VMP 1 VMP 11 VMP 12
MOSPOWER™ FET

Siliconix

N-CHANNEL ENHANCEMENT-MODE POWER MOSFET

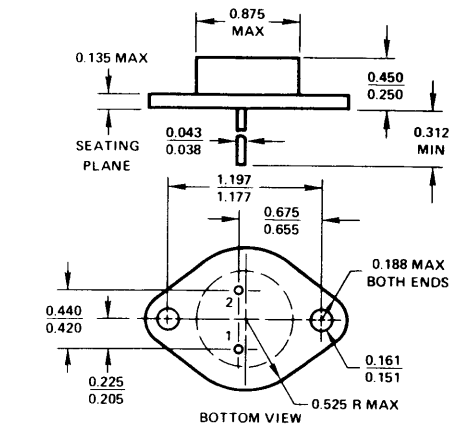
May 1976

Normally OFF Power MOSFET especially suited for switching and amplifier applications where high current, high speed, and linearity are desired.

- No Thermal Runaway
- No Secondary Breakdown
- CMOS Logic Compatible Input
- No Minority Carrier Storage Time
- High Speed Switching (4 nsec Typ at 1 Amp)
- Highly Linear Transfer Characteristics
- High Input Impedance
- Zener Protected Gate to Withstand Overload

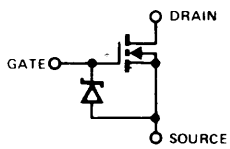
ABSOLUTE MAXIMUM RATINGS

Maximum Drain-Source Voltage	VMP 11	35 V
	VMP 1	60 V
Maximum Drain-Gate Voltage	VMP 12	90 V
Maximum Continuous Drain Current		2.0 A
Maximum Gate (Zener) Current		10 mA
Maximum Gate (Zener) Voltage		15 V
Maximum Dissipation @ 25°C Case Temperature		25 W
Thermal Derating Factor		5°C/W
Temperature (Operating and Storage)		−55 to +150°C



TO-3

ALL DIMENSIONS IN INCHES



PIN	OUT
1	G
2	S
Case	Drain

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

			Characteristics	VMP 11 Min	VMP 11 Typ	VMP 11 Max	VMP 1 Min	VMP 1 Typ	VMP 1 Max	VMP 12 Min	VMP 12 Typ	VMP 12 Max	Unit	Test Conditions
1	STATIC	BV_{DSS}	Drain-Source Breakdown	35			60			90			V	V_{GS} = 0; I_D = 100 μA
2	STATIC	$V_{GS(th)}$	Gate Threshold Voltage	0.8		2.0	0.8		2.0	0.8		2.0	V	V_{GS} = V_{DS}; I_D = 1 mA
3	STATIC	I_{GSS}	Gate-Body Leakage			0.5			0.5			0.5	μA	V_{GS} = 15 V; V_{DS} = 0
4	STATIC	$I_{D(off)}$	Drain Cutoff Current			0.5			0.5			0.5	μA	V_{GS} = 0; V_{DS} = 24 V
5	STATIC	$I_{D(on)}$	Drain ON Current*	1	2.0		1	2.0		1	2.0		A	V_{DS} = 24 V; V_{GS} = 10 V
6	STATIC	$I_{D(on)}$	Drain ON Current*	0.5			0.5			0.3			A	V_{DS} = 24 V; V_{GS} = 5 V
7	SWITCH	$r_{DS(on)}$	Drain-Source ON Resistance*		2.0	2.5		3.0	3.5		3.7	4.5	Ω	V_{GS} = 5 V; I_D = 0.1 A
8	SWITCH	$r_{DS(on)}$	Drain-Source ON Resistance*		2.4	3.0		3.3	4.0		4.6	5.5	Ω	V_{GS} = 5 V; I_D = 0.3 A
9	SWITCH	$r_{DS(on)}$	Drain-Source ON Resistance*		1.2	1.5		1.9	2.5		2.6	3.2	Ω	V_{GS} = 10 V; I_D = 0.5 A
10	SWITCH	$r_{DS(on)}$	Drain-Source ON Resistance*		1.4	1.8		2.2	3.0		3.4	4.0	Ω	V_{GS} = 10 V; I_D = 1 A
11	DYNAMIC	g_m	Forward Transconductance*	200	270		200	270		170			m℧	V_{DS} = 24 V; I_D = 0.5 A
12	DYNAMIC	C_{iss}	Input Capacitance		48			48			48		pF	V_{GS} = 0; V_{DS} = 24 V f = 1 MHz
13	DYNAMIC	C_{rss}	Reverse Transfer Capacitance		7			7			7		pF	V_{GS} = 0; V_{DS} = 24 V f = 1 MHz
14	DYNAMIC	C_{oss}	Common Source Output Capacitance		33			33			33		pF	V_{GS} = 0; V_{DS} = 24 V f = 1 MHz
15	DYNAMIC	t_{ON}	Turn ON Time**		4	10		4	10		4	10	ns	See Switching Time Test Circuit
16	DYNAMIC	t_{OFF}	Turn OFF Time**		4	10		4	10		4	10	ns	See Switching Time Test Circuit

