



MIC94030 and MIC94031

P-Channel TinyFET™ MOSFET

Preliminary Information—Production Q1 '94

General Description

The MIC94030 and MIC94031 are 4-terminal silicon gate P-channel MOSFETs that each provide low R_{ON} in a very small package.

Designed for high-side switch applications where space is critical, the MIC94030/1 exhibits an $R_{DS(ON)}$ 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 which 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

- 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
- V_{GS} and V_{BDS} to 13.5V

Applications

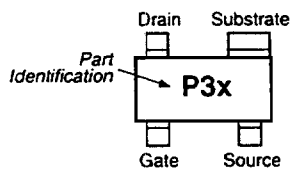
- PCMCIA Card Power Management
- Battery Powered Computers & Peripherals
- Portable Communications Equipment
- Hand Held Bar Code Scanners
- Distributed Power Management

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



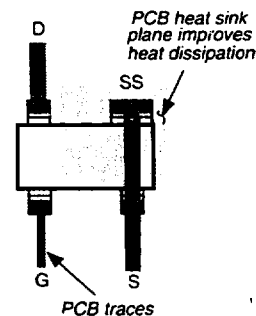
SOT-143 Package (M4)



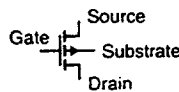
SOT-143 Package Actual Size

Part Number	Identification
MIC94030BM4	P30
MIC94031BM4	P31

Typical PCB Layout

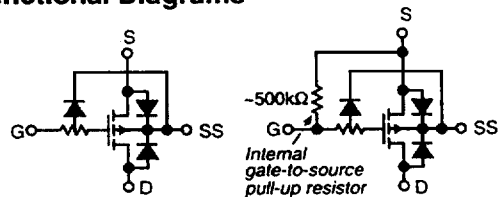


Schematic Symbol



Schematic Symbol

Functional Diagrams



MIC94030

MIC94031

TinyFET™ is a trademark of Micrel, Inc. Patents pending.

Appendix 2 P-Channel TinyFET™ MOSFET Specification

Typical Applications

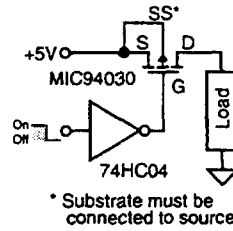


Figure 1. Power Switch Application

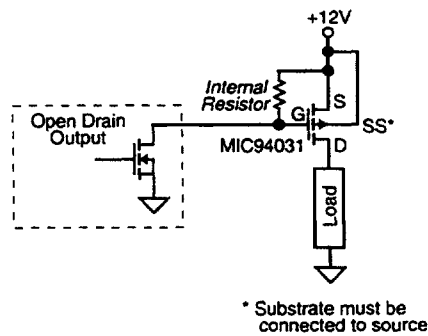


Figure 2. Power Control Application

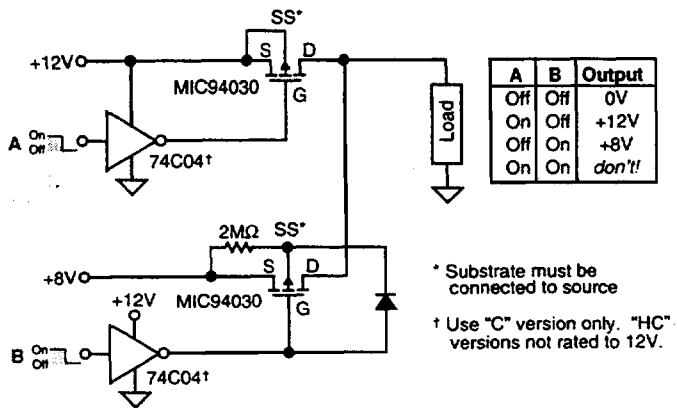


Figure 3. Analog Switch Application

Appendix 2 P-Channel TinyFET™ MOSFET Specification (con't)

Absolute Maximum Ratings

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

Drain to Source Voltage	16V
Gate to Source Voltage	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°C
Storage Temperature	-55°C to +150°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°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	$V_{GS} = 0V, I_D = 250\mu A$	13.5			V
V_{GS}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	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	1000	k Ω
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.	$V_{GS} = 10V, I_D = 100mA$		0.45		Ω
		$V_{GS} = 4.5V, I_D = 100mA$		0.75	1.00	Ω
		$V_{GS} = 2.7V, I_D = 100mA$		1.20		Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10V, I_D = 200mA$, Note 5		480		mS

