



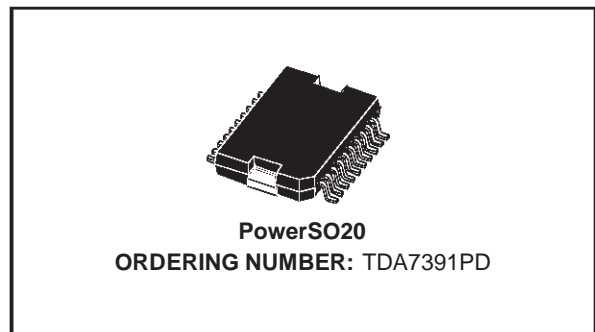
32W BRIDGE CAR RADIO AMPLIFIER

PRODUCT PREVIEW

- HIGH POWER CAPABILITY:
40W/3.2Ω EIAJ
32W/3.2Ω @ $V_s = 14.4V, f = 1KHz, d = 10\%$
26W/4Ω @ $V_s = 14.4V, f = 1KHz, d = 10\%$
- DIFFERENTIAL INPUTS (EITHER SINGLE ENDED OR DIFFERENTIAL INPUT SIGNAL ARE ACCEPTED)
- MINIMUM EXTERNAL COMPONENT COUNT:
 - NO BOOTSTRAP CAPACITORS
 - NO BOUCHEROT CELLS
 - INTERNALLY FIXED GAIN (30dB)
 - NO SVR CAPACITOR
- ST.-BY FUNCTION (CMOS COMPATIBLE)
- PROGRAMMABLE TURN-ON/OFF DELAY
- NO AUDIBLE POP DURING MUTE AND ST-BY OPERATIONS

PROTECTIONS:

- SHORT CIRCUIT (TO GND, TO V_s , ACROSS THE LOAD)
- VERY INDUCTIVE LOADS
- CHIP OVERTEMPERATURE
- LOAD DUMP
- OPEN GND
- ESD



DESCRIPTION

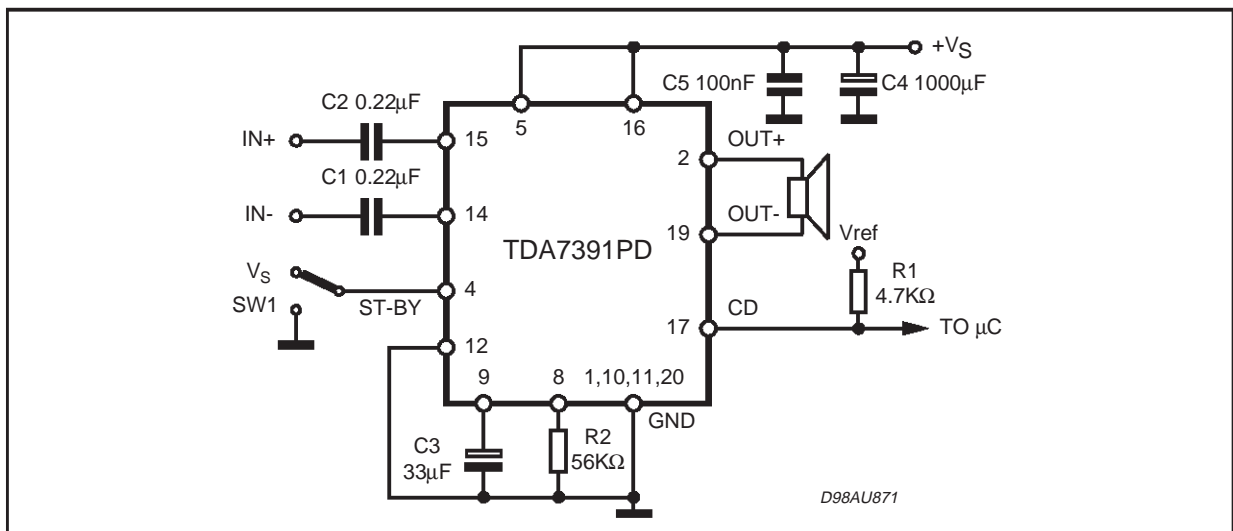
The TDA7391PD is a BRIDGE class AB audio power amplifier specially intended for car radio High Power applications.