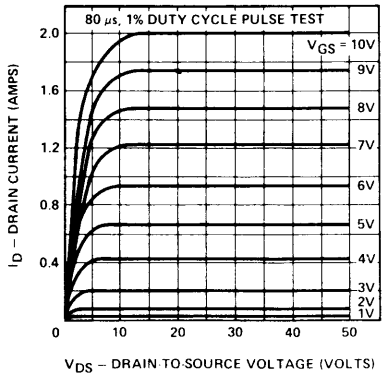
*Pulse Test **Sample Test

Pulse Test Pulse Width = 80 μsec, Duty Cycle = 1%

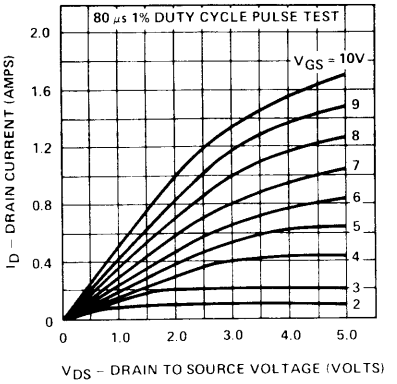
VMC

TYPICAL VMP 1 PERFORMANCE CURVES (25°C unless otherwise noted)

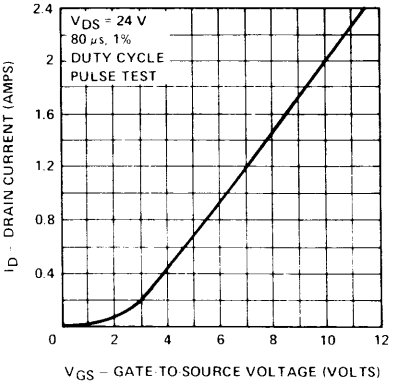
Output Characteristics



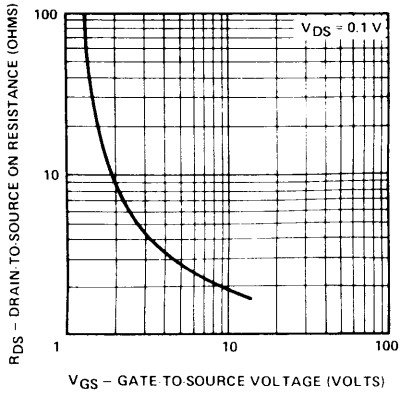
Saturation Characteristics



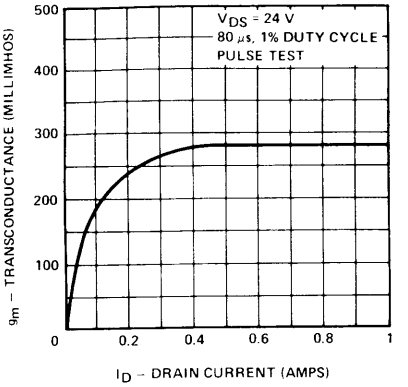
Transfer Characteristic



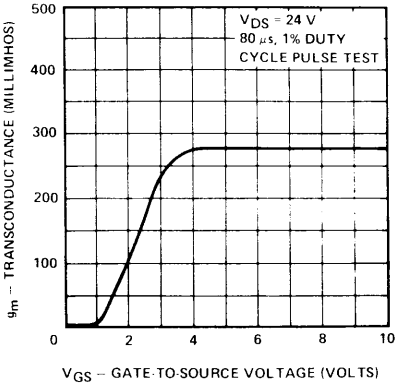
Drain-to-Source ON Resistance vs Gate-to-Source Voltage



