Ultra-Small Footprint N-Channel FemtoFET™ MOSFET Test EVM

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1 Introduction

The evaluation module (EVM) CSD1FNCHEVM-889 provides the test interface for the following N-channel FemtoFETs: CSD13380F3, CSD13383F4, CSD13385F5, CSD15380F3, CSD17381F4, CSD17585F5, and CSD18541F5.

2 Description

The CSD1FNCHEVM-889 is designed to test seven N-Channel FemtoFETs. For each MOSFET, the Drain, Gate, and Source terminals can be connected to customer test circuit through the headers for device and system evaluation. The EVM also provides sense points to evaluate the performance of the MOSFETs.

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3 Electrical Performance Specifications

Table 1. CSD1FNCHEVM-889 Electrical Performance Specifications

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
CSD13380F3					
Input Characteristics					
V_{DS}	Drain-to-Source Voltage			12	V
V_{GS}	Gate-to-Source Voltage			8	V
Output Characteristics					
I_D (1)	Continuous Drain Current, Max Cu			3.6	A
I_D (1)	Continuous Drain Current, Min Cu			2.1	A
I_{DM} (2)	Pulsed Drain Current			13.5	A
CSD13383F4					
Input Characteristics					
V_{DS}	Drain-to-Source Voltage			12	V
V_{GS}	Gate-to-Source Voltage			±10	V
Output Characteristics					
I_D (1)	Continuous Drain Current, Max Cu			4.8	A
I_D (1)	Continuous Drain Current, Min Cu			2.9	A
I_{DM} (2)	Pulsed Drain Current			18.5	A
CSD13385F5					
Input Characteristics					
V_{DS}	Drain-to-Source Voltage			12	V
V_{GS}	Gate-to-Source Voltage			8	V
Output Characteristics					
I_D (1)	Continuous Drain Current, Max Cu			7.1	A
I_D (1)	Continuous Drain Current, Min Cu			4.3	A
I_{DM} (2)	Pulsed Drain Current			41	A
CSD15380F3					
Input Characteristics					
V_{DS}	Drain-to-Source Voltage			20	V
V_{GS}	Gate-to-Source Voltage			10	V
Output Characteristics					
I_D (1)	Continuous Drain Current, Max Cu			0.9	A
I_D (1)	Continuous Drain Current, Min Cu			0.5	A
I_{DM} (2)	Pulsed Drain Current			1.6	A
CSD17381F4					
Input Characteristics					
V_{DS}	Drain-to-Source Voltage			30	V
V_{GS}	Gate-to-Source Voltage			12	V
Output Characteristics					
I_D (1)	Continuous Drain Current, Max Cu			3.1	A
I_D (1)	Continuous Drain Current, Min Cu			1.9	A
I_{DM} (2)	Pulsed Drain Current			12	A
CSD17585F5					
Input Characteristics					
V_{DS}	Drain-to-Source Voltage			30	V
V_{GS}	Gate-to-Source Voltage			20	V

(1) Refer to the thermal values in the respective data sheets.
(2) Pulse duration ≤ 100 µs, duty cycle ≤ 1%.