The high power capability together with the possibility to operate either in DIFFERENTIAL INPUT MODE or SINGLE ENDED INPUT MODE makes it suitable for boosters and high end car radio equipments.

The exclusive fully complementary output stage and the internal fixed gain configuration drop the external component count.

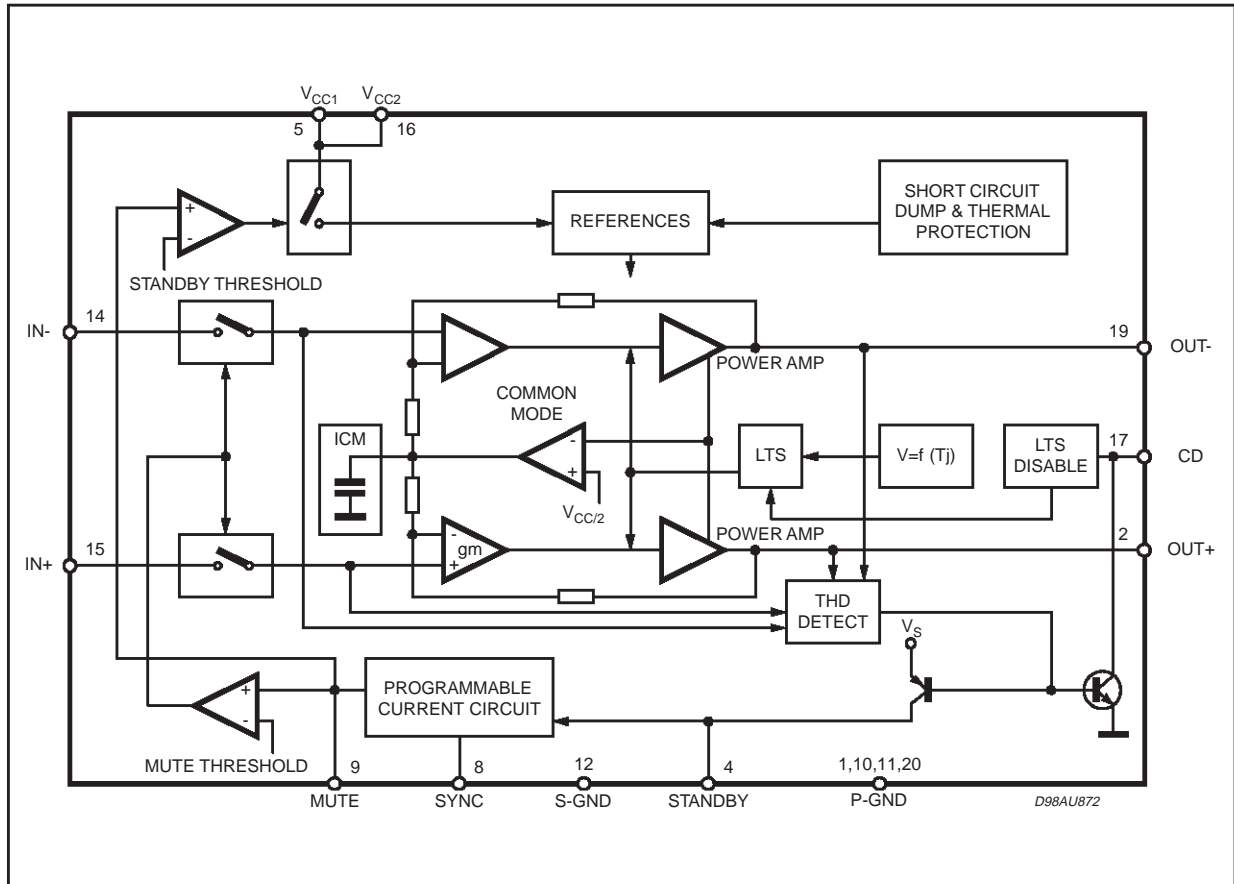
The on board clipping detector allows easy implementation of gain compression systems.