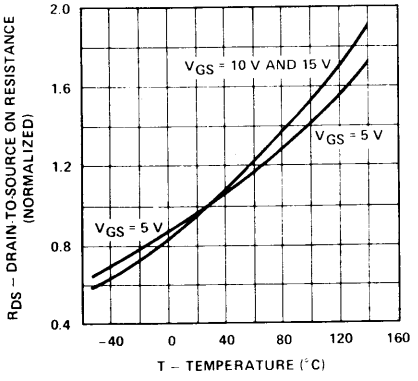
Transconductance vs Drain Current



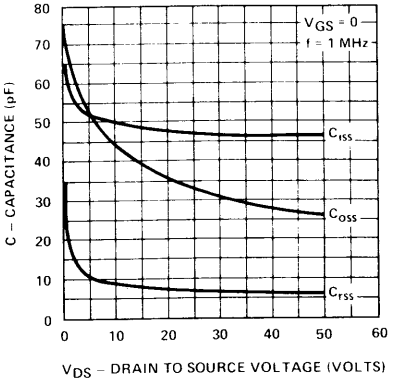
Transconductance vs Gate-to-Source Voltage



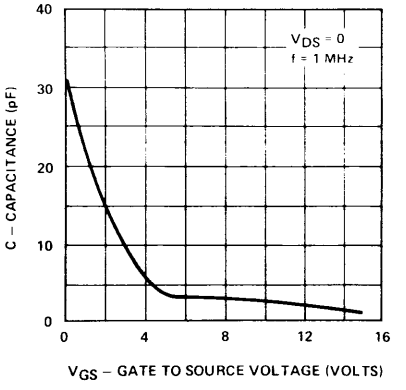
Normalized Drain-to-Source ON Resistance vs Temperature



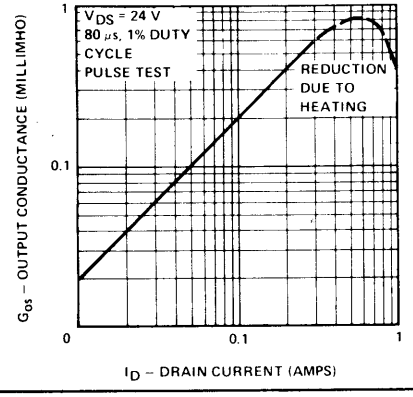
Capacitance vs Drain-to-Source Voltage



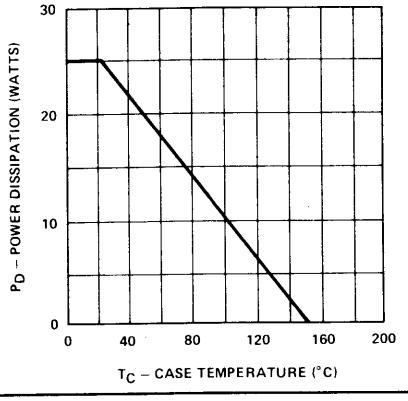
Capacitance vs Gate-to-Source Voltage



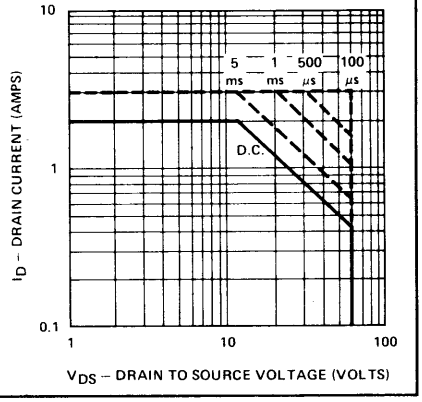
Output Conductance vs Drain Current



Power Dissipation vs Case Temperature

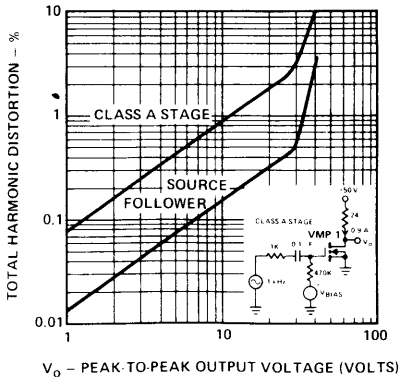


Maximum Safe Operating Region

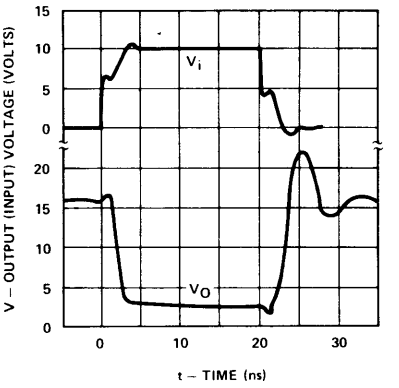


TYPICAL VMP 1 PERFORMANCE CURVES (Cont'd) (25°C unless otherwise noted)