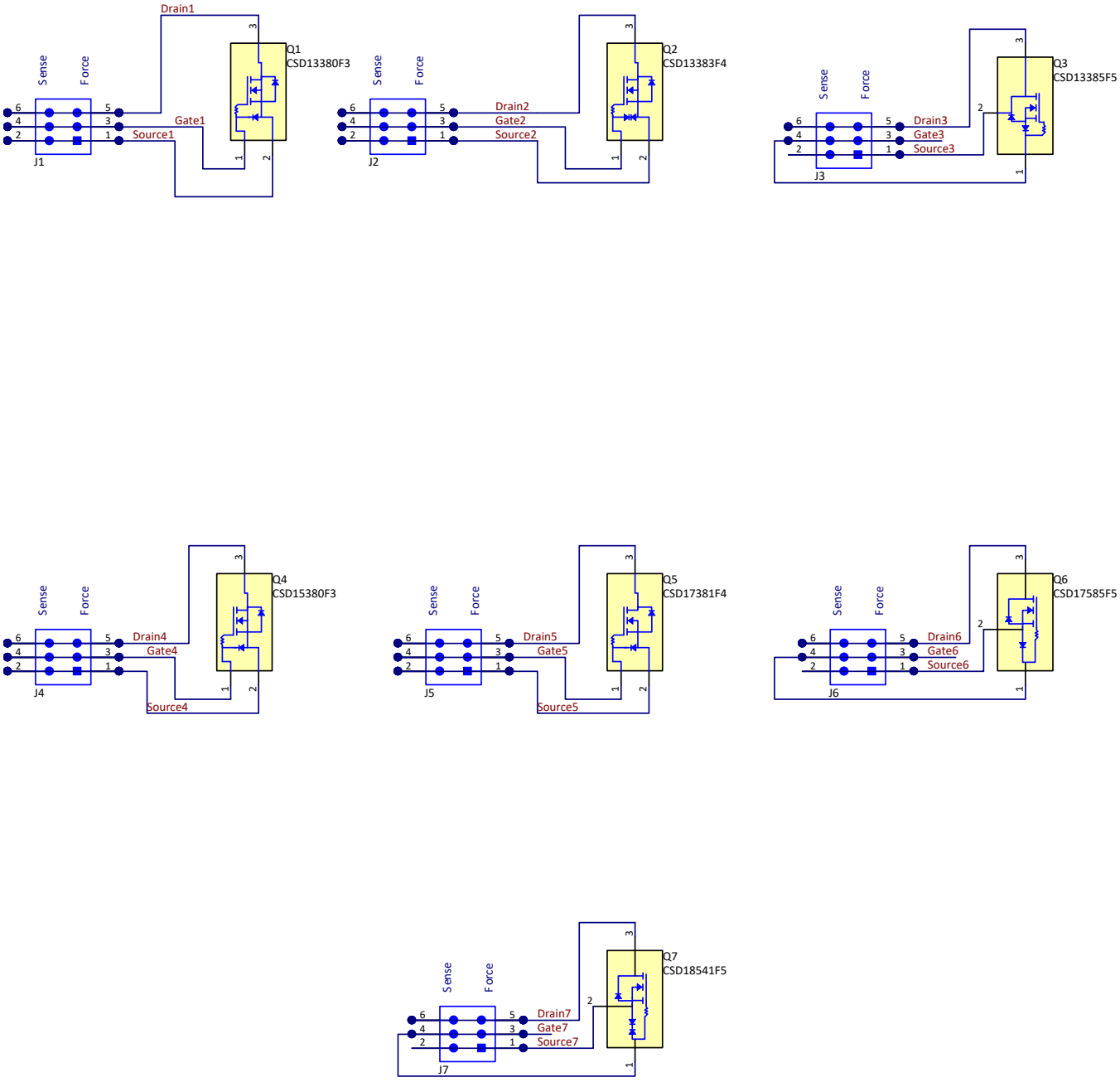
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Table 1. CSD1FNCHEVM-889 Electrical Performance Specifications (continued)

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Output Characteristics					
I_D (1)	Continuous Drain Current, Max Cu			5.9	A
I_D (1)	Continuous Drain Current, Min Cu			3.5	A
I_{DM} (2)	Pulsed Drain Current			34	A
CSD18541F5					
Input Characteristics					
V_{DS}	Drain-to-Source Voltage			60	V
V_{GS}	Gate-to-Source Voltage			±20	V
Output Characteristics					
I_D (1)	Continuous Drain Current, Max Cu			3.6	A
I_D (1)	Continuous Drain Current, Min Cu			2.2	A
I_{DM} (2)	Pulsed Drain Current			21	A