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

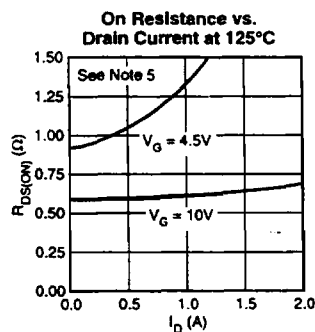
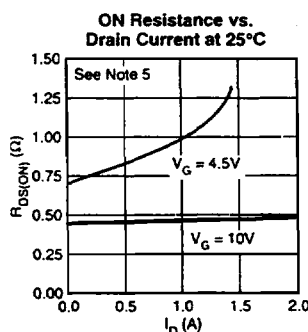
Note 2 ESD gate protection diode conducts during positive gate to source voltage excursions.

Note 3 MIC94030 only

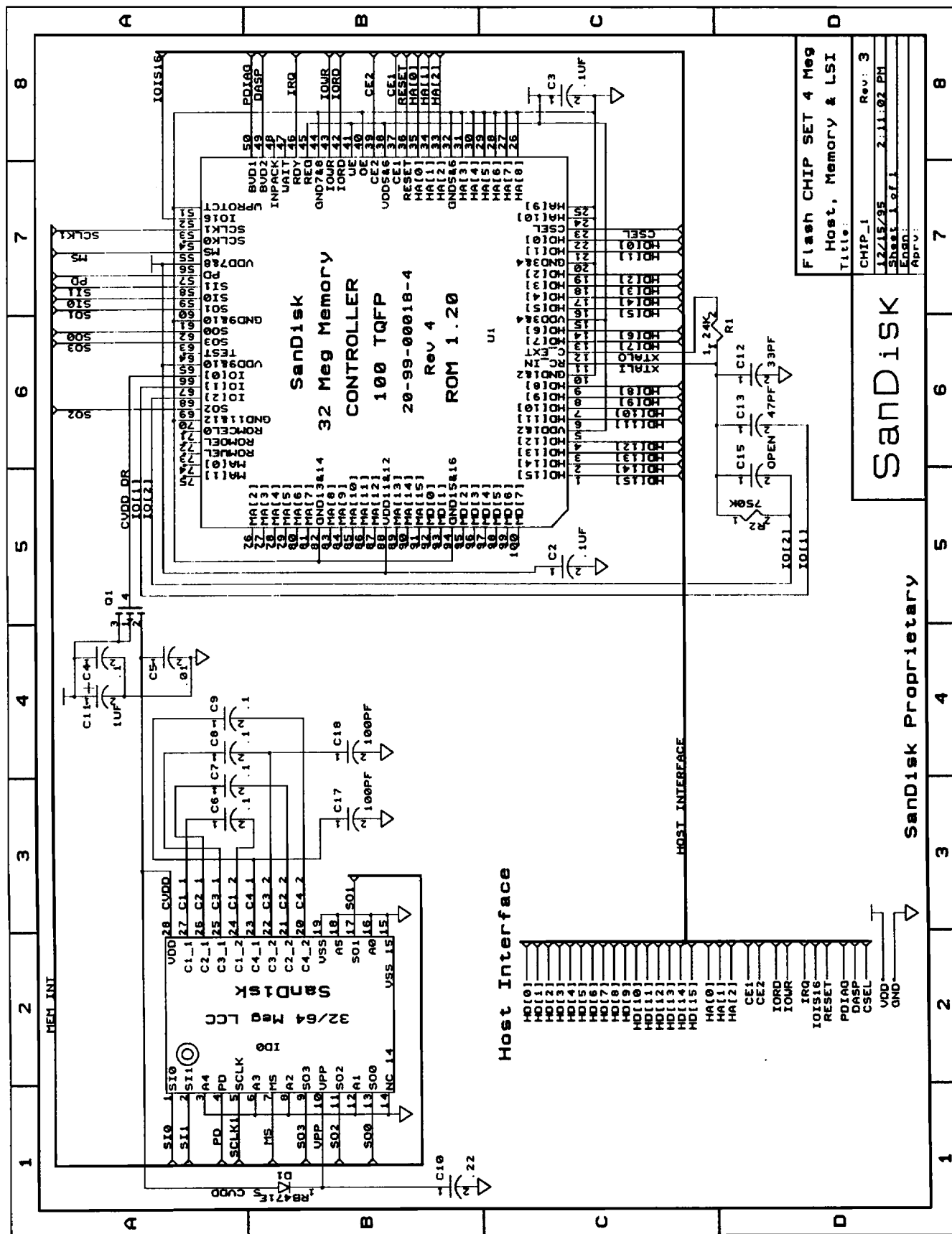
Note 4 MIC94031 only

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

