



# MIC94030/94031

## TinyFET™ P-Channel MOSFET

### Preliminary 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  $\theta_{JA}$  (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

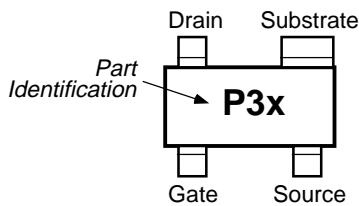
- Distributed power management
- PCMCIA card power management
- Battery-powered computers, peripherals
- Hand-held bar-code scanners
- Portable communications equipment

### 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

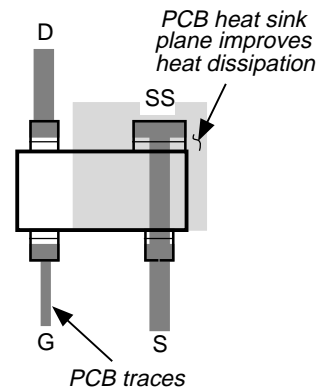
### Pin Configuration



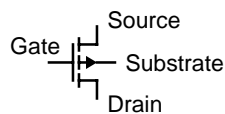
Part Number	Identification
MIC94030BM4	P30
MIC94031BM4	P31

SOT-143 Package (M4)

### Typical PCB Layout

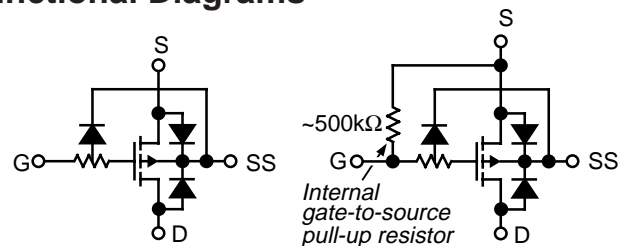


### Schematic Symbol



Schematic Symbol

### Functional Diagrams



MIC94030

MIC94031

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

## 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 .....	$-55^\circ\text{C}$ to $+150^\circ$
Storage Temperature .....	$-55^\circ\text{C}$ to $+150^\circ\text{C}$

Total Power Dissipation

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

Thermal Resistance

$\theta_{JA}$ .....	$220^\circ\text{C}/\text{W}$
$\theta_{JC}$ .....	$130^\circ\text{C}/\text{W}$

Lead Temperature

1/16" from case, 10s .....	$+300^\circ\text{C}$
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## 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	$V_{DS} = 0\text{V}, V_{GS} = 12\text{V}$ , <b>Note 2, Note 3</b>			1	$\mu\text{A}$
$R_{GS}$	Gate-Source Resistor	$V_{DS} = 0\text{V}, V_{GS} = 12\text{V}$ , <b>Note 2, Note 4</b>	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	$\mu\text{A}$
		$V_{DS} = 12\text{V}, V_{GS} = 0\text{V}, T_J = 125^\circ\text{C}$		0.010	250	$\mu\text{A}$
$I_{D(ON)}$	On-State Drain Current	$V_{DS} = 10\text{V}, V_{GS} = 10\text{V}$ , <b>Note 5</b>		6.3		A
$R_{DS(ON)}$	Drain-Source On-State Resist.	$V_{GS} = 10\text{V}, I_D = 100\text{mA}$		0.45		$\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 100\text{mA}$		0.75	1.00	$\Omega$
		$V_{GS} = 2.7\text{V}, I_D = 100\text{mA}$		1.20		$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 200\text{mA}$ , <b>Note 5</b>		480		mS