Figure 1: Test And Application Circuit

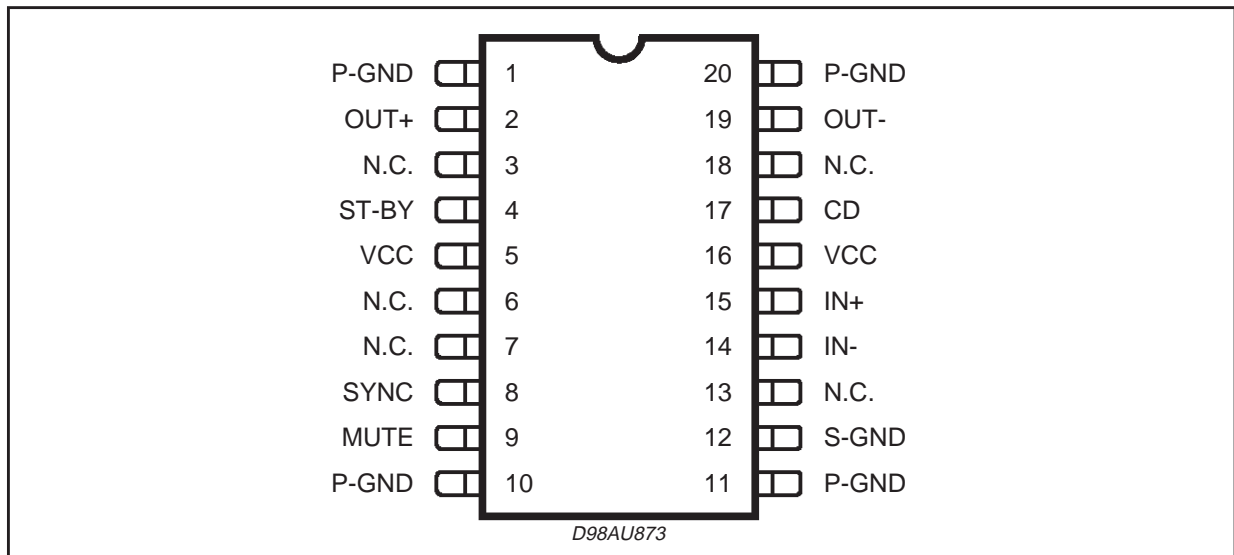


TDA7391PD

Figure 2: Block Diagram



PIN CONNECTION (Top view)



THERMAL DATA

| Symbol | Description | Value | Unit |
|------------------|----------------------------------|-------|------|
| $R_{th\ j-case}$ | Thermal Resistance Junction-case | Max 2 | °C/W |

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|----------------|---|------------|------------------|
| V_S | DC Supply Voltage | 28 | V |
| V_{OP} | Operating Supply Voltage | 18 | V |
| V_{PEAK} | Peak Supply Voltage (t = 50ms) | 50 | V |
| I_O | Output Peak Current repetitive (f > 10Hz) | 4.5 | A |
| | Output Peak Current non repetitive | 6 | A |
| P_{tot} | Power Dissipation ($T_{CASE} = 85^\circ\text{C}$) | 32 | W |
| T_{stg}, T_j | Storage and Junction-Case Temperature | -40 to 150 | $^\circ\text{C}$ |

