

TL-SCSI285 FIXED-VOLTAGE REGULATORS FOR SCSI ACTIVE TERMINATION

SLVS065F – NOVEMBER 1991 – REVISED JULY 1999

- Fully Matches Parameters for SCSI Alternative 2 Active Termination
- Fixed 2.85-V Output
- $\pm 1\%$ Maximum Output Tolerance at $T_J = 25^\circ\text{C}$
- 0.7-V Maximum Dropout Voltage
- 620-mA Output Current
- $\pm 2\%$ Absolute Output Variation
- Internal Overcurrent-Limiting Circuitry
- Internal Thermal-Overload Protection
- Internal Overvoltage Protection

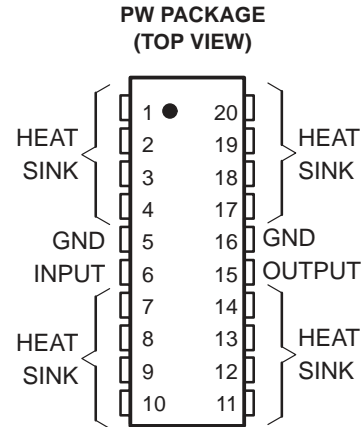
description

The TL-SCSI285 is a low-dropout (0.7-V) fixed-voltage regulator specifically designed for small computer systems interface (SCSI) alternative 2 active signal termination. The TL-SCSI285 0.7-V maximum dropout ensures compatibility with existing SCSI systems, while providing a wide TERMPWR voltage range. At the same time, the $\pm 1\%$ initial tolerance on its 2.85-V output voltage ensures a tighter line-driver current tolerance, thereby increasing the system noise margin.

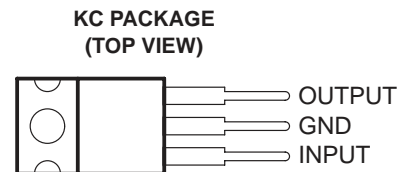
The fixed 2.85-V output voltage of the TL-SCSI285 supports the SCSI alternative 2 termination standard, while reducing system power consumption. The 0.7-V maximum dropout voltage brings increased TERMPWR isolation, making the device ideal for battery-powered systems. The TL-SCSI285, with internal current limiting, overvoltage protection, ESD protection, and thermal protection, offers designers enhanced system protection and reliability.

When configured as a SCSI active terminator, the TL-SCSI285 low-dropout regulator eliminates the 220- Ω and the 330- Ω resistors required for each transmission line with a passive termination scheme, reducing significantly the continuous system power drain. When placed in series with 110- Ω resistors, the device matches the impedance level of the transmission cable and eliminates reflections.

The TL-SCSI285 is characterized for operation over the virtual junction temperature range of 0°C to 125°C.



HEAT SINK – These terminals have an internal resistive connection to ground and should be grounded or electrically isolated.



The GND terminal is in electrical contact with the mounting base.

AVAILABLE OPTIONS

| T_J | PACKAGED DEVICES | | CHIP FORM (Y) |
|--------------|--------------------|--------------------|---------------|
| | PLASTIC POWER (KC) | SURFACE MOUNT (PW) | |
| 0°C to 125°C | TL-SCSI285KC | TL-SCSI285PWR | TL-SCSI285Y |

The PW package is only available taped and reeled. Chip forms are tested at 25°C.



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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TL-SCSI285 FIXED-VOLTAGE REGULATORS FOR SCSI ACTIVE TERMINATION

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absolute maximum ratings over operating virtual junction temperature range (unless otherwise noted)†

| | |
|--|----------------|
| Continuous input voltage, V_I | 7.5 V |
| Operating virtual junction temperature range, T_J | -55°C to 150°C |
| Package thermal impedance, θ_{JA} (see Notes 1 and 2): KC package | 22°C/W |
| PW package | 83°C/W |
| Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: KC or PW package | 260°C |
| Storage temperature range, T_{stg} | -65°C to 150°C |

† 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.

