



The Infinite Bandwidth Company™

MIC94030/94031

TinyFET™ P-Channel MOSFET

Final Information

General Description

The MIC94030 and MIC94031 are 4-terminal silicon gate P-channel MOSFETs that provide low on-resistance in a very small package.

Designed for high-side switch applications where space is critical, the MIC94030/1 exhibits an on-resistance of typically 0.75Ω at 4.5V gate-to-source voltage. The MIC94030/1 also operates with only 2.7V gate-to-source voltage.

The MIC94030 is the basic 4-lead P-channel MOSFET. The MIC94031 is a variation that includes an internal gate pull-up resistor that can reduce the system parts count in many applications.

The 4-terminal SOT-143 package permits a substrate connection separate from the source connection. This 4-terminal configuration improves the θ_{JA} (improved heat dissipation) and makes analog switch applications practical.

The small size, low threshold, and low $R_{DS(on)}$ make the MIC94030/1 the ideal choice for PCMCIA card sleep mode or distributed power management applications.

Features

- 13.5V minimum drain-to-source breakdown
- 0.75Ω typical on-resistance at 4.5V gate-to-source voltage
- 0.45Ω typical on-resistance at 10V gate-to-source voltage
- Operates with 2.7V gate-to-source voltage
- Separate substrate connection for added control
- Industry's smallest surface mount package

Applications

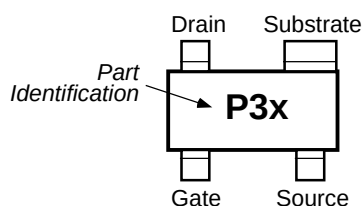
- Distributed power management
- PCMCIA card power management
- Battery-powered computers, peripherals
- Hand-held bar-code scanners
- Portable communications equipment

Ordering Information

Part Number	Temperature Range*	Package
MIC94030BM4	-55°C to +150°C	SOT-143
MIC94031BM4	-55°C to +150°C	SOT-143

* Operating Junction Temperature

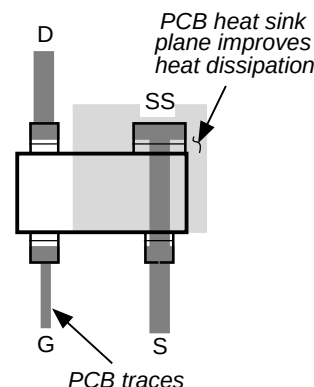
Pin Configuration



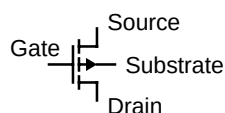
SOT-143 Package (M4)

Part Number	Identification
MIC94030BM4	P30
MIC94031BM4	P31

Typical PCB Layout

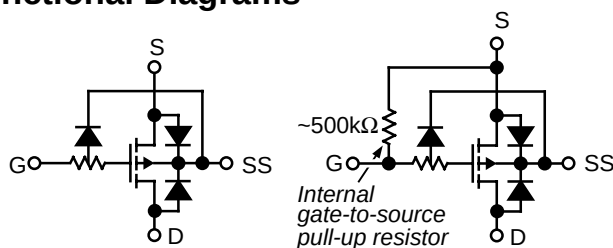


Schematic Symbol



Schematic Symbol

Functional Diagrams



MIC94030

MIC94031

Patents 5,355,008; 5,589,702

Micrel, Inc. • 1849 Fortune Drive • San Jose, CA 95131 • USA • tel + 1 (408) 944-0800 • fax + 1 (408) 944-0970 • <http://www.micrel.com>

Absolute Maximum Ratings

Voltage and current values are negative. Signs not shown for clarity.

Drain-to-Source Voltage (pulse)	16V
Gate-to-Source Voltage (pulse)	16V
Continuous Drain Current	
$T_A = 25^\circ\text{C}$	1A
$T_A = 100^\circ\text{C}$	0.5A
Operating Junction Temperature	-55°C to $+150^\circ$
Storage Temperature	-55°C to $+150^\circ\text{C}$

Total Power Dissipation

$T_A = 25^\circ\text{C}$	568mW
$T_A = 100^\circ\text{C}$	227mW

Thermal Resistance

θ_{JA}	220°C/W
θ_{JC}	130°C/W

Lead Temperature

1/16" from case, 10s	$+300^\circ\text{C}$
----------------------------	----------------------

Electrical Characteristics

Voltage and current values are negative. Signs not shown for clarity.