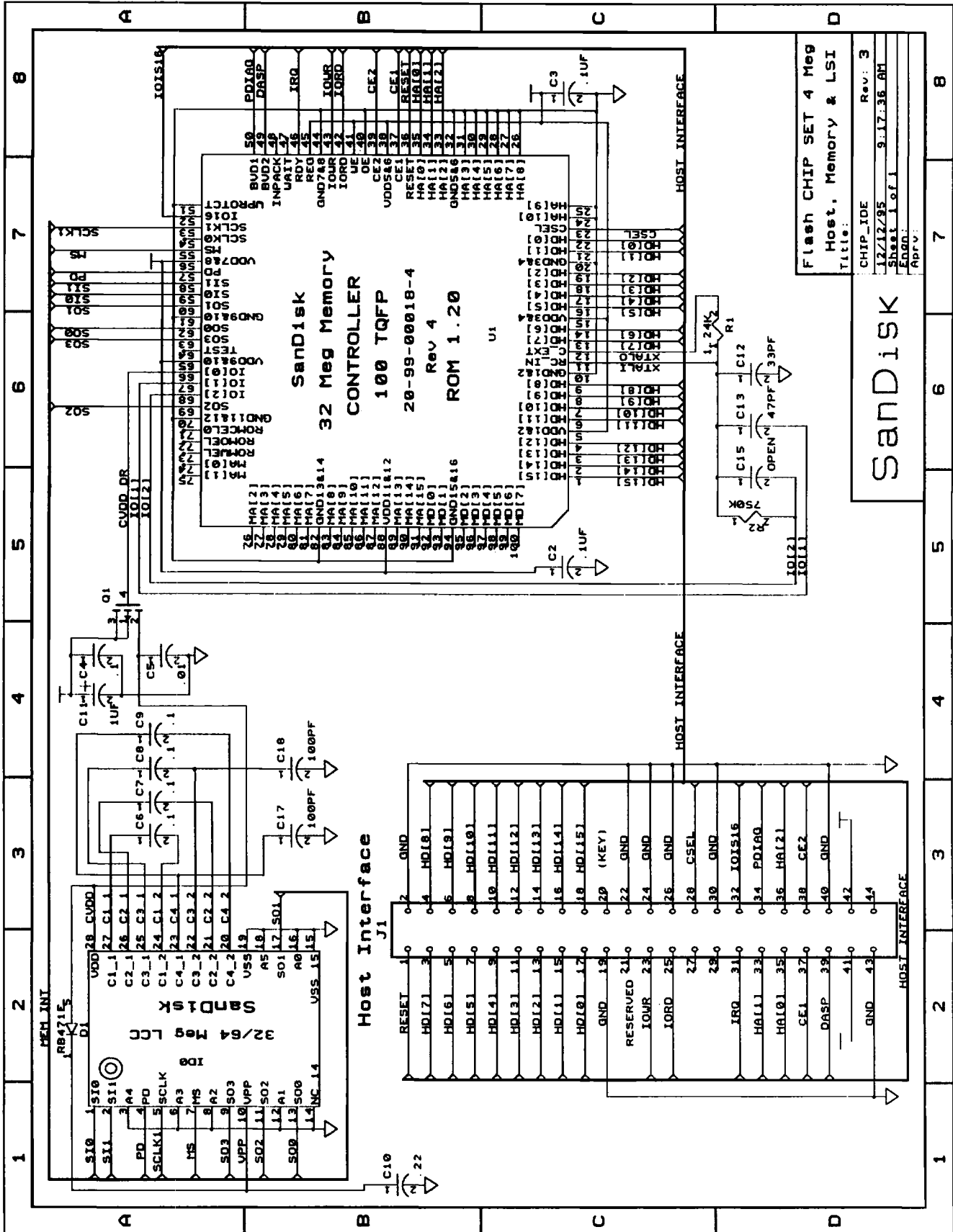
Typical Characteristics



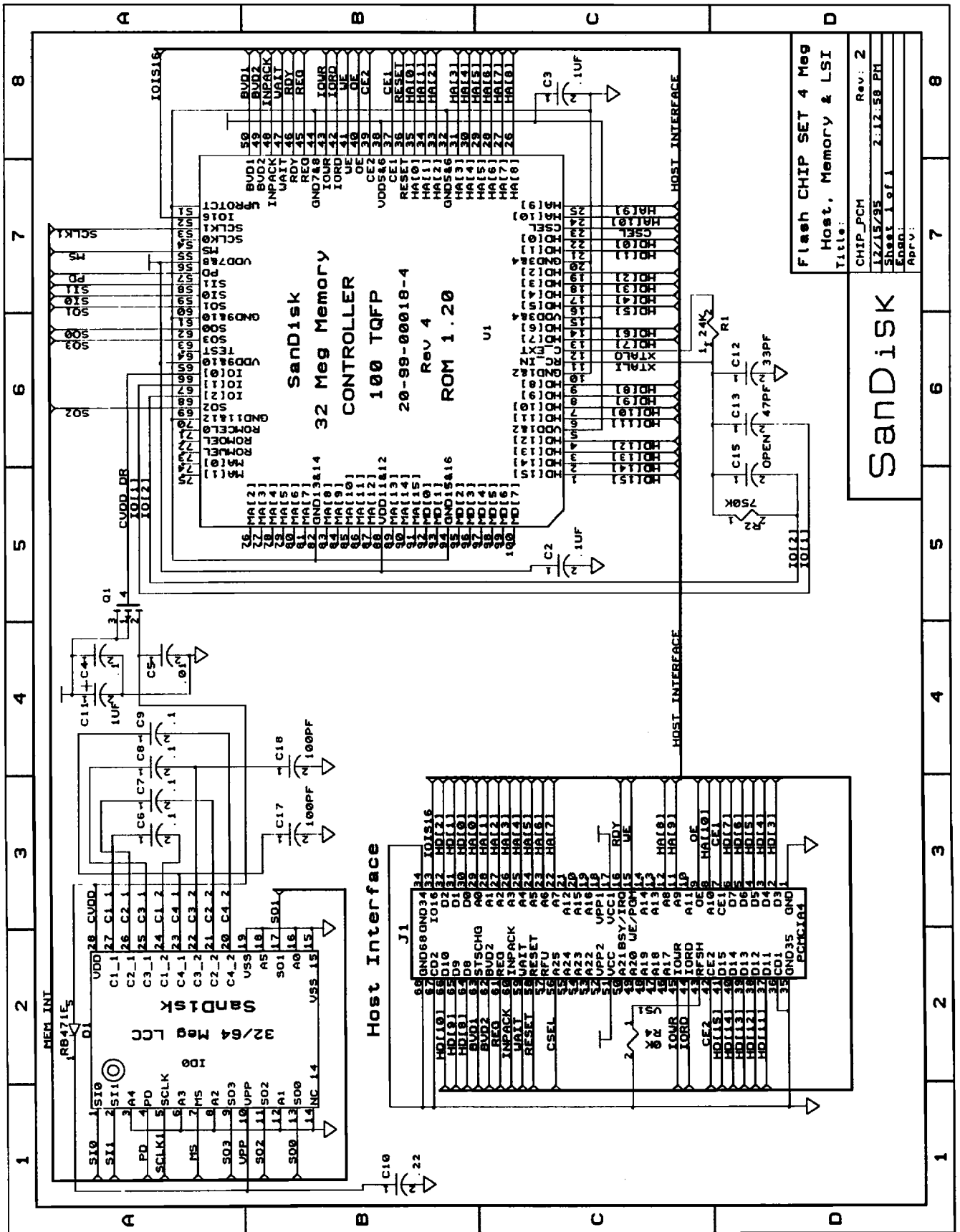
Appendix 2 P-Channel TinyFET™ MOSFET Specification (con't)