- NOTES: 1. Maximum power dissipation is a function of $T_{J(max)}$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_{J(max)} - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can impact reliability. Due to variations in individual device electrical characteristics and thermal resistance, the built-in thermal overload protection may be activated at power levels slightly above or below the rated dissipation.
2. The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.

recommended operating conditions

| | | TL-SCSI285 | | UNIT |
|---|---|------------|-----|------|
| | | MIN | MAX | |
| Input voltage, V_I | $T_J = 25^\circ\text{C}$ | | | V |
| Input voltage, V_I | $T_J = 0^\circ\text{C to } 125^\circ\text{C}$ | 3.55 | 5.5 | V |
| Output current, I_O | KC package | 0 | 620 | mA |
| | PW package | 0 | 500 | |
| Operating virtual junction temperature range, T_J | | 0 | 125 | °C |

electrical characteristics, $V_I = 4.5\text{ V}$, $I_O = 500\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS‡ | TL-SCSI285KC | | | UNIT |
|----------------------|---|--------------|------|------|------|
| | | MIN | TYP | MAX | |
| Output voltage | $I_O = 20\text{ mA to } 500\text{ mA}$, $V_I = 3.55\text{ V to } 5.5\text{ V}$, $T_J = 25^\circ\text{C}$ | 2.82 | 2.85 | 2.88 | V |
| | $I_O = 500\text{ mA to } 620\text{ mA}$, $V_I = 3.65\text{ V to } 5.5\text{ V}$, $T_J = 0\text{ to } 125^\circ\text{C}$ | 2.79 | | 2.91 | |
| Input regulation | $V_I = 3.55\text{ V to } 5.5\text{ V}$ | | 5 | 15 | mV |
| Ripple rejection | $f = 120\text{ Hz}$, $V_{\text{ripple}} = 1\text{ V}_O(\text{PP})$ | | -62 | | dB |
| Output regulation | $I_O = 20\text{ mA to } 620\text{ mA}$ | | 5 | 30 | mV |
| | $I_O = 20\text{ mA to } 500\text{ mA}$ | | 5 | 30 | |
| Output noise voltage | $f = 10\text{ Hz to } 100\text{ kHz}$ | | 500 | | µV |
| Dropout voltage | $I_O = 500\text{ mA}$ | | | 0.7 | V |
| | $I_O = 620\text{ mA}$ | | | 0.8 | |
| Bias current | $I_O = 0$ | | 2 | 5 | mA |
| | $I_O = 27\text{ mA}$, equivalent 1 line asserted | | 3 | 6 | |
| | $I_O = 500\text{ mA}$, equivalent 18 lines asserted (8-bit) | | 26 | 49 | |
| | $I_O = 620\text{ mA}$ | | 37 | 62 | |

‡ Pulse-testing techniques are used to maintain the virtual junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1-µF capacitor across the input and a 22.0-µF tantalum capacitor with equivalent series resistance of 1.5 Ω on the output.



electrical characteristics, $V_I = 4.5\text{ V}$, $I_O = 500\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONST | TL-SCSI285PW | | | UNIT | |
|----------------------|---|---------------------------------------|------|------|---------------|---|
| | | MIN | TYP | MAX | | |
| Output voltage | $I_O = 20\text{ mA to }500\text{ mA}$, $V_I = 3.55\text{ V to }5.5\text{ V}$ | $T_J = 25^\circ\text{C}$ | 2.82 | 2.85 | 2.88 | V |
| | | $T_J = 0\text{ to }125^\circ\text{C}$ | 2.79 | | 2.91 | |
| Input regulation | $V_I = 3.55\text{ V to }5.5\text{ V}$ | | 5 | 15 | mV | |
| Ripple rejection | $f = 120\text{ Hz}$, $V_{\text{ripple}} = 1\text{ V}_{O(\text{PP})}$ | | -62 | | dB | |
| Output regulation | $I_O = 20\text{ mA to }500\text{ mA}$ | | 5 | 30 | mV | |
| Output noise voltage | $f = 10\text{ Hz to }100\text{ kHz}$ | | 500 | | μV | |
| Dropout voltage | $I_O = 500\text{ mA}$ | | | 0.7 | V | |
| Bias current | $I_O = 0$ | | 2 | 5 | mA | |
| | $I_O = 27\text{ mA}$, equivalent 1 line asserted | | 3 | 6 | | |
| | $I_O = 500\text{ mA}$, equivalent 18 lines asserted (8-bit) | | 26 | 49 | | |

