

# EVM User's Guide: JFE2325EVM

## JFE2325EVM

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### Description

THE JFE2325 evaluation board converts the JFE2325 device in the DTQ package into an easy-to-use, standard, dual 300-mil-wide, PDIP footprint. The PCB can be used in a standard PDIP socket. The board dimensions are 550 mil × 600 mil.

### Features

- Standard PDIP Pin Spacing

- Can be used in a standard bread board

### Applications

- Electret Condenser Microphones (ECM)
- MEMS Microphones
- Accelerometers
- Pyroelectric Infrared (PIR) Sensors
- Photodiode Amplifiers



## 1 Evaluation Module Overview

### 1.1 Introduction

THE JFE2325 evaluation board converts the JFE2325 device in the DTQ package into an easy-to-use, standard, dual 300-mil-wide, PDIP footprint. The PCB can be used in a standard PDIP socket. The board dimensions are 550 mil  $\times$  600 mil. The JFE2325 is a monolithic, matched-pair discrete JFET intended for use with very high-impedance (ECMs). The device consists of two N-channel JFETs, laid out for excellent matching on a single die. The gate of each JFET is biased by an integrated diode which allows for direct coupling of a signal source to the gate without the need for a biasing resistor. The JFE2325 achieves much higher input impedance ( $>4\text{G}\Omega$ ) than possible when discrete resistors are used to bias the gate. Furthermore, the JFE2325 features an extremely low input capacitance of 0.5pF per JFET which maximizes signal levels from transducers with extremely low output capacitance. Each JFET is capable of 0.6ms of transconductance when configured to run at the full drain current of 325 $\mu\text{A}$ . The JFETs can be used individually, or in parallel for higher transconductance and lower noise.

### 1.2 Kit Contents

The contents of the EVM kit are detailed in [Table 1-1](#). Contact the nearest TI Product Information Center if any component is missing.

**Table 1-1. Contents of the JFE2325EVM Kit**

Item	Quantity
JFE2325EVM evaluation board PCB	1

### 1.3 Specification

The JFE2325 is a monolithic, matched-pair discrete JFET intended for use with very high-impedance sensors such as electret condenser microphones (ECMs). The device consists of two N-channel JFETs, laid out for excellent matching on a single die. The gate of each JFET is biased by an integrated diode which allows for direct coupling of a signal source to the gate without the need for a biasing resistor. The JFE2325 achieves much higher input impedance ( $>4\text{G}\Omega$ ) than possible when discrete resistors are used to bias the gate. Furthermore, the JFE2325 features an extremely low input capacitance of 0.5pF per JFET which maximizes signal levels from transducers with extremely low output capacitance.

Each JFET is capable of 0.6ms of transconductance when configured to run at the full drain current of 325 $\mu\text{A}$ . The JFETs can be used individually, or in parallel for higher transconductance and lower noise.

### 1.4 Device Information

The JFE2325EVM provides a basic PDIP breakout board that can be used in a standard breadboard or printed circuit board that uses standard pin sockets. The pins on the JFE2325EVM are spaced 0.1 inches (2.54mm) from the center of one pin to the center of the next pin in the same row. The spacing between the two rows of pins is 0.3 inches (7.62mm). For typical applications, see the [JFE2325](#) data sheet.

## 2 Hardware

### 2.1 Getting Started

For typical applications, see the [JFE2325](#) data sheet.

### 2.2 Electrostatic Discharge Caution

**CAUTION**

The components on the JFE2325EVM are susceptible to damage by electrostatic discharge (ESD). Use proper ESD handling precautions when unpacking and handling the EVM. Failure to observe ESD handling procedures can result in damage to the EVM components.