ELECTRICAL CHARACTERISTICS ($V_S = 14.4\text{V}$; $R_L = 4\Omega$, $f = 1\text{KHz}$, $T_{amb} = 25^\circ\text{C}$, unless otherwise specified)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|----------------------------|--|--|------|------|------|------------------|
| V_S | Supply Voltage Range | | 8 | | 18 | V |
| I_q | Total Quiescent Current | | | 60 | 150 | mA |
| V_{OS} | Output Offset Voltage | | | | 120 | mV |
| I_{SB} | ST-BY Current | $V_{ST-BY} = 1.5\text{V}$ | | | 100 | μA |
| I_{SBin} | ST-BY Input Bias Current | $V_{ST-BY} = 5\text{V}$ | | | 10 | μA |
| V_{SBon} | ST-BY On Threshold Voltage | | | | 1.5 | V |
| V_{SBoff} | ST-BY Off threshold Voltage | | 3.5 | | | V |
| ATT_{ST-BY} | ST-BY Attenuation | | | 90 | | dB |
| $I_{M in}$ | Mute Input Bias Current | ($V_{MUTE} = 5\text{V}$) | | | 10 | μA |
| A_M | Mute Attenuation | | | 90 | | dB |
| P_O | RMS Output Power | d = 10% | 20 | 26 | | W |
| | | d = 1% | | 21 | | W |
| d = 10%; $R_L = 3.2\Omega$ | | | 32 | | W | |
| | EIAJ Output Power | $V_S = 13.7\text{V}$ | | 40 | | W |
| d | Distortion | $P_O = 0.1$ to 15W | | 0.06 | | % |
| | | | | 0.03 | | % |
| G_V | Voltage Gain | | 29.5 | 30 | 30.5 | dB |
| f_H | High Frequency rolloff | $P_O = 1\text{W}$; -3dB | 75 | | | KHz |
| R_{IN} | Input Impedance | Differential | 36 | 60 | | $\text{K}\Omega$ |
| | | Single Ended | 30 | 55 | | $\text{K}\Omega$ |
| E_{IN} | Input Noise Voltage | $R_g = 0\Omega$; f = 22Hz to 22KHz | | 4 | | mV |
| CMRR | Input Common Mode Rejection | f = 1KHz; $V_{IN} = 1\text{Vrms}$ | | 65 | | dB |
| SVR | Supply Voltage Rejection | $R_g = 0\Omega$; $V_r = 1\text{Vrms}$ | | 60 | | dB |
| CDL | Clipping Detection Level | | 5 | 10 | 15 | % |
| T_{sd} | Absolute Thermal Shutdown Junction Temperature | | | 160 | | $^\circ\text{C}$ |

TDA7391PD

FUNCTIONAL DESCRIPTION

| Pin | Function | Description |
|----------------|-----------------|---|
| 14, 15 | INPUTS | The input stage is a high impedance type also capable of operation in single ended mode with one input capacitively coupled to the signal GND. The impedance seen by the inverting and non inverting input pins must be matched. |
| 5,16 | +V _S | Supply Voltage. |
| 17 | CD | The TDA7391PD is equipped with a diagnostic circuitry able to detect the clipping in the Output Signal (distortion = 10%). The CD pin (open collector) gives out low level signal during clipping. |
| 2,19 | OUTPUTS | The output stage is a bridge type able to drive loads as low as 3.2Ω. It consists of two class AB fully complementary PNP/NPN stages fully protected. A rail to rail output voltage swing is achieved without need of bootstrap capacitors. No external compensation is necessary. |
| 1,10, 11,20 | P-GND | Power Ground. |
| 12 | S-GND | Signal Ground. |
| 4 | STAND-BY | The device features a ST-BY function which shuts down all the internal bias supplies when the ST-BY pin is low. In ST-BY mode the amplifier sinks a small current (in the range of few μA). When the ST-BY pin is high the IC becomes fully operational. |
| 8 | SYNC | A resistor (R ₂) has to be connect between pin 8 and GND in order to program the current that flows in the C ₃ capacitor (pin 9). The values of C ₃ and R ₂ determine the time required to bias the amplifier. |
| 9 | MUTE | The pin will have a capacitor (C ₃) tied to GND to set the MUTE/STAND-BY time. An automatic Mute during turn on/off is provided to prevent noisy transients. |