† Pulse-testing techniques are used to maintain the virtual junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1- μF capacitor across the input and a 22.0- μF tantalum capacitor with equivalent series resistance of 1.5 Ω on the output.

electrical characteristics, $V_I = 4.5\text{ V}$, $I_O = 500\text{ mA}$, $T_J = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONST | TL-SCSI285Y | | | UNIT |
|----------------------|---|-------------|------|-----|---------------|
| | | MIN | TYP | MAX | |
| Output voltage | $I_O = 20\text{ mA to }500\text{ mA}$, $V_I = 3.55\text{ V to }5.5\text{ V}$ | | 2.85 | | V |
| Input regulation | $V_I = 3.55\text{ V to }5.5\text{ V}$ | | 5 | | mV |
| Ripple rejection | $f = 120\text{ Hz}$, $V_{\text{ripple}} = 1\text{ V}_{O(\text{PP})}$ | | -62 | | dB |
| Output regulation | $I_O = 20\text{ mA to }620\text{ mA}$ | | 5 | | mV |
| | $I_O = 20\text{ mA to }500\text{ mA}$ | | 5 | | |
| Output noise voltage | $f = 10\text{ Hz to }100\text{ kHz}$ | | 500 | | μV |
| Bias current | $I_O = 0$ | | 2 | | mA |
| | $I_O = 27\text{ mA}$, equivalent 1 line asserted | | 3 | | |
| | $I_O = 500\text{ mA}$, equivalent 18 lines asserted (8-bit) | | 26 | | |
| | $I_O = 620\text{ mA}$ | | 37 | | |

† Pulse-testing techniques are used to maintain the virtual junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1- μF capacitor across the input and a 22.0- μF tantalum capacitor with equivalent series resistance of 1.5 Ω on the output.

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FOR SCSI ACTIVE TERMINATION**

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APPLICATION INFORMATION

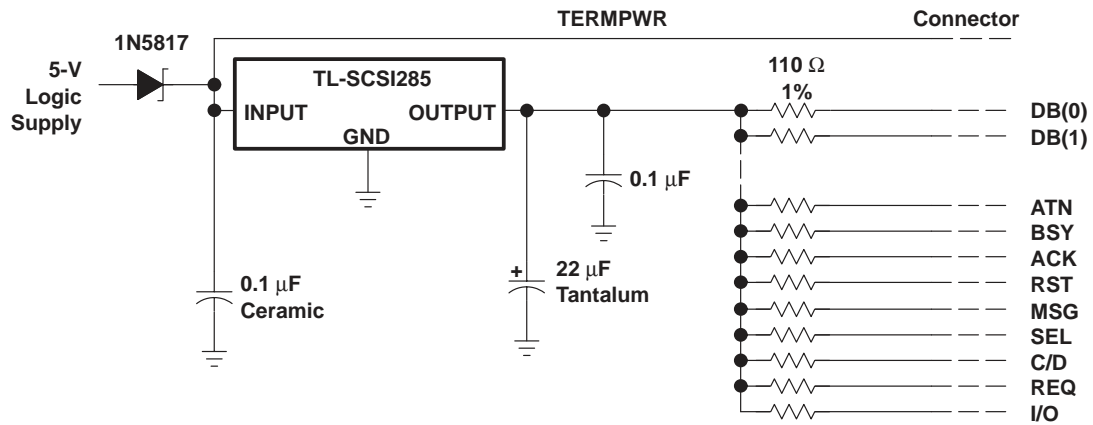
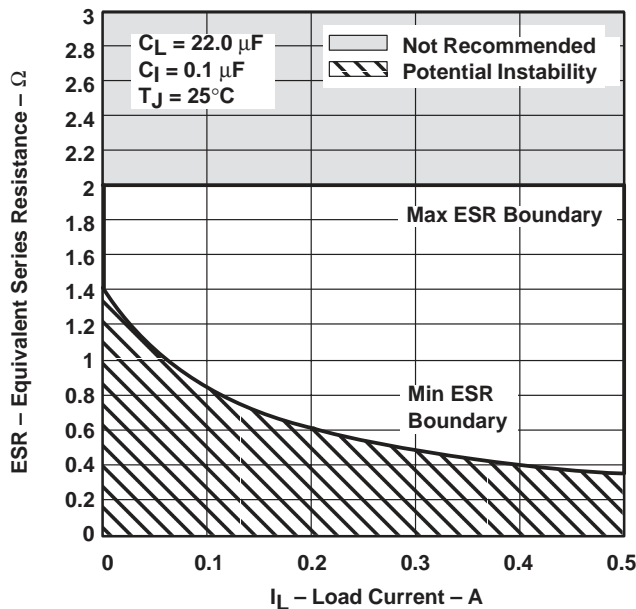