Symbol	Parameter	Condition (Note 1)	Min	Typ	Max	Units
V_{BDSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu\text{A}$	13.5			V
V_{GS}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	0.6	1.0	1.4	V
I_{GSS}	Gate-Body Leakage	$V_{DS} = 0V, V_{GS} = 12V$, Note 2, Note 3			1	μA
R_{GS}	Gate-Source Resistor	$V_{DS} = 0V, V_{GS} = 12V$, Note 2, Note 4	500	750	1000	$k\Omega$
C_{ISS}	Input Capacitance	$V_{GS} = 0V, V_{DS} = 12V$		100		pF
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 12V, V_{GS} = 0V$			25	μA
		$V_{DS} = 12V, V_{GS} = 0V, T_J = 125^\circ\text{C}$		0.010	250	μA
$I_{D(ON)}$	On-State Drain Current	$V_{DS} = 10V, V_{GS} = 10V$, Note 5		6.3		A
$R_{DS(ON)}$	Drain-Source On-State Resist.	$V_{GS} = 10V, I_D = 100\text{mA}$		0.45	1.00	Ω
		$V_{GS} = 4.5V, I_D = 100\text{mA}$		0.75		Ω
		$V_{GS} = 2.7V, I_D = 100\text{mA}$		1.20		Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10V, I_D = 200\text{mA}$, Note 5		480		mS

Note 1 $T_A = 25^\circ\text{C}$ unless noted. Substrate connected to source for all conditions

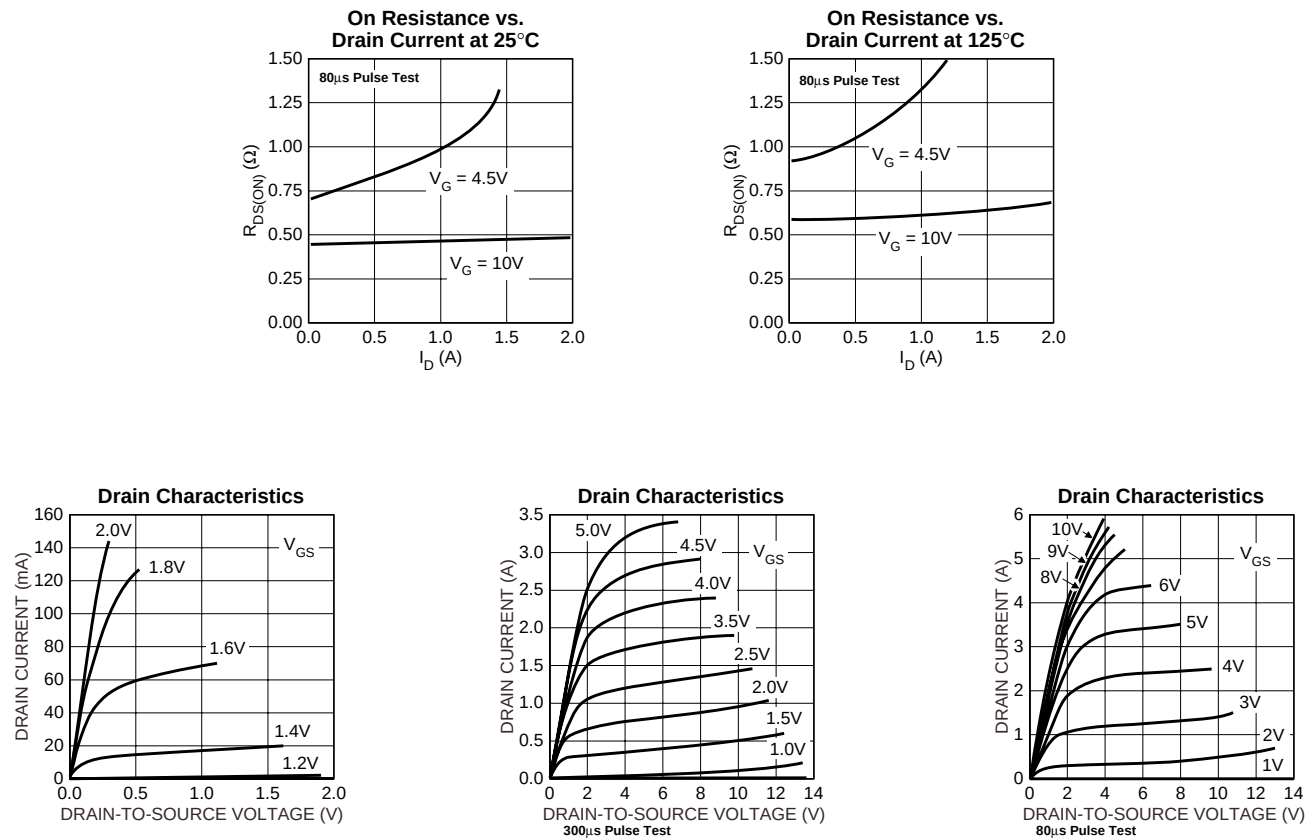
Note 2 ESD gate protection diode conducts during positive gate-to-source voltage excursions.

