

## 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  $0.75\Omega$  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
- $0.75\Omega$  typical on-resistance
  - at 4.5V gate-to-source voltage
- $0.45\Omega$  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

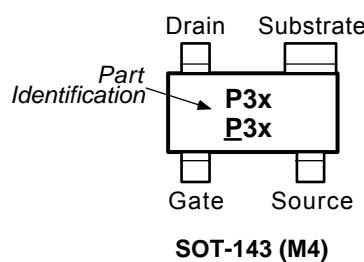
## Applications

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

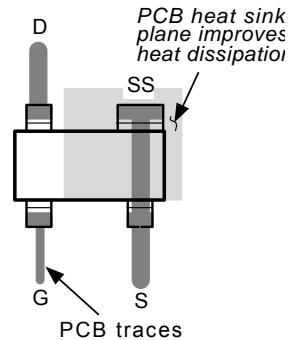
## Ordering Information

Part Number				Junction Temp. Range	Package
Standard	Marking	Pb-Free	Marking		
MIC94030BM4	P30	MIC94030YM4	P30	−55° to +150°C	SOT-143
MIC94031BM4	P31	MIC94031YM4	P31	−55° to +150°C	SOT-143

## Pin Configuration



## Typical PCB Layout

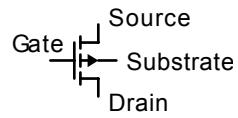
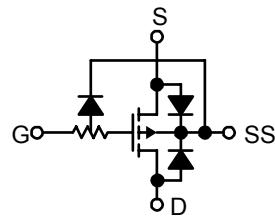
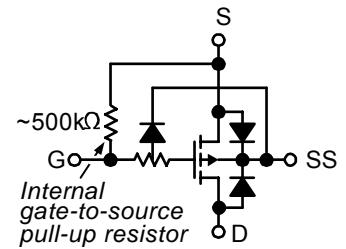


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M9999-071106

**Schematic Symbol****Schematic Symbol****Functional Diagrams****MIC94030****MIC94031**

## Absolute Maximum Ratings<sup>(1)</sup>

<i>Voltage and current values are negative. Signs not shown for clarity.</i>	
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 $+150^\circ\text{C}$
Storage Temperature.....	$-55^\circ\text{C}$ to $+150^\circ\text{C}$

<b>Total Power Dissipation</b>	
$T_A = 25^\circ\text{C}$ .....	568mW
$T_A = 100^\circ\text{C}$ .....	227mW
<b>Thermal Resistance</b>	
$\theta_{JA}$ .....	220°C/W
$\theta_{JC}$ .....	130°C/W
<b>Lead Temperature</b>	
$1/16''$ from case, 10s.....	+300°C

## Electrical Characteristics

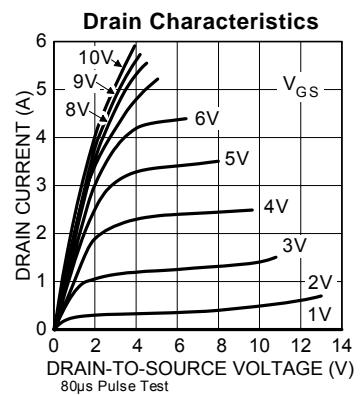
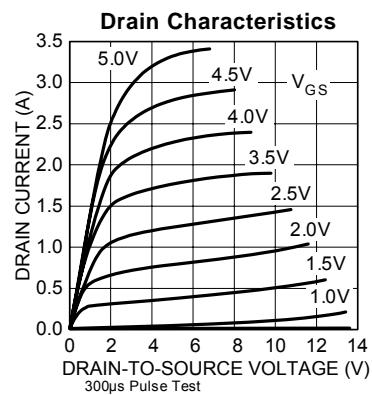
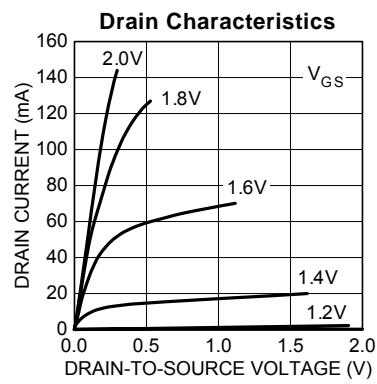
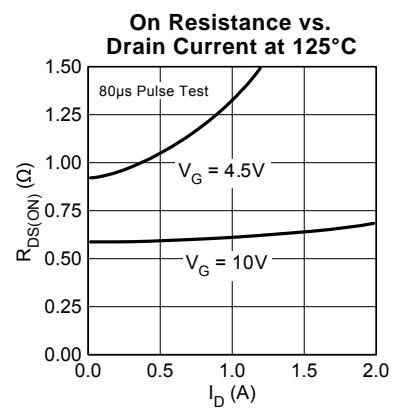
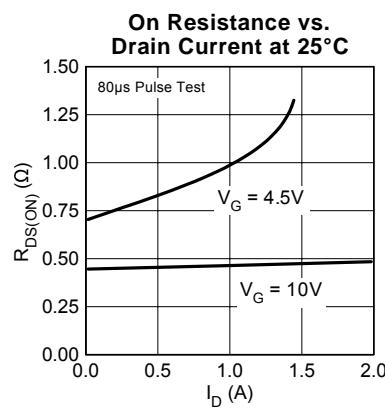
*Voltage and current values are negative. Signs not shown for clarity.*