Figure 1. Typical Application Schematic

COMPENSATION CAPACITOR SELECTION INFORMATION

The TL-SCSI285 is a low-dropout regulator. This means that the capacitance loading is important to the performance of the regulator because it is a vital part of the control loop. The capacitor value and the equivalent series resistance (ESR) both affect the control loop and must be defined for the load range and the temperature range. Figures 2 and 3 can be used to establish the capacitance value and ESR range for best regulator performance.

**ESR OF OUTPUT CAPACITOR
vs
LOAD CURRENT**



**STABILITY
vs
ESR**

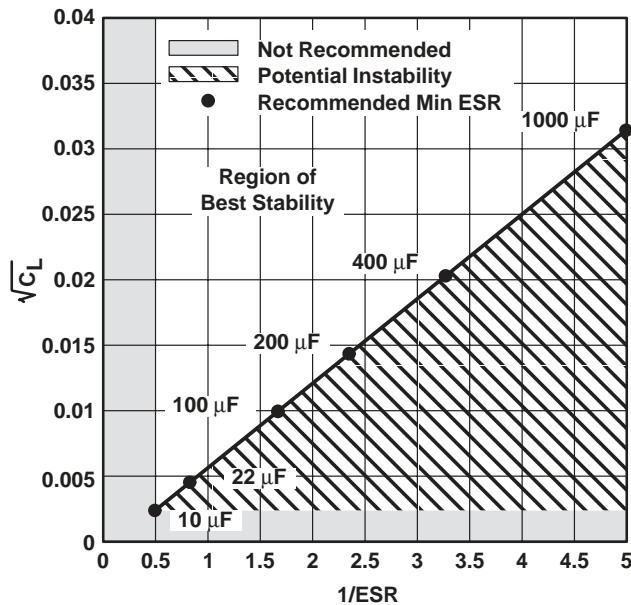


Figure 3

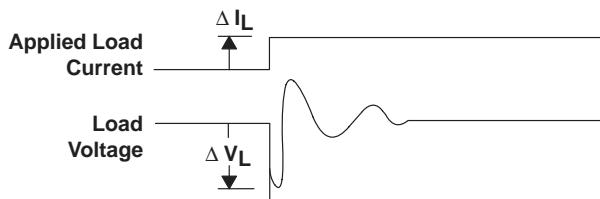


Figure 2

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/ Ball Finish | MSL Peak Temp ⁽³⁾ | Samples (Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|----------------------|------------------------------|--|
| TL-SCSI285KC | OBSOLETE | TO-220 | KC | 3 | | TBD | Call TI | Call TI | Samples Not Available |
| TL-SCSI285KCE3 | OBSOLETE | TO-220 | KC | 3 | | TBD | Call TI | Call TI | Samples Not Available |