Figure 2: Quiescent Current vs Supply Voltage

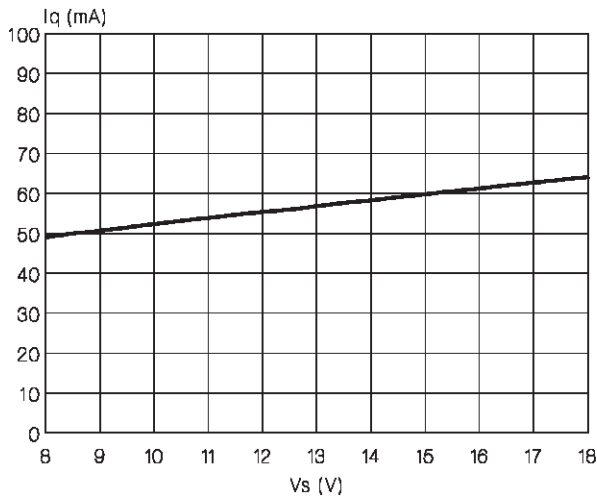


Figure 3: EIAJ power vs Supply Voltage

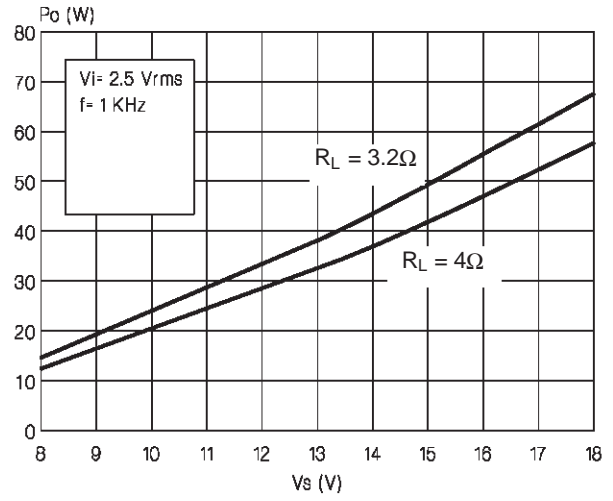


Figure 4: Output Power vs Supply Voltage (@ $R_L = 4\Omega$)

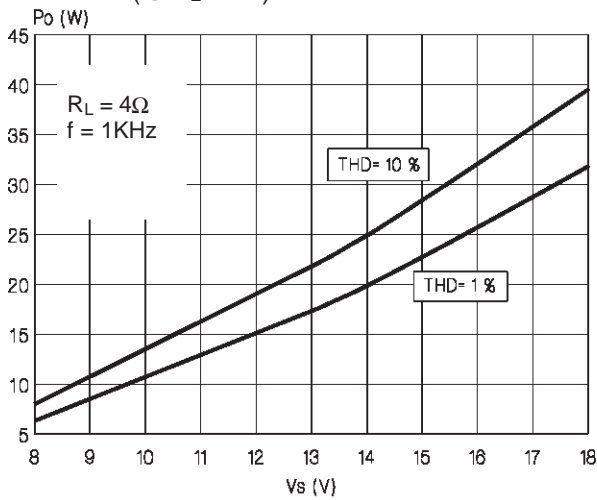


Figure 5: Distortion vs Frequency (@ $R_L = 4\Omega$)

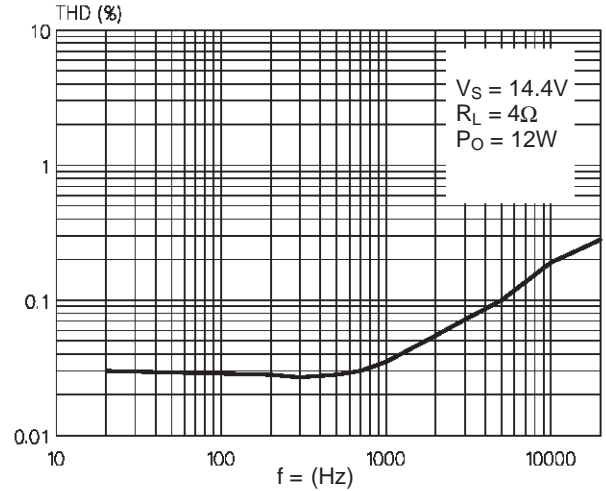


Figure 6: Output Power vs Supply Voltage (@ $R_L = 3.2\Omega$)