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4 Schematic



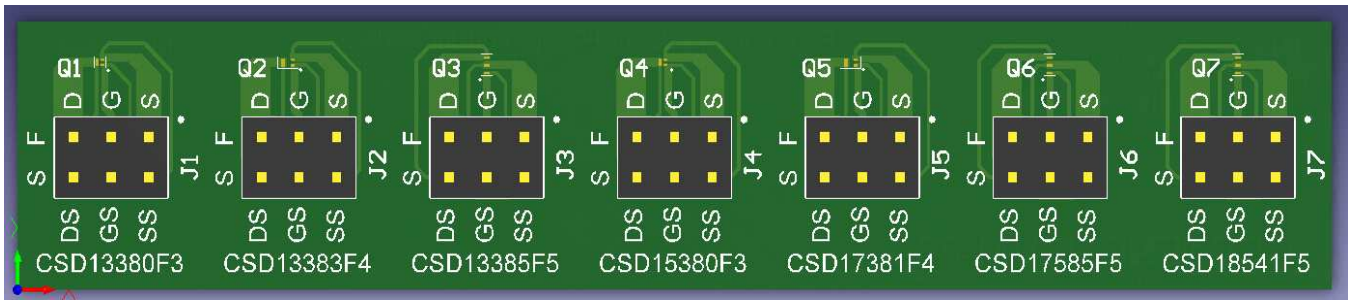
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Figure 1. CSD1FNCHEVM-889 Schematic

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5 Test Setup

5.1 Board Picture

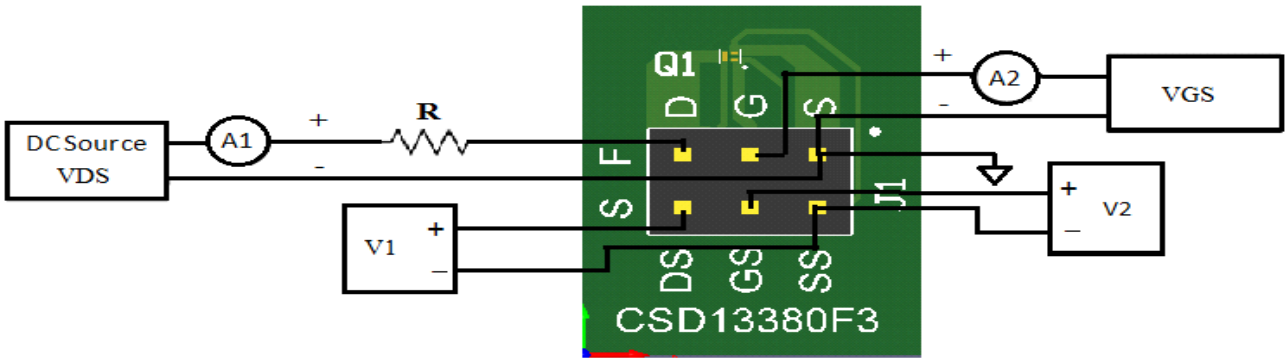


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Figure 2. CSD1FNCHEVM-889

Figure 2 is board picture of the CSD1FNCHEVM-889. For each MOSFET, there is a connector which provides the force and sense points to the Drain, Gate, and Source terminals. The D (Drain), G (Gate), and S (Source) are the force points which need to be connected to the test circuit; while DS (Drain Sense), GS (Gate Sense), and SS (Source Sense) are the sense points which can be used to measure the voltages.

5.1.1 Test Set-Up Example



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Figure 3. CSD1FNCHEVM-889

Figure 3 shows an example of the test setup for CSD13380F3: a voltage source V_{DS} is connected to D and S through a load resistor and a voltage source V_{GS} is connected to the G and S. With V_{DS} voltage being applied, the MOSFET will be turned on if V_{GS} is larger than the threshold voltage. V1 and V2 are the voltage meters to measure the V_{DS} and V_{GS} voltages, while A1 and A2 are the current meters to monitor the currents I_D and I_G.

Table 1 lists the maximum V_{GS} and V_{DS} voltages and maximum I_D current for each of the devices.

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6 EVM Assembly Drawing and PCB Layout

The following figures (Figure 4 and Figure 5) show the design of the CSD1FNCHEVM-889 printed circuit board. The EVM has been designed using a 2-Layer circuit board.