| TL-SCSI285KCSE3 | ACTIVE | TO-220 | KCS | 3 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type | Request Free Samples |
| TL-SCSI285PWR | ACTIVE | TSSOP | PW | 20 | 2000 | Green (RoHS & no Sb/Br) | Call TI | Level-1-260C-UNLIM | Contact TI Distributor or Sales Office |
| TL-SCSI285PWRE4 | ACTIVE | TSSOP | PW | 20 | 2000 | Green (RoHS & no Sb/Br) | Call TI | Level-1-260C-UNLIM | Contact TI Distributor or Sales Office |
| TL-SCSI285PWRG4 | ACTIVE | TSSOP | PW | 20 | 2000 | Green (RoHS & no Sb/Br) | Call TI | Level-1-260C-UNLIM | Contact TI Distributor or Sales Office |

⁽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.

OBSOLETE: 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.

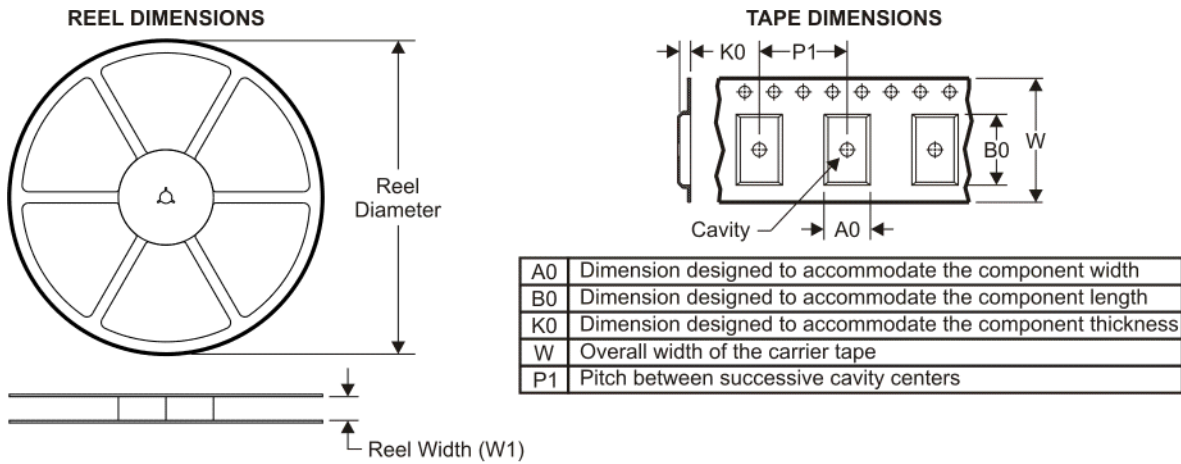
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

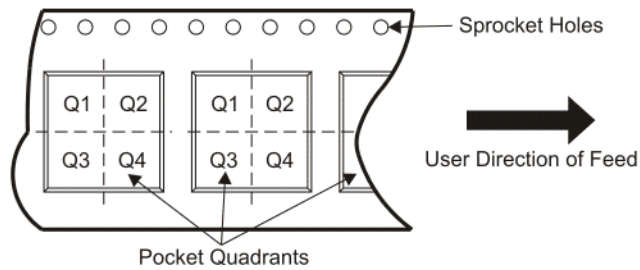
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TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TL-SCSI285PWR | TSSOP | PW | 20 | 2000 | 330.0 | 16.4 | 6.95 | 7.1 | 1.6 | 8.0 | 16.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS

