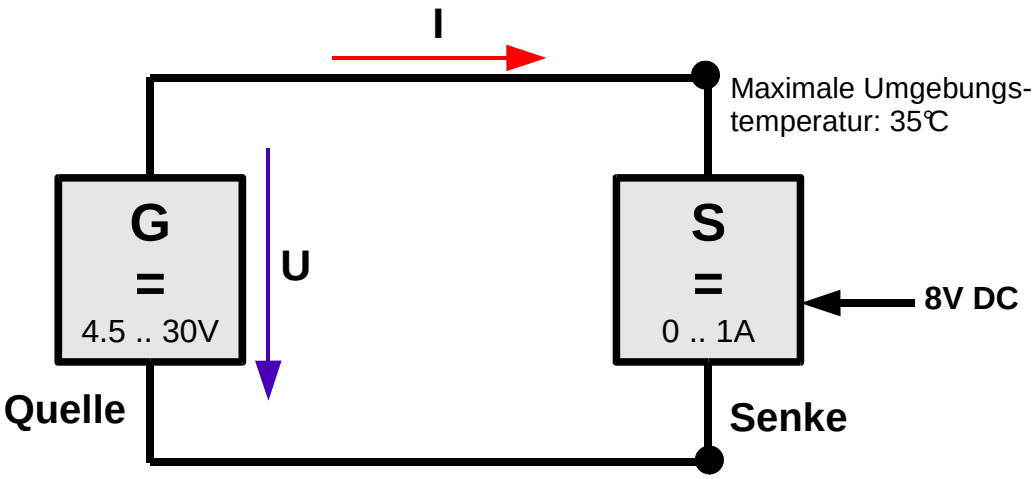
Einstellbare elektronische Last

Fallstudie für Elektroniker Feb. 2005, B.Wamister

Für Labor- und Testzwecke soll eine elektronische Last (Stromsenke) entwickelt werden, welche eine Spannungsquelle (4V bis 30V) mit einen konstanten, einstellbaren Strom im Bereich von 0 bis 1A belastet. Die Stromsenke wird mit einem geregelten Netzadapter 8V/100mA gespeist.

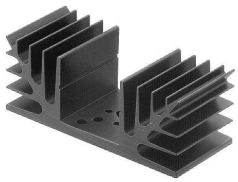
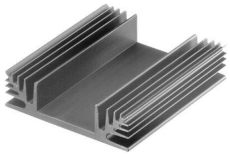
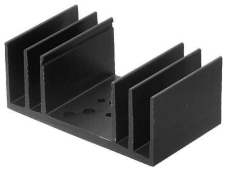
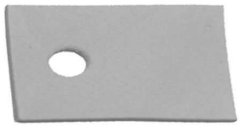
Prinzip:



Aufgabe:

Entwickeln Sie die Schaltung der Stromsenke. Dazu stehen Ihnen folgende Komponenten zur Verfügung (weitere, zusätzliche Komponenten nach Ihrem Ermessen):

Operationsverstärker: LM6482 Input Output Rail to Rail OpAmp. Power MOSFET: IRL2505. Potentiometer 1kOhm. Messwiderstand 500mOhm / 1W.
Wählen Sie den kleinst möglichen Kühlkörper aus. Der MOSFET wird isoliert montiert.

Typ A	***Typ B***	***Typ C***	***Typ D***	***Isolation***
				
Rth = 1.8 K/W	Rth = 2.0 K/W	Rth = 3.25 K/W	Rth = 5K/W	Rth = 0.5K/W

Bewertung: Ihre Arbeit wird anhand der folgenden Punkte bewertet:

Aufbau, Nachvollziehbarkeit und Sauberkeit der Doku		Normenkonformes Schema	
Dimensionierung, Funktion der Schaltung (zählt doppelt):		**Note:**	

Zeit: 2 Lektionen (1.5 Std)

November 1997

National Semiconductor

LMC6482
CMOS Dual Rail-To-Rail Input and Output Operational Amplifier

General Description

The LMC6482 provides a common-mode range that extends to both supply rails. This rail-to-rail performance combined with excellent accuracy, due to a high CMRR, makes it unique among rail-to-rail input amplifiers.