6.1 Top Layer Assembly Drawing (Top View)

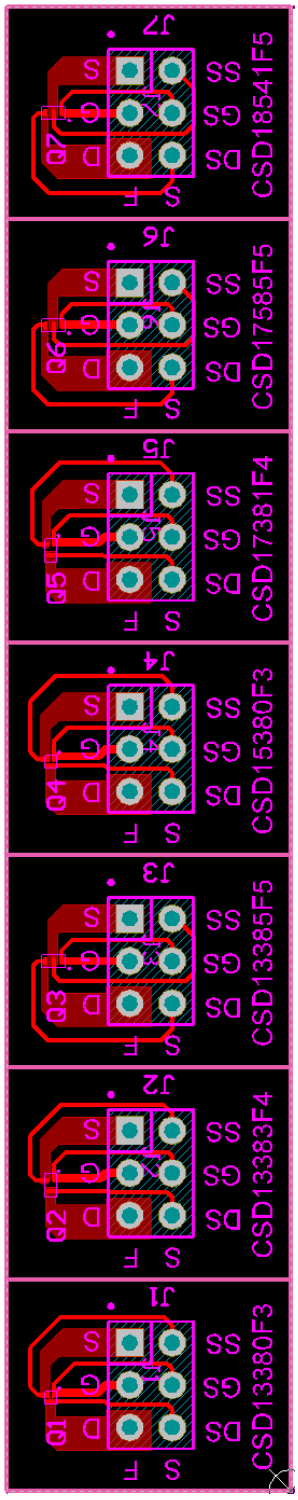


Figure 4. CSD1FNCHEVM-889

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6.2 Bottom Assembly Drawing (Bottom View)

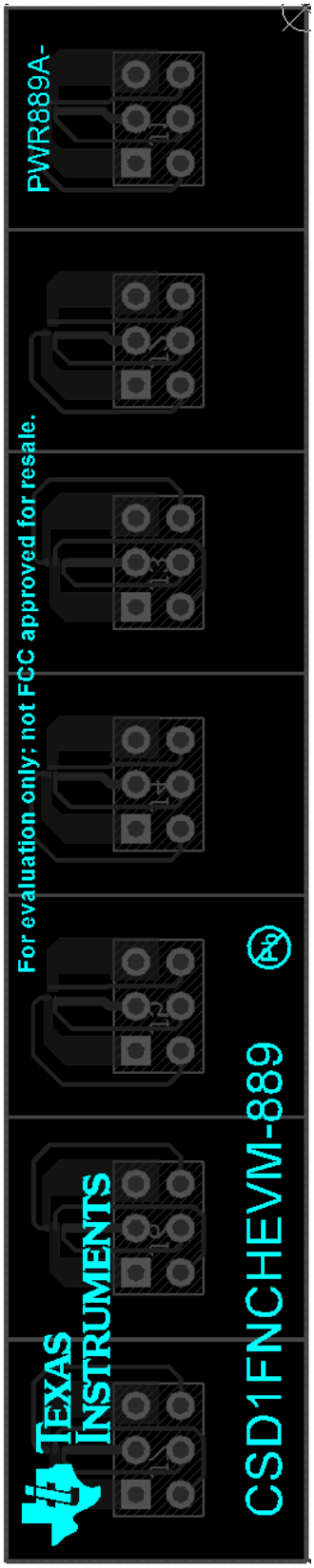


Figure 5. CSD1FNCHEVM-889

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7 Bill of Materials

The EVM components list according to the schematic in Figure 1.

Table 2. List of Materials

PART NUMBER	DESCRIPTION	DESIGNATOR	FOOTPRINT	LIB REF	QTY
PWR889A	Printed Circuit Board	PCB1		PCB	1
TSW-103-07-G-D	Header, 100 mil, 3×2, Gold, TH	J1, J2, J3, J4, J5, J6, J7	TSW-103-07-G-D	TSW-103-07-G-D	7
CSD13380F3	12-V N-Ch FemtoFET	Q1	FemtoF3	CSD13380F3	1
CSD13383F4	12-V N-Ch FemtoFET	Q2	FemtoF4	CSD13383F4	1
CSD13385F5	12-V N-Ch FemtoFET	Q3	FemtoF5	CSD13385F5	1
CSD15380F3	20-V N-Ch FemtoFET	Q4	FemtoF3	CSD15380F3	1
CSD17381F4	30-V N-Ch FemtoFET	Q5	FemtoF4	CSD17381F4	1
CSD17585F5	30-V, N-Ch FemtoFET	Q6	FemtoF5	CSD17585F5	1
CSD18541F5	60-V N-Ch FemtoFET	Q7	FemtoF5	CSD18541F5	1

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of and the output voltage range of .

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than . The EVM is designed to operate properly with certain components above as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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