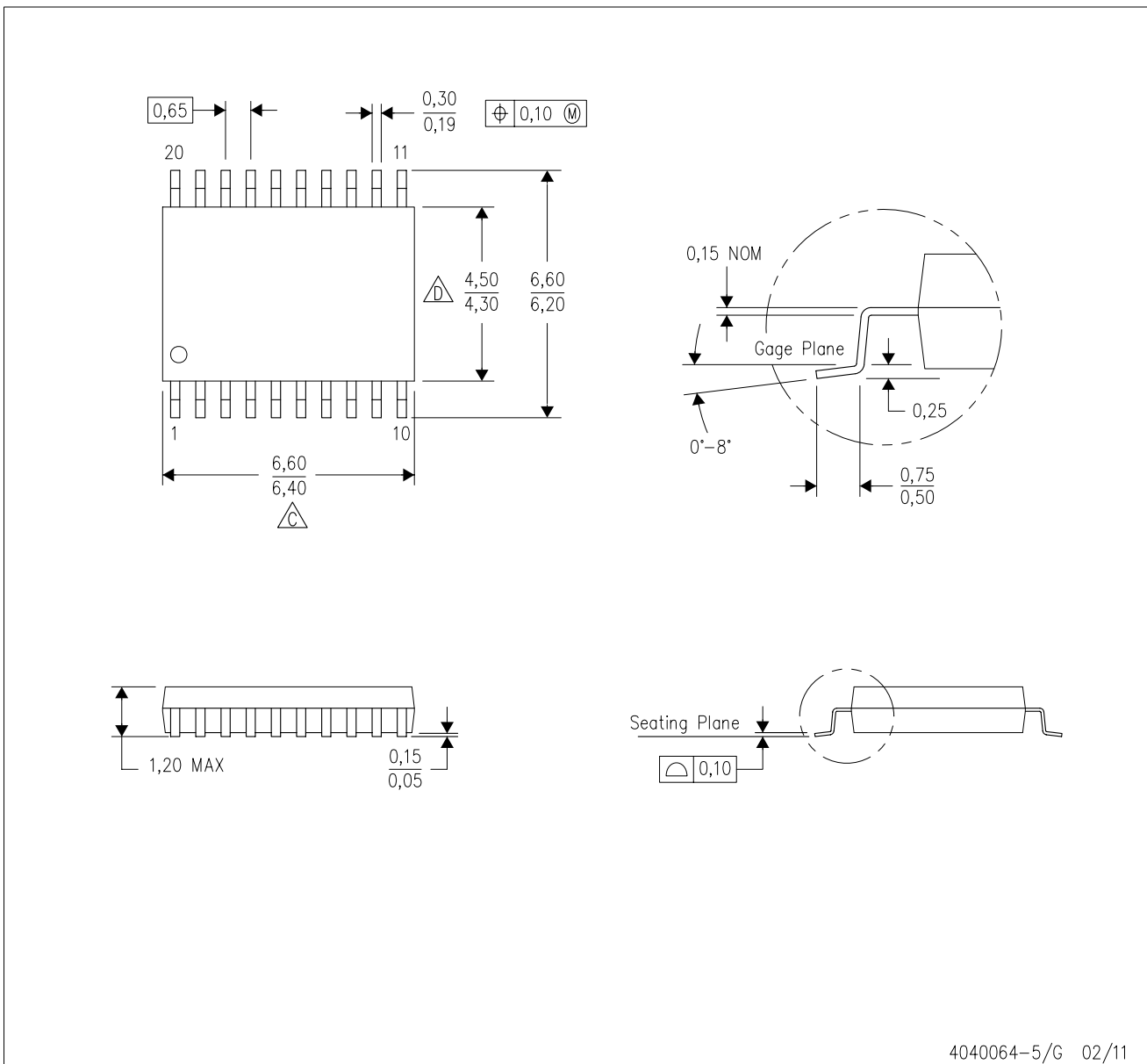


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TL-SCSI285PWR | TSSOP | PW | 20 | 2000 | 346.0 | 346.0 | 33.0 |