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	$\mu\text{A}$
$R_{GS}$	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	$\mu\text{A}$
		$V_{DS} = 12\text{V}$ , $V_{GS} = 0\text{V}$ , $T_J = 125^\circ\text{C}$		0.010	250	$\mu\text{A}$
$I_{D(ON)}$	On-State Drain Current	$V_{DS} = 10\text{V}$ , $V_{GS} = 10\text{V}$ , Note 5		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		$\Omega$
		$V_{GS} = 2.7\text{V}$ , $I_D = 100\text{mA}$		1.20	1.00	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{V}$ , $I_D = 200\text{mA}$ , Note 5		480		mS

Notes:

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

## Typical Characteristics



## Typical Applications

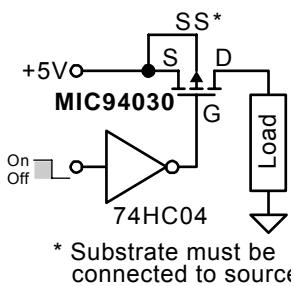


Figure 1. Power Switch Application

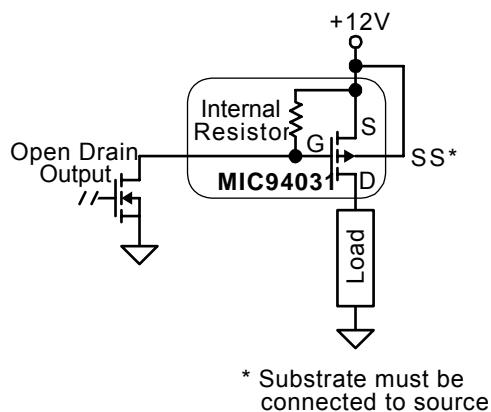


Figure 2. Power Control Application

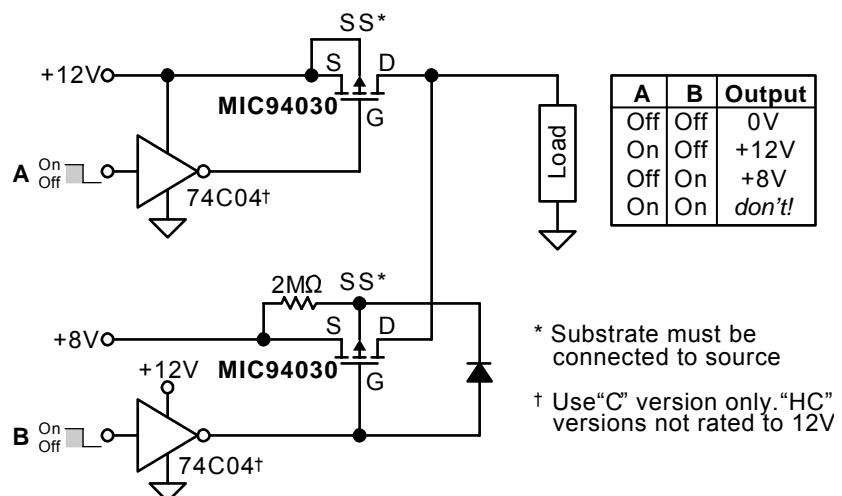
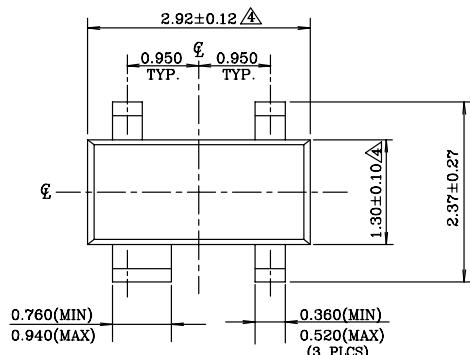
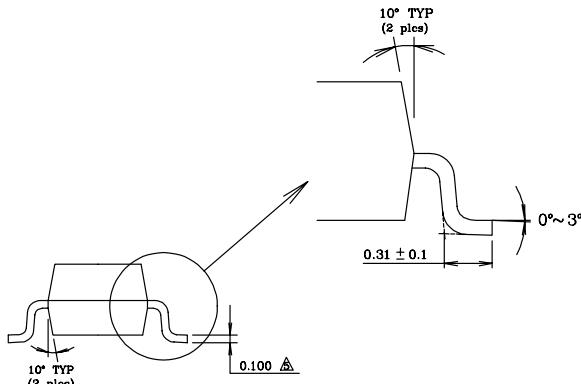


Figure 3. Analog Switch Application

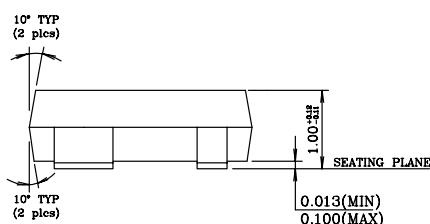
## Package Information



### 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)

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