



MIC94030/94031

TinyFET[®] P-Channel MOSFET

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

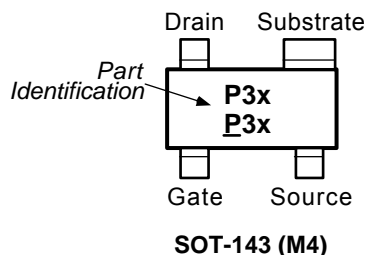
Applications

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

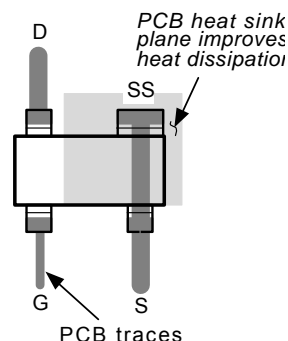
Ordering Information

Part Number				Junction Temp. Range	Package
Standard	Marking	Pb-Free	Marking		
MIC94030BM4	P30	MIC94030YM4	<u>P</u> 30	-55° to +150°C	SOT-143
MIC94031BM4	P31	MIC94031YM4	<u>P</u> 31	-55° to +150°C	SOT-143

Pin Configuration



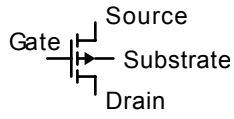
Typical PCB Layout



TinyFET is a registered trademark of Micrel, Inc.

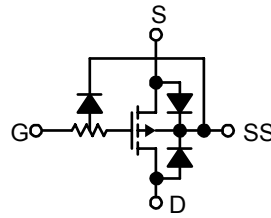
Micrel Inc. • 2180 Fortune Drive • San Jose, CA 95131 • USA • tel +1 (408) 944-0800 • fax + 1 (408) 474-1000 • <http://www.micrel.com>

Schematic Symbol

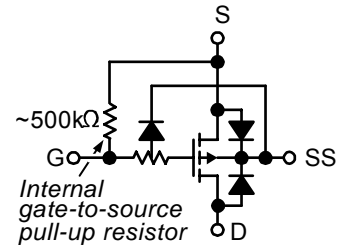


Schematic Symbol

Functional Diagrams



MIC94030



MIC94031

Absolute Maximum Ratings⁽¹⁾

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 $+150^\circ\text{C}$
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}	$220^\circ\text{C}/\text{W}$
θ_{JC}	$130^\circ\text{C}/\text{W}$
Lead Temperature	
1/16" from case, 10s.....	$+300^\circ\text{C}$

Electrical Characteristics

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

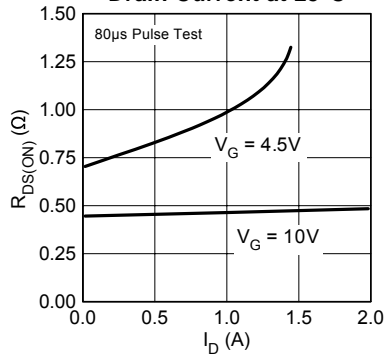
Symbol	Parameter	Condition (Note 1)	Min	Typ	Max	Units
V_{BDSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}$, $I_D = 250\mu\text{A}$	13.5			V
V_{GS}	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	0.6	1.0	1.4	V
I_{GSS}	Gate-Body Leakage	$V_{DS} = 0\text{V}$, $V_{GS} = 12\text{V}$,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

Notes:

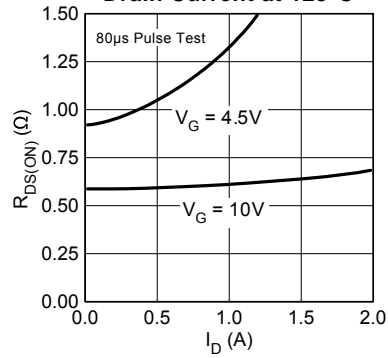
- $T_A = 25^\circ\text{C}$ unless noted. Substrate connected to source for all conditions.
- ESD gate protection diode conducts during positive gate-to-source voltage excursions.
- MIC94030 only.
- MIC94031 only.
- Pulse Test: Pulse Width $\leq 80\mu\text{sec}$, Duty Cycle $\leq 0.5\%$.

Typical Characteristics

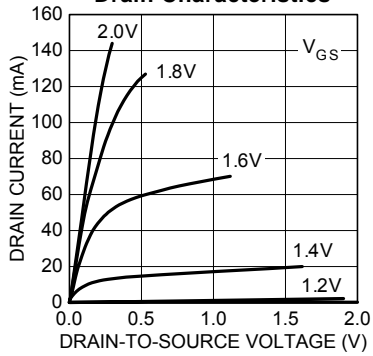
On Resistance vs. Drain Current at 25°C



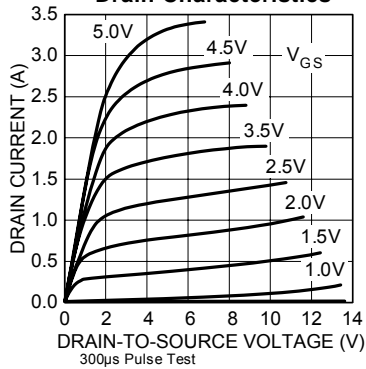
On Resistance vs. Drain Current at 125°C