## 3 Hardware Design Files

### 3.1 Schematics

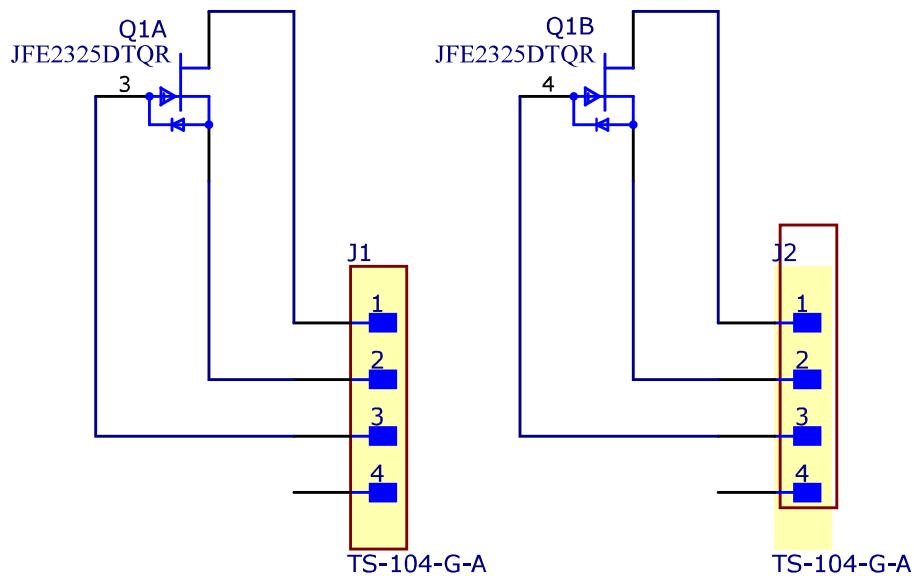


Figure 3-1. JFE2325EVM Schematic

### 3.2 PCB Layouts

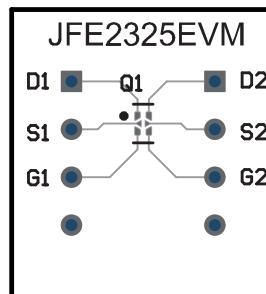


Figure 3-2. JFE2325EVM PCB Layout Composite (Top View)

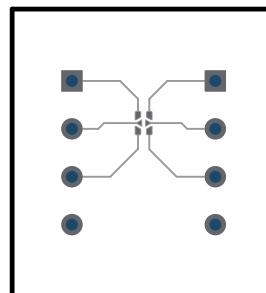
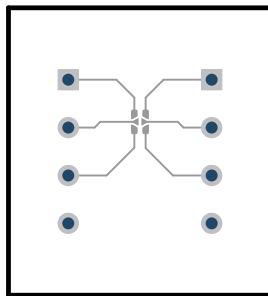
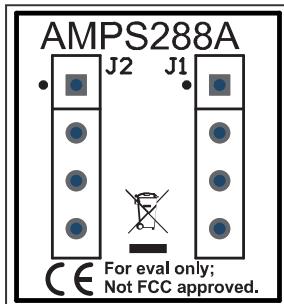


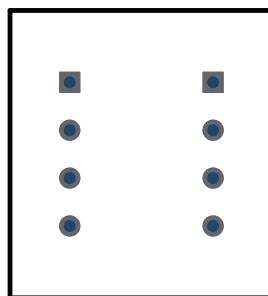
Figure 3-3. JFE2325EVM PCB Top Layer Mask



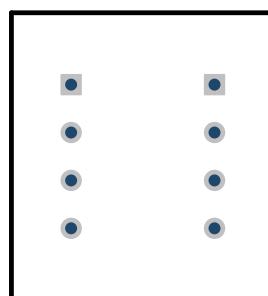
**Figure 3-4. JFE2325EVM PCB Top Layer**



**Figure 3-5. JFE2325EVM PCB Composite (Bottom View)**



**Figure 3-6. JFE2325EVM PCB Bottom Layer Mask**



**Figure 3-7. JFE2325EVM PCB Bottom Layer**

### 3.3 Bill of Materials (BOM)

The complete bill of materials for the JFE2325EVM is listed in [Table 3-1](#). Data for each component are available from the corresponding manufacturer web site.

**Table 3-1. JFE2325EVM Bill of Materials**

Designator	Quantity	Value	Description	PackageReference	Part Number	Manufacturer
J1, J2	2		Conn Unshrouded Header HDR 4 POS 2.54mm Solder ST Top Entry Thru-Hole Bulk	HDR4	TS-104-G-A	Samtec
Q1	1		Dual, Low-Power, N-Channel JFET for Electret Microphones	X2SON6	JFE2325DTQR	Texas Instruments

## 4 Additional Information

### 4.1 Trademarks

All trademarks are the property of their respective owners.

## 5 Related Documentation

The documents that provide information about TI's integrated circuits and support tools for the JFE2325EVM are listed in [Table 5-1](#).

**Table 5-1. Related Documentation**

Document	Literature Number
<a href="#">JFE2325 product data sheet</a>	<a href="#">SLPS816</a>

## STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an "EVM" or "EVMs") to the User ("User") in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.
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### **WARNING**

**Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.**

**User shall operate the Evaluation Kit within TI's recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI's recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI's instructions for electrical ratings of interface circuits such as input, output and electrical loads.**

**NOTE:**

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGRADATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

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### 3 Regulatory Notices:

#### 3.1 United States

##### 3.1.1 Notice applicable to EVMs not FCC-Approved:

**FCC NOTICE:** This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

##### 3.1.2 For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:

#### CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

#### FCC Interference Statement for Class A EVM devices

*NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

#### FCC Interference Statement for Class B EVM devices

*NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:*

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

#### 3.2 Canada

##### 3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247

#### Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

#### Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

#### Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

#### Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

#### 3.3 Japan

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<https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html>

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive):*

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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