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

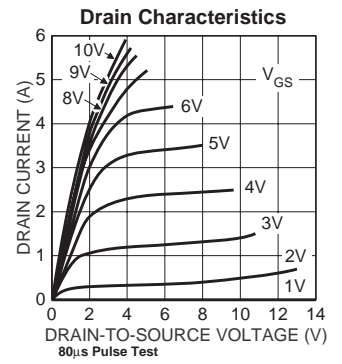
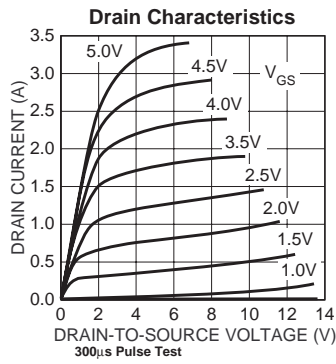
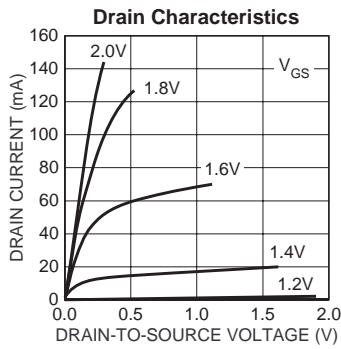
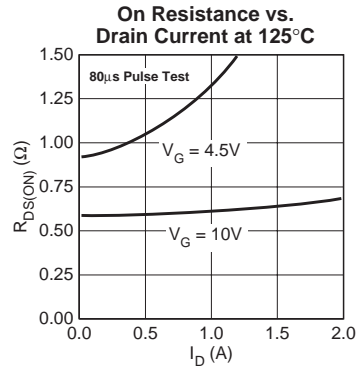
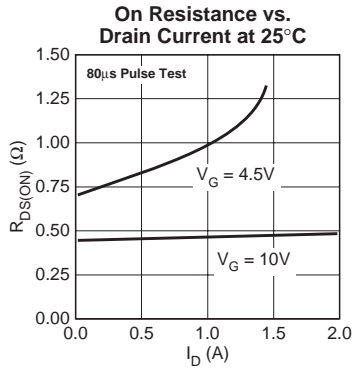
**Note 2** ESD gate protection diode conducts during positive gate-to-source voltage excursions.

**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

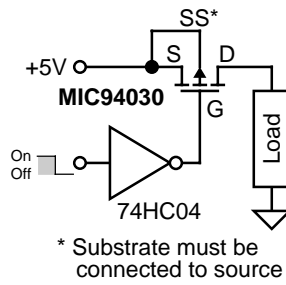


Figure 1. Power Switch Application

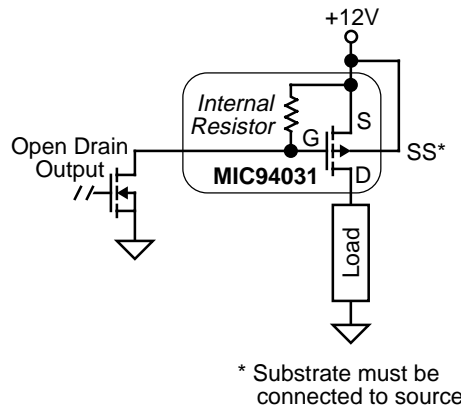


Figure 2. Power Control Application

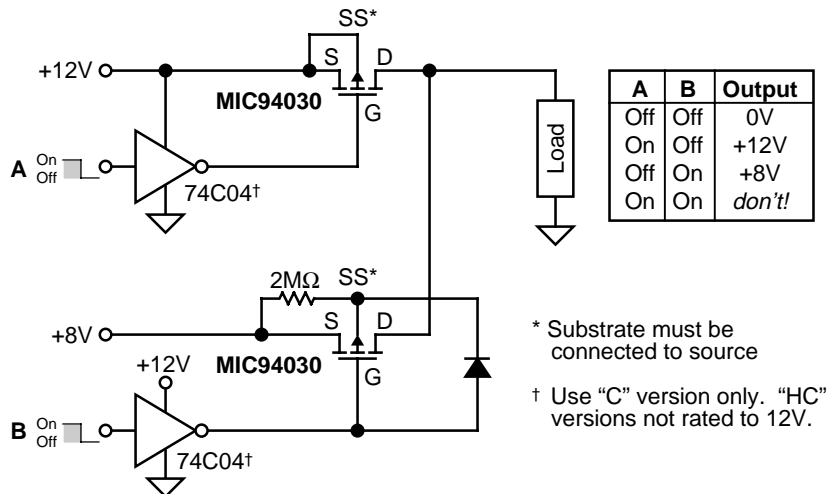


Figure 3. Analog Switch Application