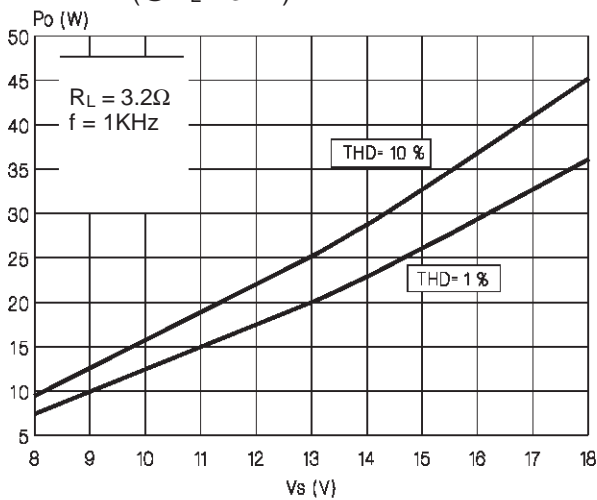


Figure 7: Distortion vs Frequency ($R_L = 4\Omega$)

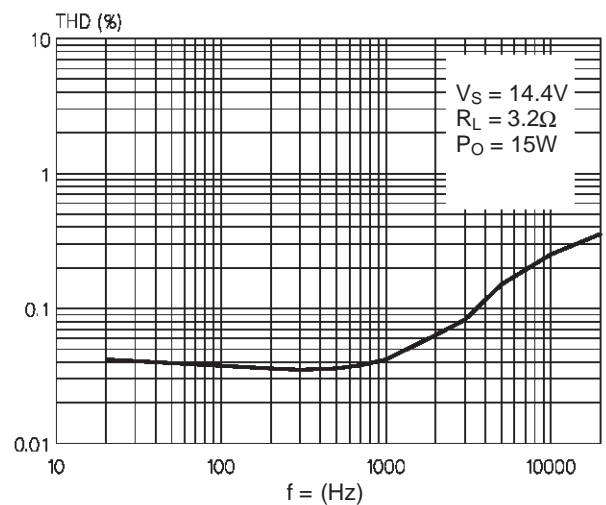


Figure 8: Supply Voltage Rejection vs Frequency

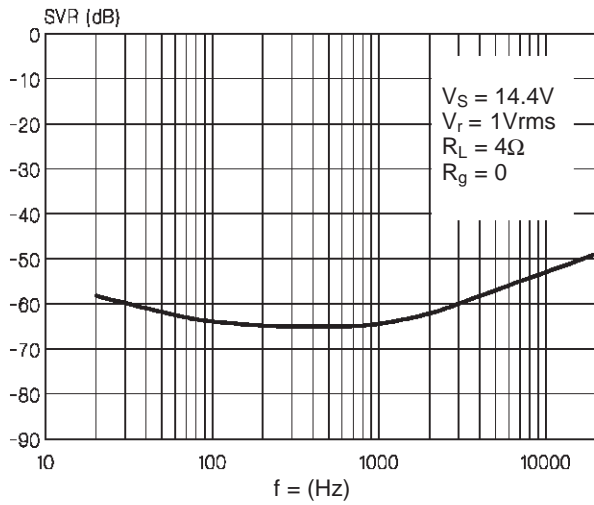


Figure 9: Common Mode Rejection vs. Frequency

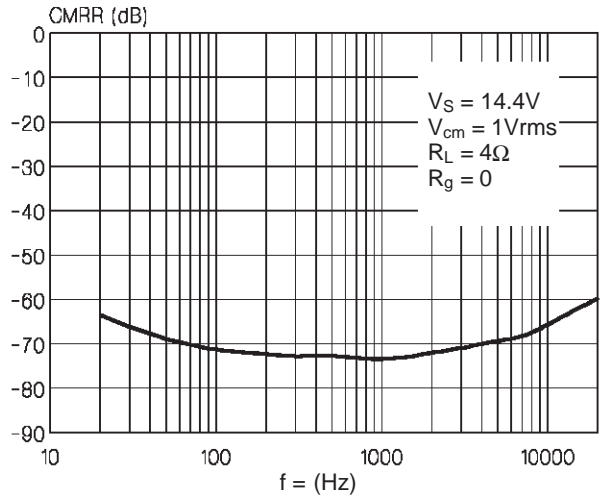


Figure 10: Total Power Dissipation & Efficiency vs. Output Power (@ $R_L = 4\Omega$)

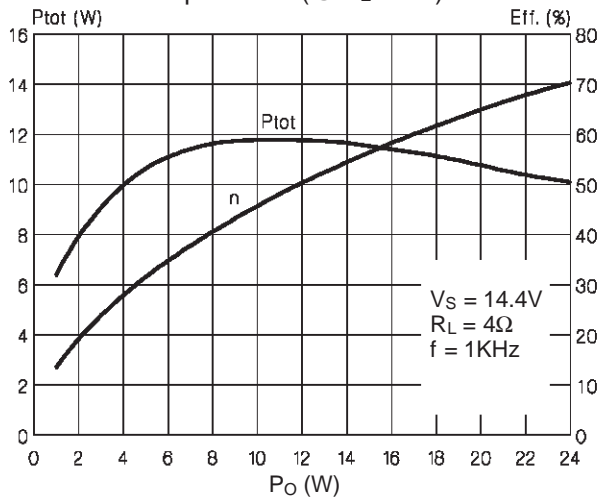
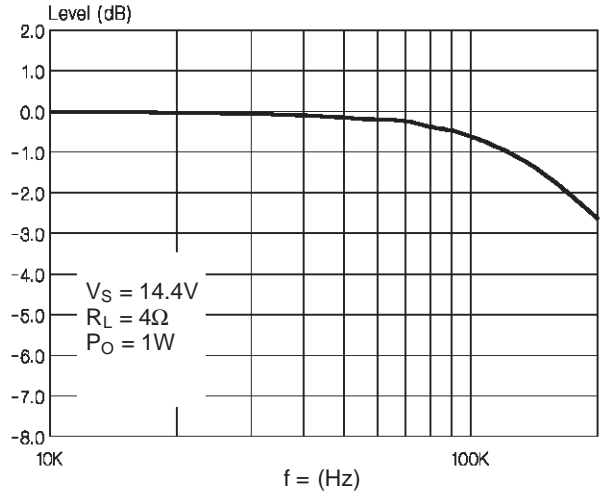


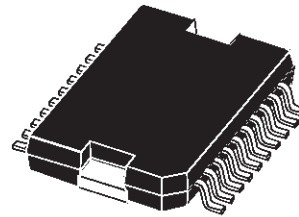
Figure 11: Power Bandwidth



| DIM. | mm | | | inch | | |
|--------|------------|-------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 3.6 | | | 0.142 |
| a1 | 0.1 | | 0.3 | 0.004 | | 0.012 |
| a2 | | | 3.3 | | | 0.130 |
| a3 | 0 | | 0.1 | 0.000 | | 0.004 |
| b | 0.4 | | 0.53 | 0.016 | | 0.021 |
| c | 0.23 | | 0.32 | 0.009 | | 0.013 |
| D (1) | 15.8 | | 16 | 0.622 | | 0.630 |
| D1 | 9.4 | | 9.8 | 0.370 | | 0.386 |
| E | 13.9 | | 14.5 | 0.547 | | 0.570 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 11.43 | | | 0.450 | |
| E1 (1) | 10.9 | | 11.1 | 0.429 | | 0.437 |
| E2 | | | 2.9 | | | 0.114 |
| E3 | 5.8 | | 6.2 | 0.228 | | 0.244 |
| G | 0 | | 0.1 | 0.000 | | 0.004 |
| H | 15.5 | | 15.9 | 0.610 | | 0.626 |
| h | | | 1.1 | | | 0.043 |
| L | 0.8 | | 1.1 | 0.031 | | 0.043 |
| N | 10° (max.) | | | | | |
| S | 8° (max.) | | | | | |
| T | | 10 | | | 0.394 | |