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE

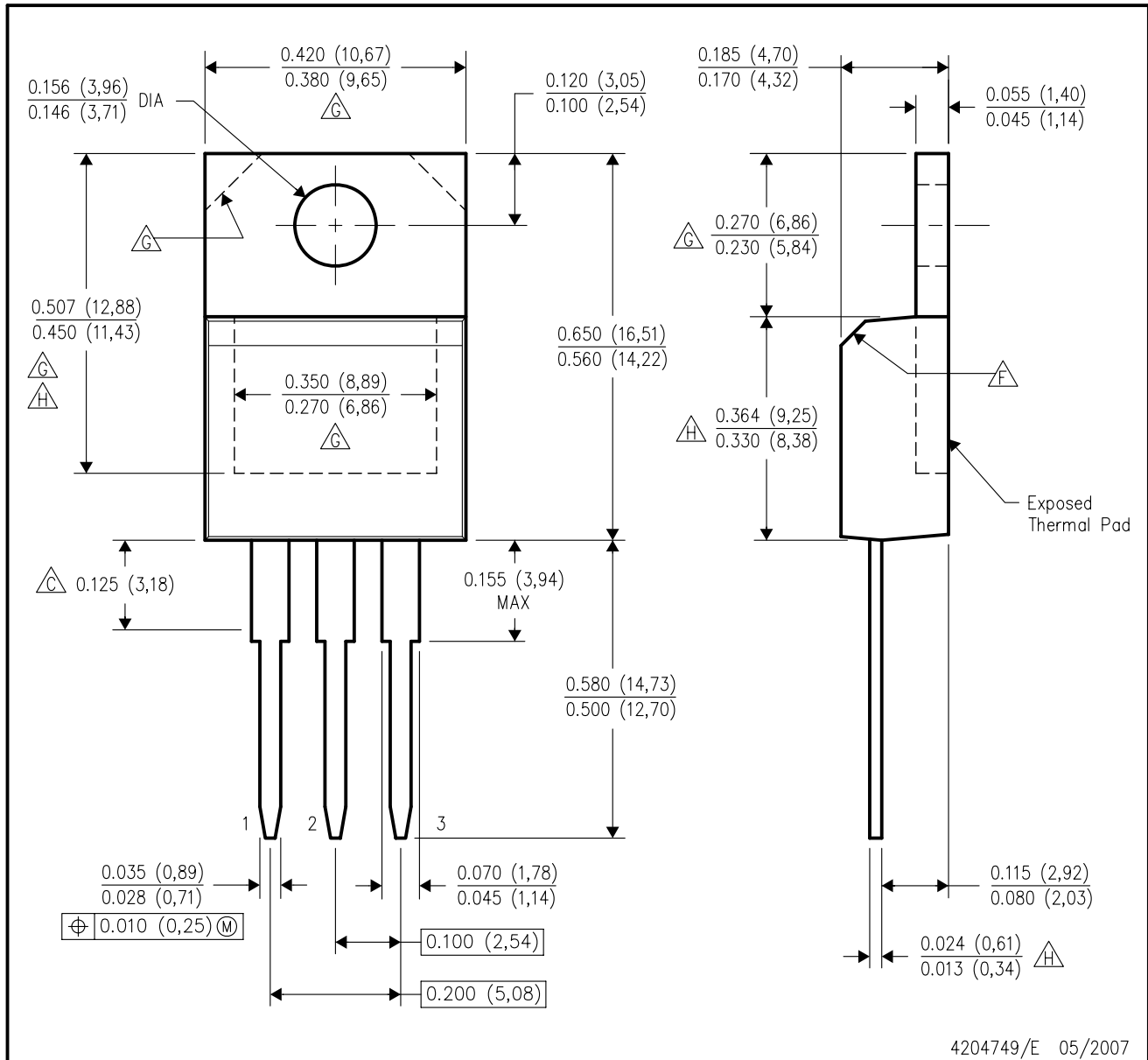


4040064-5/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

KCS (R-PSFM-T3)