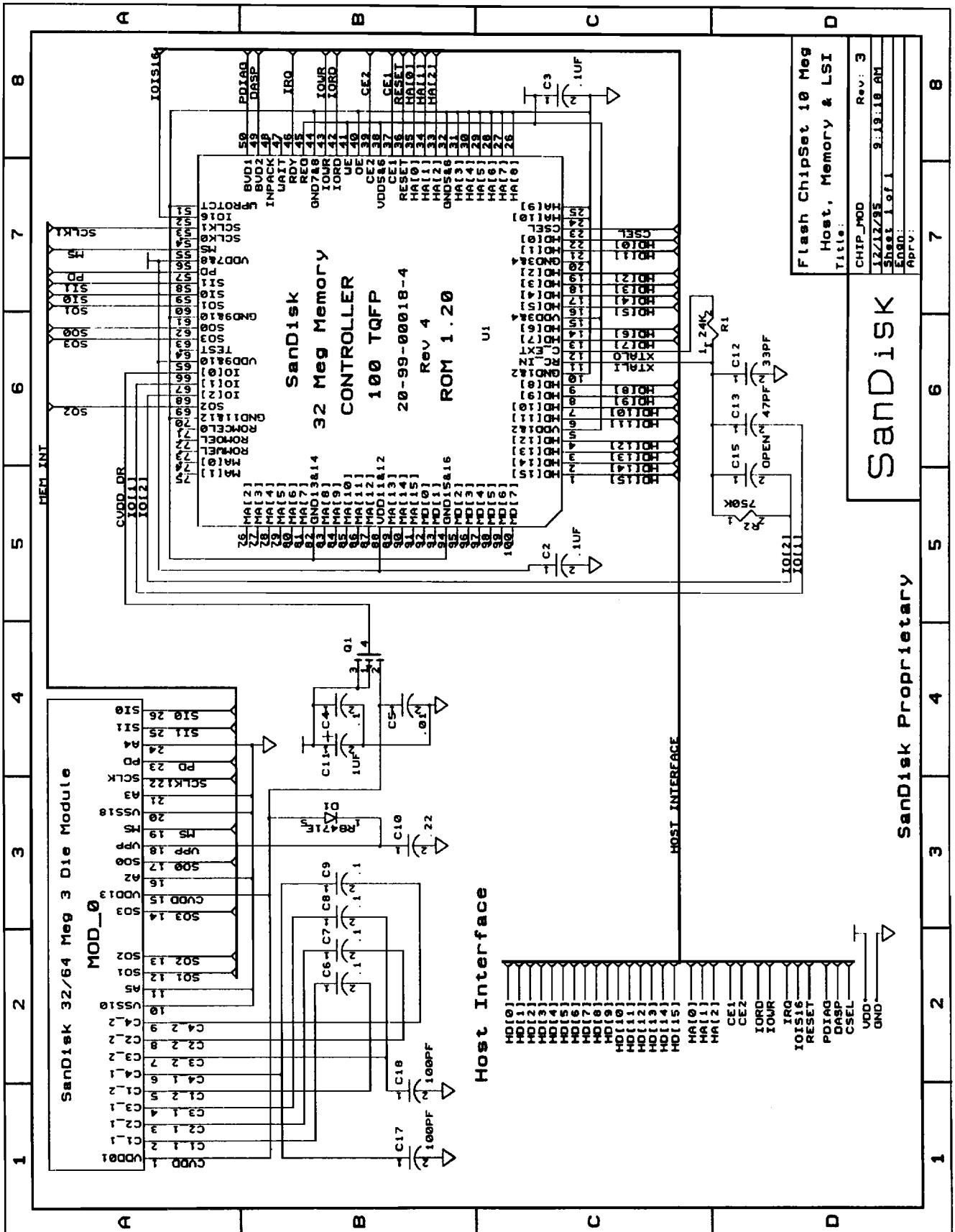
Appendix 3 Schematic Generic Host and 2 or 4 Megabyte LCC



Appendix 4 Schematic IDE Host and 2 or 4 Megabyte LCC



Appendix 5 Schematic PCMCIA Host and 2 or 4 Megabyte LCC



Flash ChipSet 10 Meg
 Host, Memory & LSI
 Title: CHIP_MOD Rev: 3
 12/12/95
 Sheet 1 of 1
 Date: 9:19:18 AM
 Appr:

Sandisk

Sandisk Proprietary

Appendix 6 Schematic Generic Host and 10 Megabyte SIMM