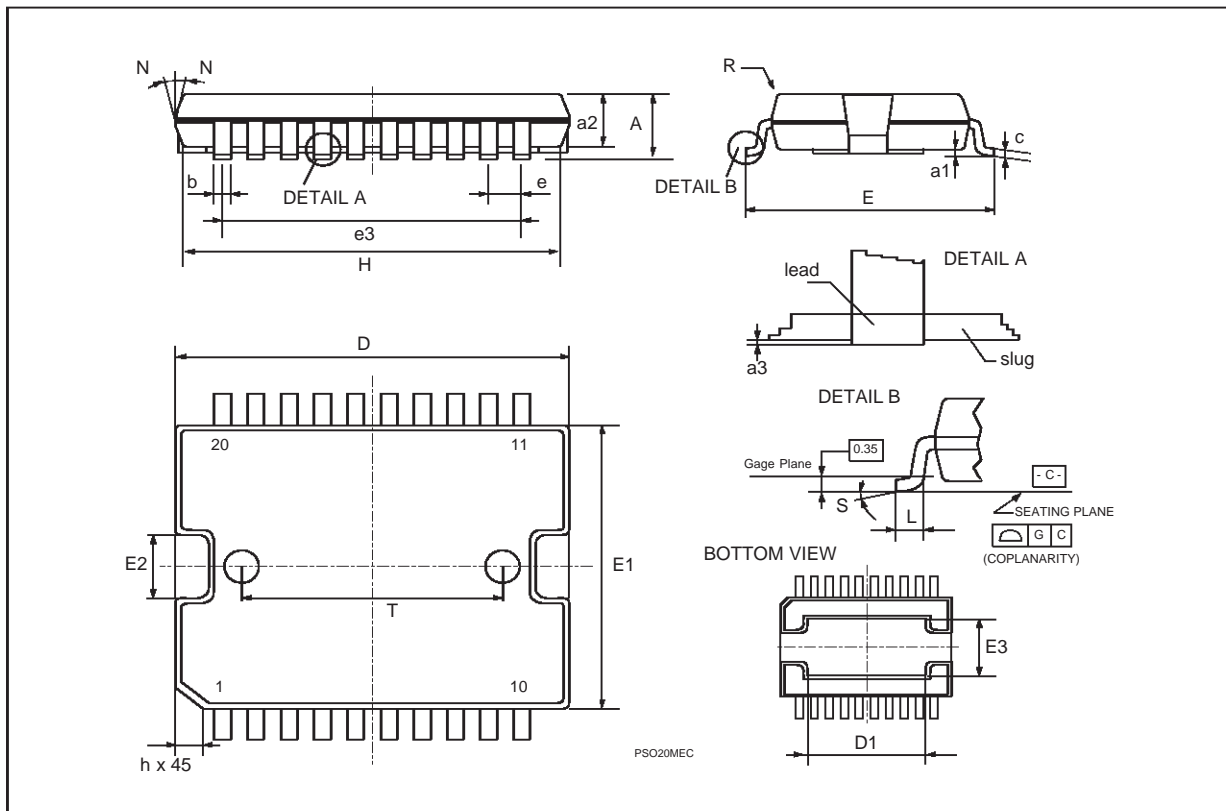
(1) "D and F" do not include mold flash or protrusions.
 - Mold flash or protrusions shall not exceed 0.15 mm (0.006").
 - Critical dimensions: "E", "G" and "a3"

OUTLINE AND MECHANICAL DATA



JEDEC MO-166

PowerSO20



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