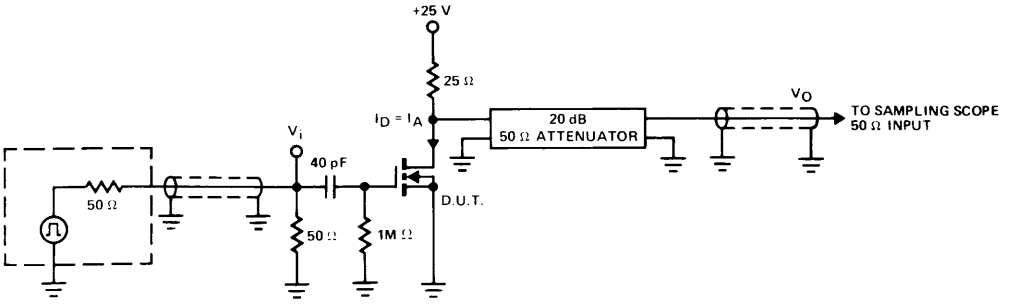
Distortion vs Signal Output



Switching Waveforms

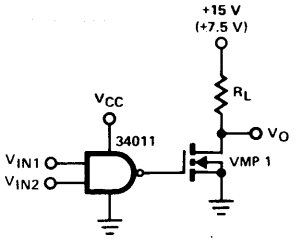


Switching Time Test Circuit

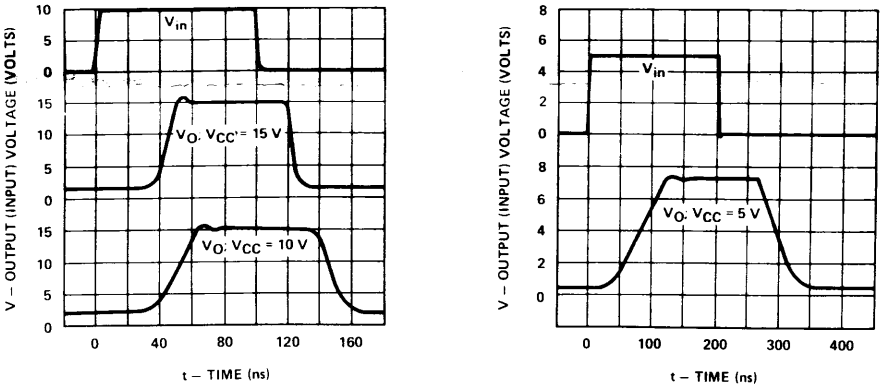


APPLICATIONS

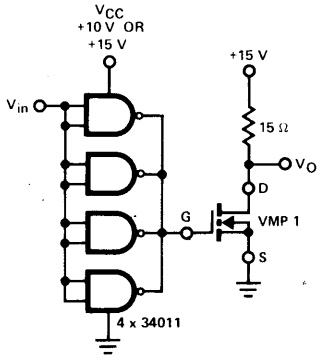
CMOS Compatible Switch



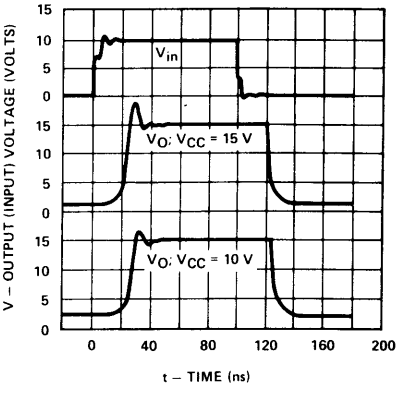
CMOS Switching Waveforms



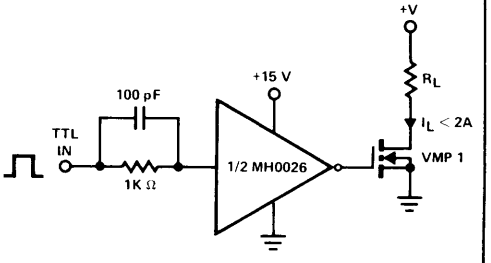
High Speed CMOS Compatible Switch



High Speed CMOS Switch Performance

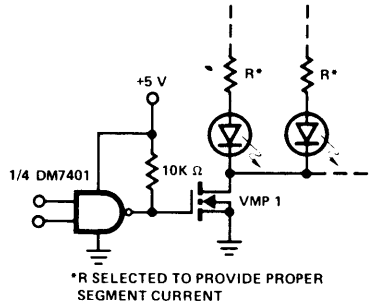


TTL Compatible High Speed High Current Switch

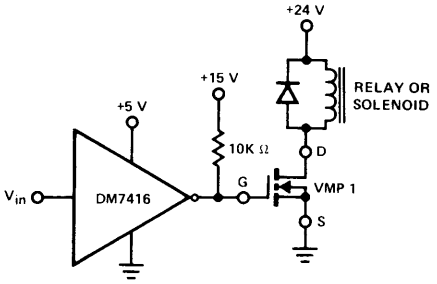


APPLICATIONS (Cont'd)

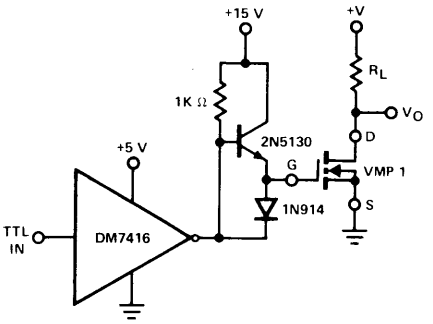
TTL Logic Compatible LED Driver



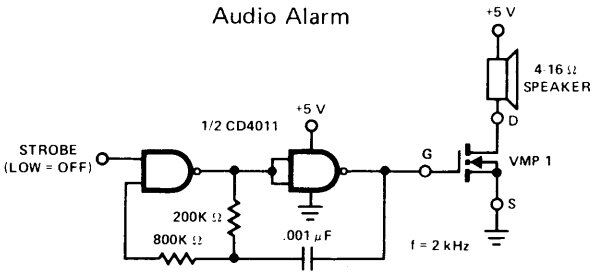
TTL Logic Compatible High Current Solenoid Driver