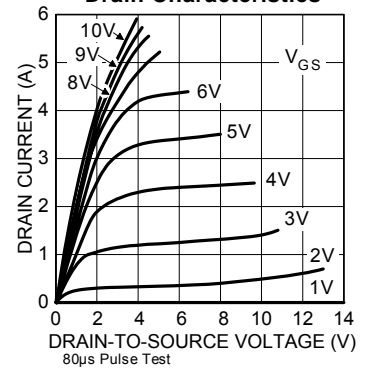
Drain Characteristics



Drain Characteristics



Drain Characteristics



Typical Applications

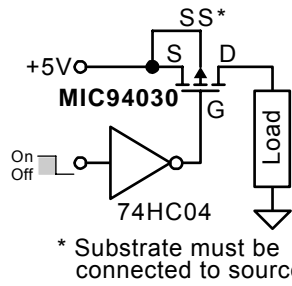


Figure 1. Power Switch Application

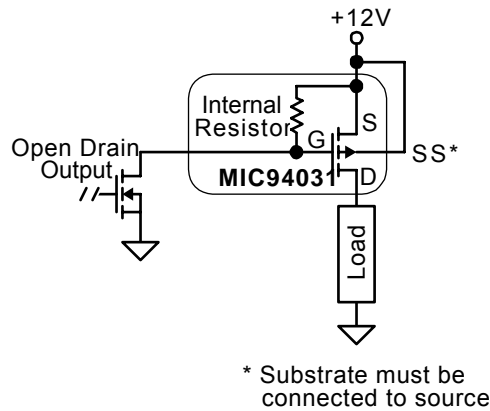


Figure 2. Power Control Application

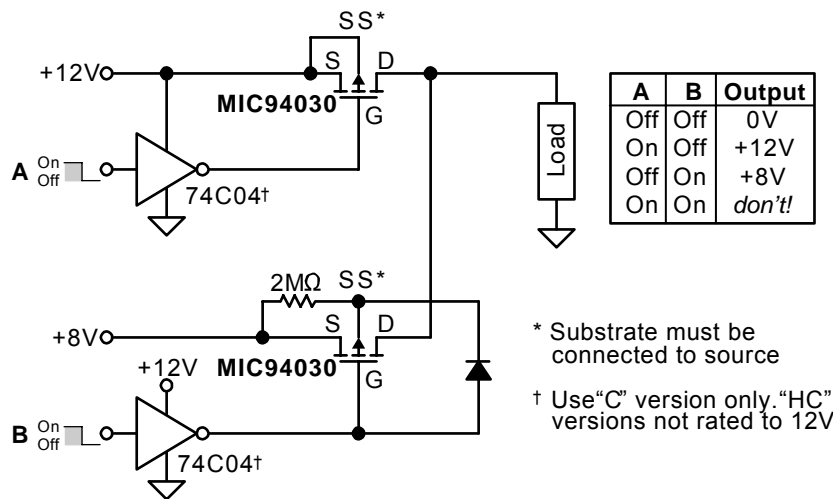
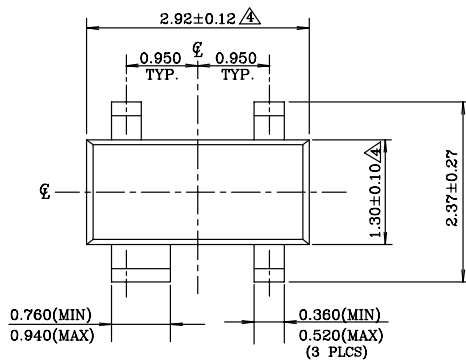
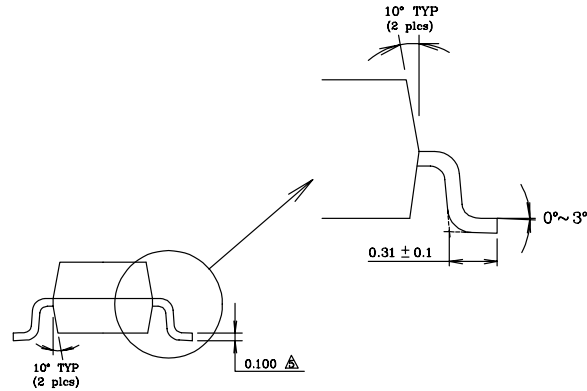


Figure 3. Analog Switch Application

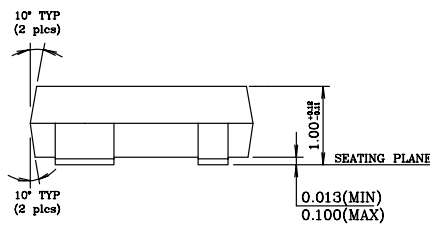
Package Information



TOP VIEW



END VIEW



SIDE VIEW

NOTE:

1. Dimensions and tolerances are as per ANSI Y14.5M, 1982.
2. Package surface to be mirror finish.
3. Die is facing up for mold & trim/form.
- △ Dimension are exclusive of mold flash and gate burr.
- ⊕ Dimension are exclusive of solder plating.

SOT-143 (M4)

MICREL, INC. 2180 FORTUNE DRIVE SAN JOSE, CA 95131 USA
 TEL +1 (408) 944-0800 FAX +1 (408) 474-1000 WEB <http://www.micrel.com>

The information furnished by Micrel in this data sheet is believed to be accurate and reliable. However, no responsibility is assumed by Micrel for its use. Micrel reserves the right to change circuitry and specifications at any time without notification to the customer.

Micrel Products are not designed or authorized for use as components in life support appliances, devices or systems where malfunction of a product can reasonably be expected to result in personal injury. Life support devices or systems are devices or systems that (a) are intended for surgical implant into the body or (b) support or sustain life, and whose failure to perform can be reasonably expected to result in a significant injury to the user. A Purchaser's use or sale of Micrel Products for use in life support appliances, devices or systems is a Purchaser's own risk and Purchaser agrees to fully indemnify Micrel for any damages resulting from such use or sale.

© 1997 Micrel, Incorporated.