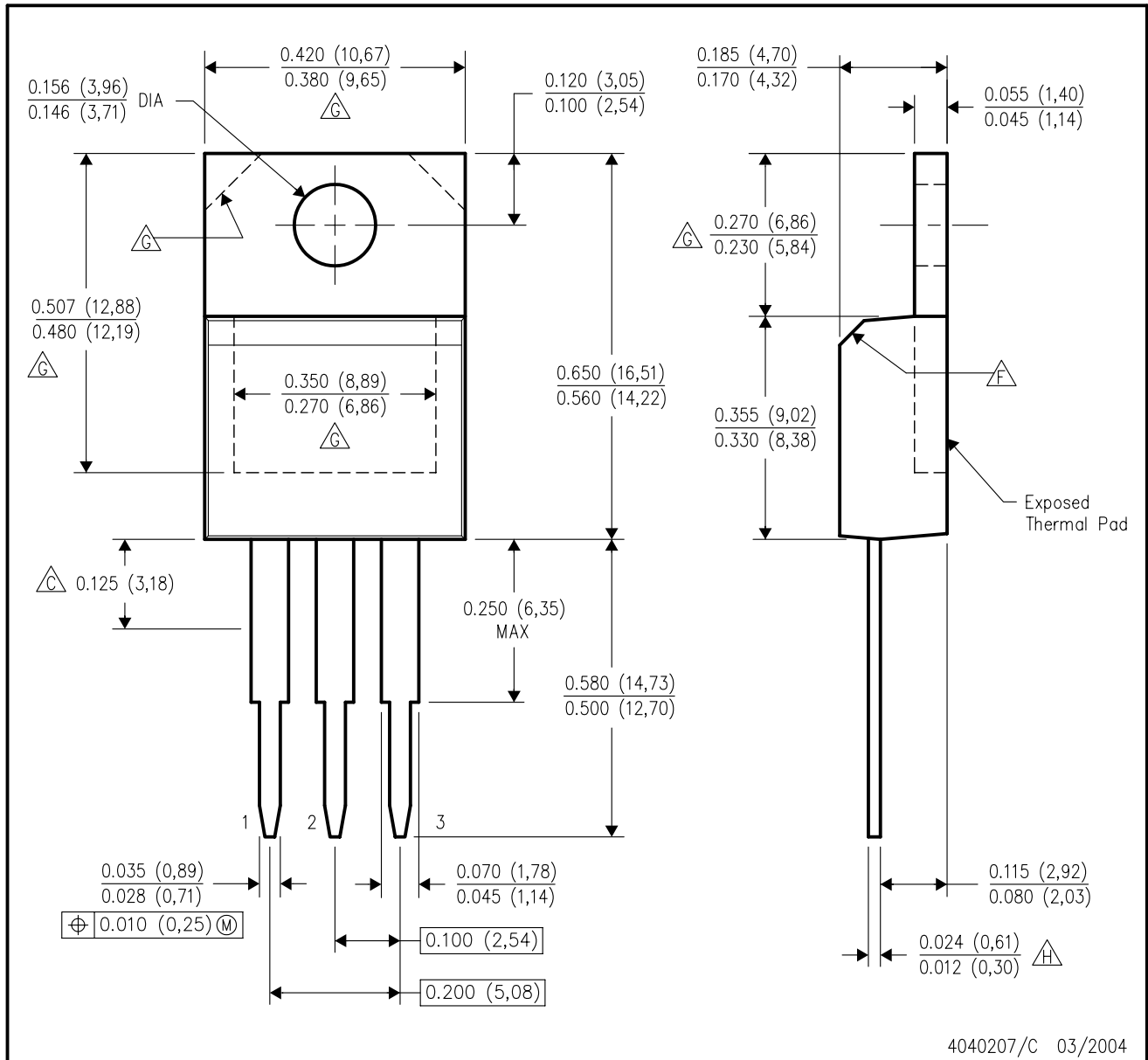
PLASTIC FLANGE-MOUNT PACKAGE



- 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.

KC (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.
 - 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.
 - F. The chamfer is optional.
 - G. Thermal pad contour optional within these dimensions.
 - H. Falls within JEDEC TO-220 variation AB, except minimum lead thickness.

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