It is ideal for systems, such as data acquisition, that require a large input signal range. The LMC6482 is also an excellent upgrade for circuits using limited common-mode range amplifiers such as the TLC272 and TLC277.

Maximum dynamic signal range is assured in low voltage and single supply systems by the LMC6482's rail-to-rail output swing. The LMC6482's rail-to-rail output swing is guaranteed for loads down to 600Ω.

Guaranteed low voltage characteristics and low power dissipation make the LMC6482 especially well-suited for battery-operated systems.

LMC6482 is also available in MSOP package which is almost half the size of a SO-8 device.

See the LMC6484 data sheet for a Quad CMOS operational amplifier with these same features.

Features

(Typical unless otherwise noted)

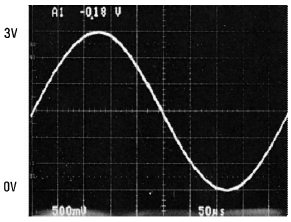
- Rail-to-Rail Input Common-Mode Voltage Range (Guaranteed Over Temperature)
- Rail-to-Rail Output Swing (within 20 mV of supply rail, 100 kΩ load)
- Guaranteed 3V, 5V and 15V Performance
- Excellent CMRR and PSRR: 82 dB
- Ultra Low Input Current: 20 fA
- High Voltage Gain (R_L = 500 kΩ): 130 dB
- Specified for 2 kΩ and 600Ω loads
- Available in MSOP Package

Applications

- Data Acquisition Systems
- Transducer Amplifiers
- Hand-held Analytic Instruments
- Medical Instrumentation
- Active Filter, Peak Detector, Sample and Hold, pH Meter, Current Source
- Improved Replacement for TLC272, TLC277

3V Single Supply Buffer Circuit

Rail-To-Rail Input



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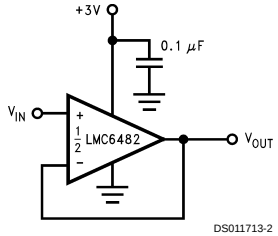

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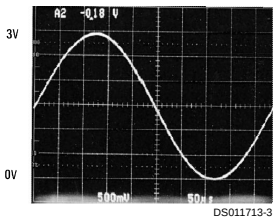
Rail-To-Rail Output



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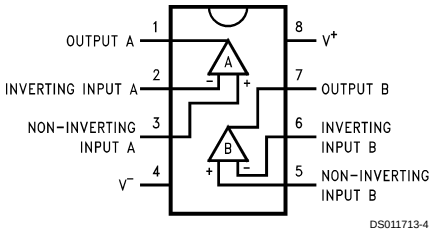
Connection Diagram



DS011713-4

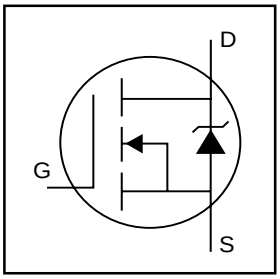
International
IOR Rectifier

PD - 91325C

IRL2505

HEXFET® Power MOSFET

- Logic-Level Gate Drive
- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated



V_{DSS} = 55V

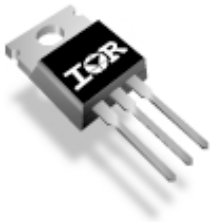
$R_{DS(on)}$ = 0.008Ω

I_D = 104A⑤

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The TO-220 is universally preferred for all commercial-Industrial applications at power dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.



TO-220AB

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	104⑤	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	74	
I_{DM}	Pulsed Drain Current ①	360	
P_D @T_C = 25°C	Power Dissipation	200	W
	Linear Derating Factor	1.3	W/°C
V_{GS}	Gate-to-Source Voltage	± 16	V
E_{AS}	Single Pulse Avalanche Energy②	500	mJ
I_{AR}	Avalanche Current ①	54	A
E_{AR}	Repetitive Avalanche Energy①	20	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	55 to + 175	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torque, 6-32 or M3 srew	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.75	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Juction-to-Ambient	—	62	

11/19/01