Note 3 MIC94030 only

Note 4 MIC94031 only

Note 5 Pulse Test: Pulse Width $\leq 80\mu\text{sec}$, Duty Cycle $\leq 0.5\%$

Typical Characteristics



Typical Applications

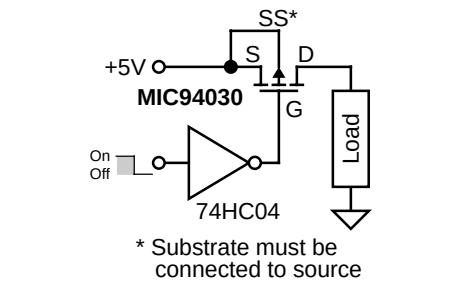


Figure 1. Power Switch Application

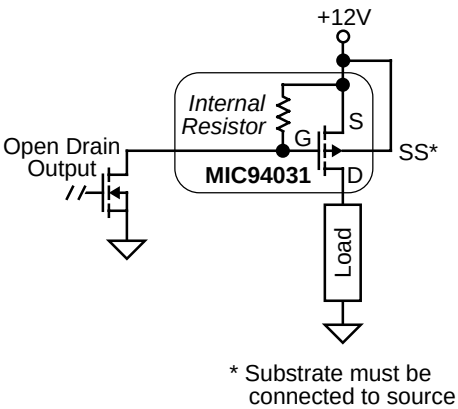


Figure 2. Power Control Application

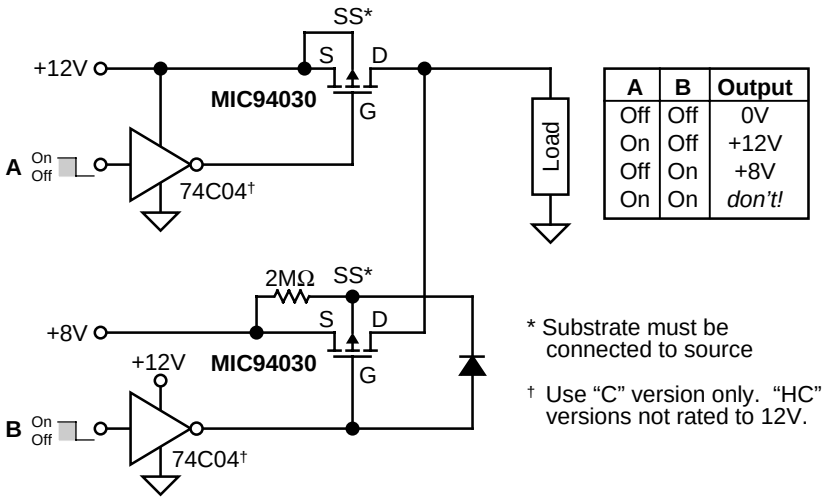
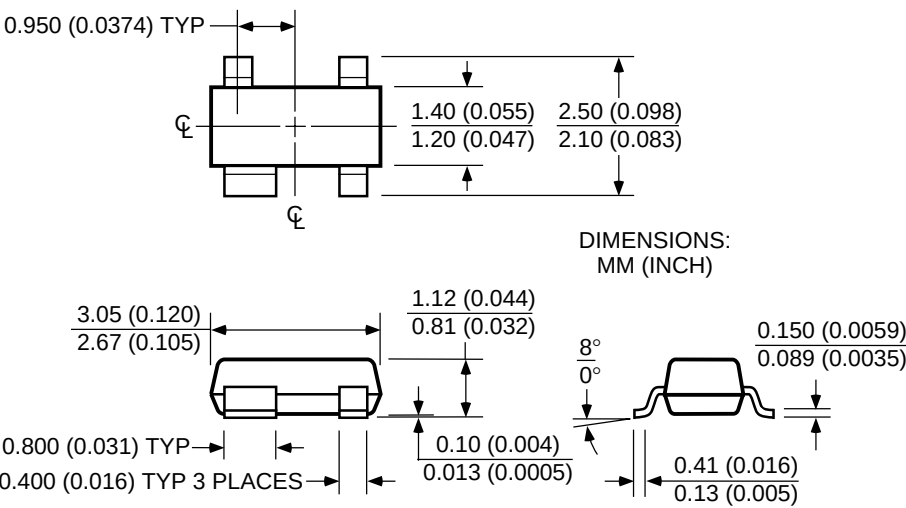


Figure 3. Analog Switch Application

Package Information



SOT-143 (M4)

MICREL INC. 1849 FORTUNE DRIVE SAN JOSE, CA 95131 USA

TEL + 1 (408) 944-0800 FAX + 1 (408) 944-0970 WEB <http://www.micrel.com>

This information is believed to be accurate and reliable, however no responsibility is assumed by Micrel for its use nor for any infringement of patents or other rights of third parties resulting from its use. No license is granted by implication or otherwise under any patent or patent right of Micrel Inc.

© 1997 Micrel Incorporated