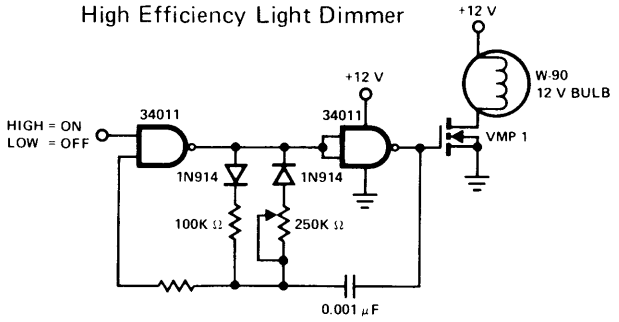
High Speed Open Collector TTL Interface



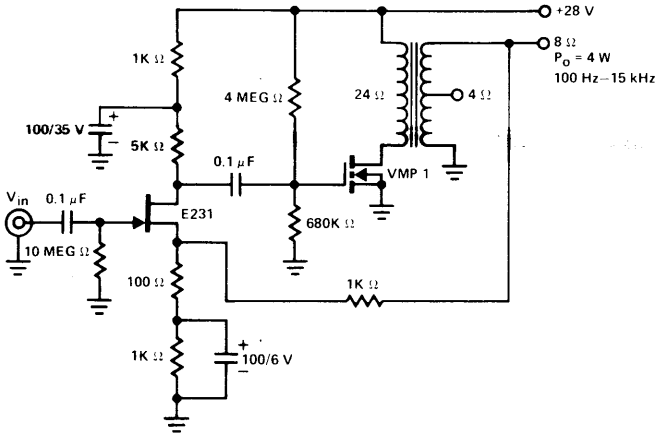
Audio Alarm



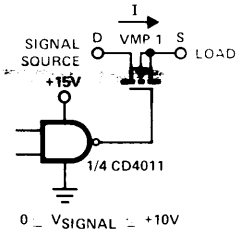
High Efficiency Light Dimmer



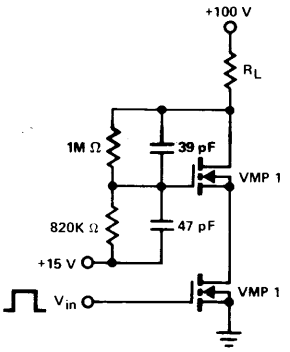
A Simple Audio Power Amplifier



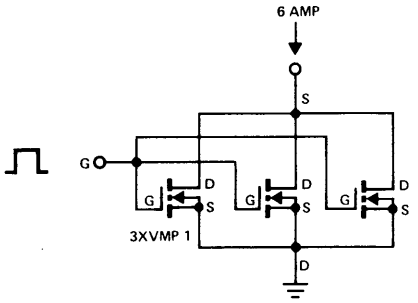
Low Resistance Analog Switch



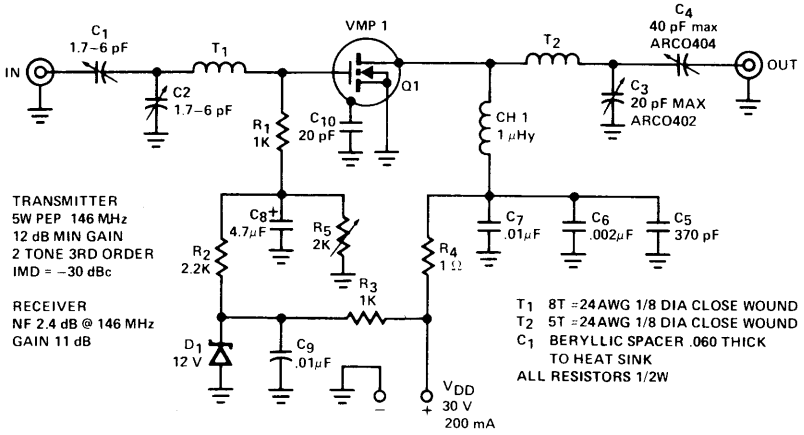
Series Operation



Parallel Operation



144–146 MHz Linear Amplifier



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Siliconix

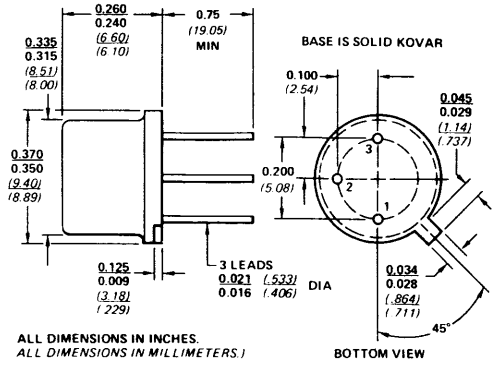
VMP 2 VMP 21 VMP 22
MOSPOWER™ FET

N-CHANNEL ENHANCEMENT-MODE POWER MOSFET

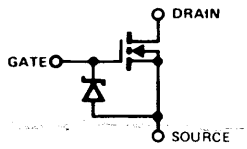
May 1976

Normally OFF MOSFET especially suited for switching where high input impedance and fast switching times are desired.

- **No Thermal Runaway**
- **No Secondary Breakdown**
- **CMOS Logic Compatible Input**
- **No Minority Carrier Storage Time**
- **High Speed Switching (4 nsec Typ at 0.5 Amp)**
- **High Input Impedance**
- **Zener Protected Gate to Withstand Overload**



TO-39



PIN	OUT
1	S
2	G
3	Drain & Case

ABSOLUTE MAXIMUM RATINGS

Maximum Drain-Source Voltage	VMP 21	35 V
	VMP 2	60 V
Maximum Drain-Gate Voltage	VMP 22	90 V
Maximum Continuous Drain Current		1.5 A
Maximum Gate (Zener) Current		10 mA
Maximum Gate (Zener) Voltage		15 V
Maximum Dissipation @ 25°C Case Temperature		4 W
Thermal Derating Factor		30°C/W
Maximum Free Air Dissipation @ 25°C Ambient Temp.		1 W
Derate Above 25°C		125°C/W
Temperature (Operating and Storage)		–55 to +150°C

