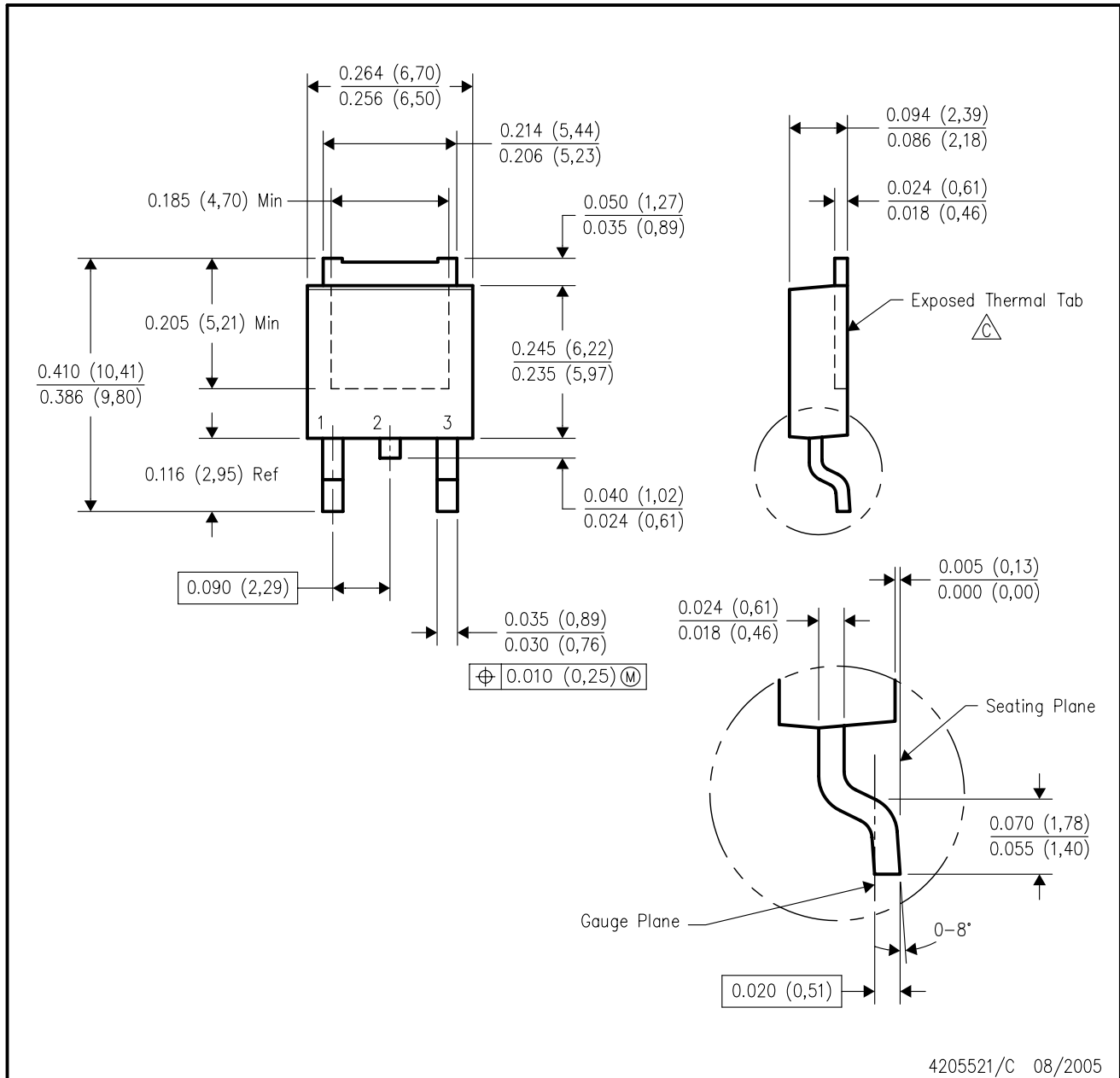
PLASTIC FLANGE-MOUNT PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Lead dimensions are not controlled within this area.
 - D. All lead dimensions apply before solder dip.
 - E. The center lead is in electrical contact with the mounting tab.
 - $\triangle F$ The chamfer is optional.
 - $\triangle G$ Thermal pad contour optional within these dimensions.
 - $\triangle H$ Falls within JEDEC TO-220 variation AB, except minimum lead thickness, minimum exposed pad length, and maximum body length.