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

		Characteristics		VMP 21			VMP 2			VMP 22			Unit	Test Conditions
				Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
1	STATIC	BV_{DSS}	Drain-Source Breakdown	35			60			90			V	V_{GS} = 0; I_D = 100 μA
2	STATIC	$V_{GS(th)}$	Gate Threshold Voltage	0.8		2.0	0.8		2.0	0.8		2.0	V	V_{GS} = V_{DS}; I_D = 1 mA
3	STATIC	I_{GSS}	Gate-Body Leakage			0.5			0.5			0.5	μA	V_{GS} = 15 V; V_{DS} = 0
4	STATIC	$I_{D(off)}$	Drain Cutoff Current			0.5			0.5			0.5	μA	V_{GS} = 0; V_{DS} = 24 V
5	SWITCH	$r_{DS(on)}$	Drain Source ON Resistance*		2.0	2.5		3.0	3.5		3.7	4.5	Ω	V_{GS} = 5V; I_D = 0.1 A
6	SWITCH				2.4	3.0		3.3	4.0		4.6	5.5	Ω	V_{GS} = 5 V; I_D = 0.3 A
7	SWITCH				1.2	1.5		1.8	2.5		2.8	3.5	Ω	V_{GS} = 10 V; I_D = 0.5 A
8	SWITCH				1.4	2.0		2.2	3.0		3.8	4.5	Ω	V_{GS} = 10 V; I_D = 1 A
9	DYNAMIC	g_m	Forward Transconductance*		270			270			210		m℧	V_{DS} = 10 V; I_D = 0.4 A
10	DYNAMIC	C_{iss}	Input Capacitance		50			50			50		pF	V_{GS} = 0; V_{DS} = 10 V f = 1 MHz
11	DYNAMIC	C_{rss}	Reverse Transfer Capacitance		8			8			8		pF	V_{GS} = 0; V_{DS} = 10 V f = 1 MHz
12	DYNAMIC	C_{oss}	Common Source Output Capacitance		40			40			40		pF	V_{GS} = 0; V_{DS} = 10 V f = 1 MHz
13	DYNAMIC	t_{ON}	Turn ON Time**		4	10		4	10		4	10	ns	See Switching Time Test Circuit
14	DYNAMIC	t_{OFF}	Turn OFF Time**		4	10		4	10		4	10	ns	See Switching Time Test Circuit

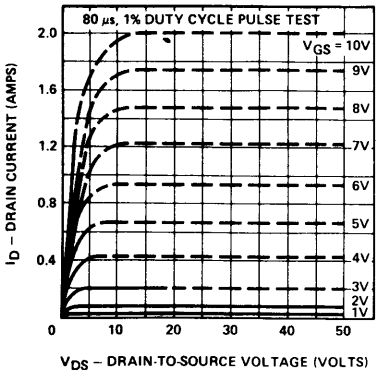
*Pulse Test **Sample Test

Pulse Test Pulse Width = 80 μsec, Duty Cycle = 1%

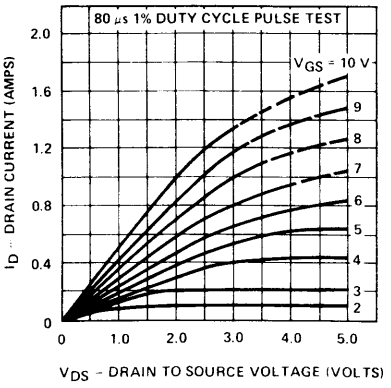
VMC

TYPICAL VMP 2 PERFORMANCE CURVES (25°C unless otherwise noted)