KVU (R-PSFM-G3)

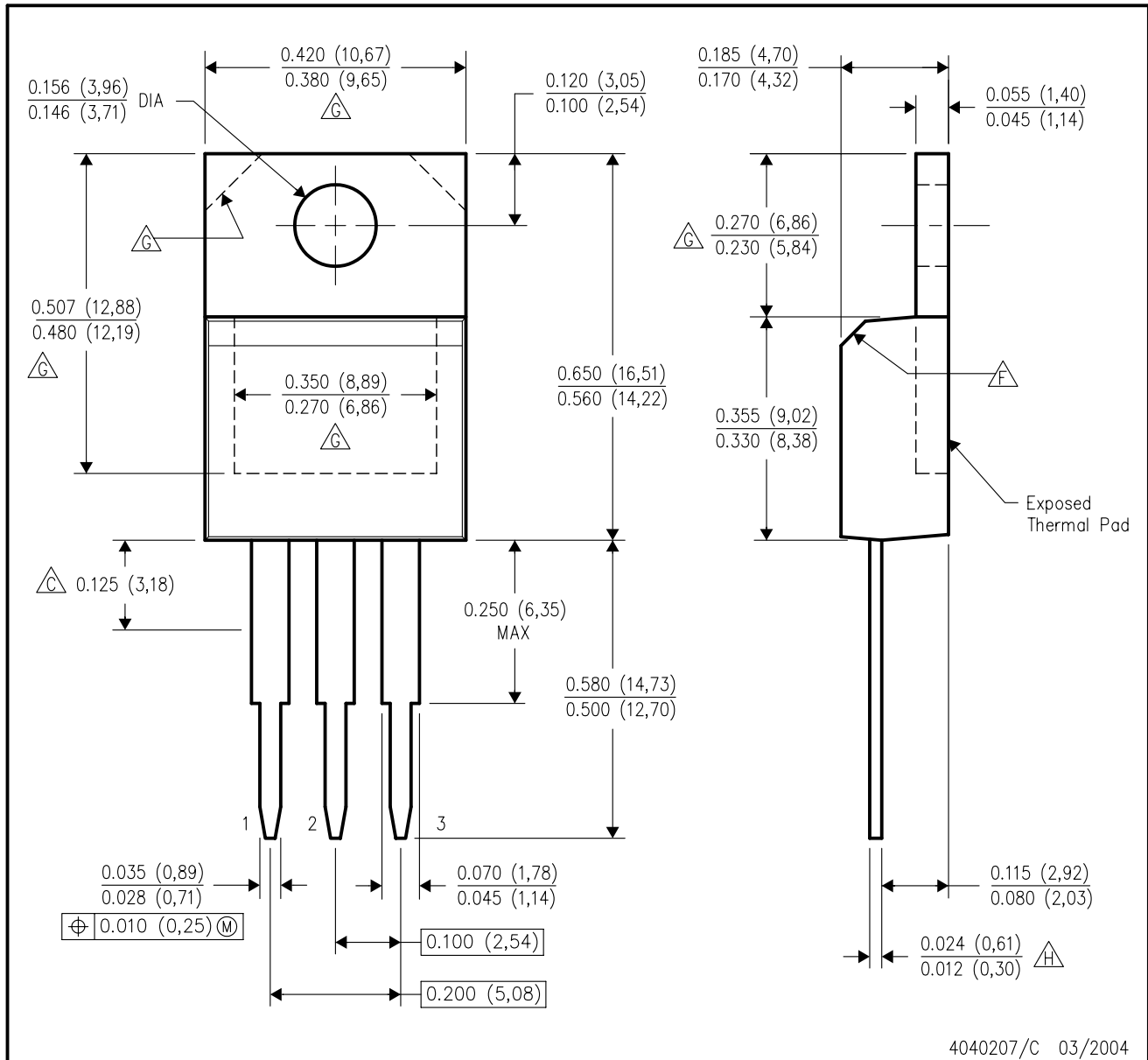
PLASTIC FLANGE-MOUNT PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ The center lead is in electrical contact with the exposed thermal tab.
 - D. Body Dimensions do not include mold flash or protrusions. Mold flash and protrusion shall not exceed 0.006 (0,15) per side.
 - E. Falls within JEDEC TO-252 variation AA.

KC (R-PSFM-T3)

PLASTIC FLANGE-MOUNT PACKAGE



4040207/C 03/2004

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