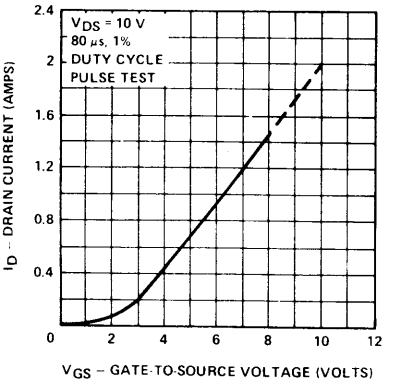
Output Characteristics



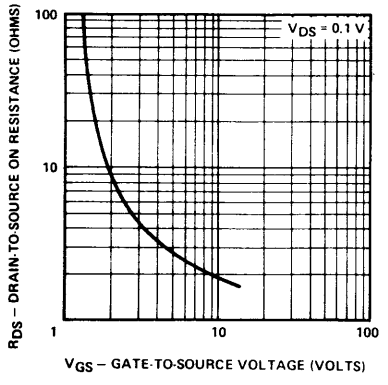
Saturation Characteristics



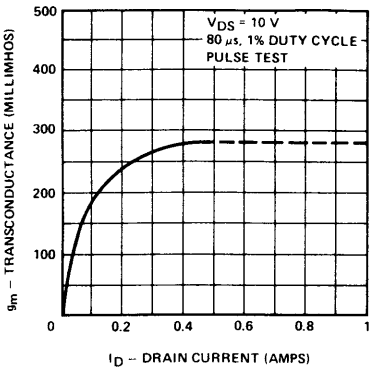
Transfer Characteristic



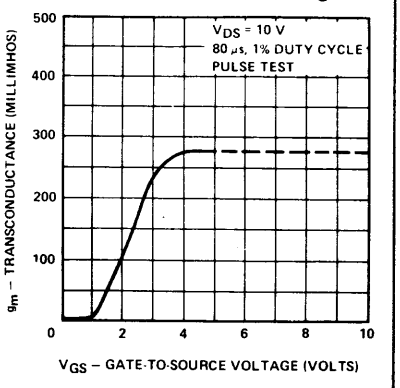
Drain-to-Source ON Resistance vs Gate-to-Source Voltage



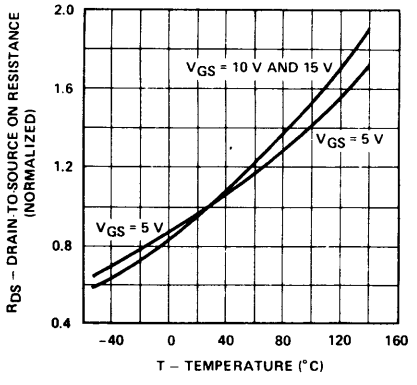
Transconductance vs Drain Current



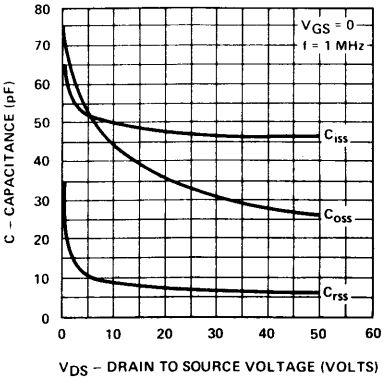
Transconductance vs Gate-to-Source Voltage



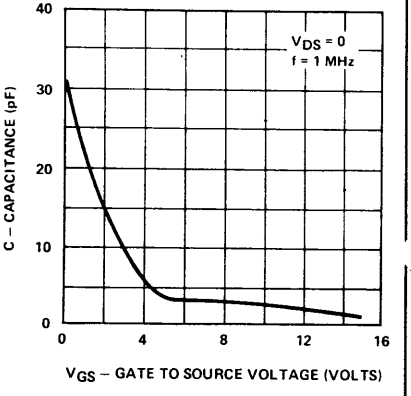
Normalized Drain-to-Source ON Resistance vs Temperature



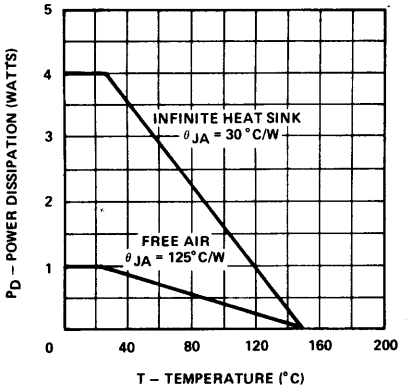
Capacitance vs Drain-to-Source Voltage



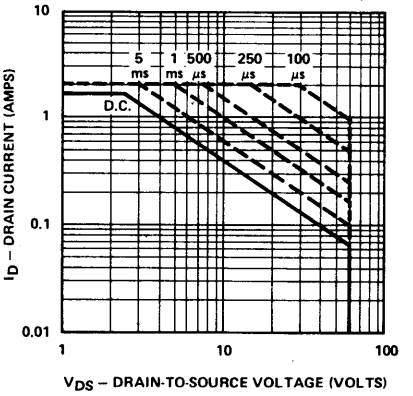
Capacitance vs Gate-to-Source Voltage



Power Dissipation vs Case or Ambient Temperature

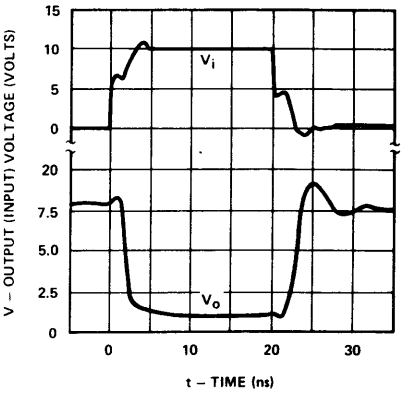


Maximum Safe Operating Region

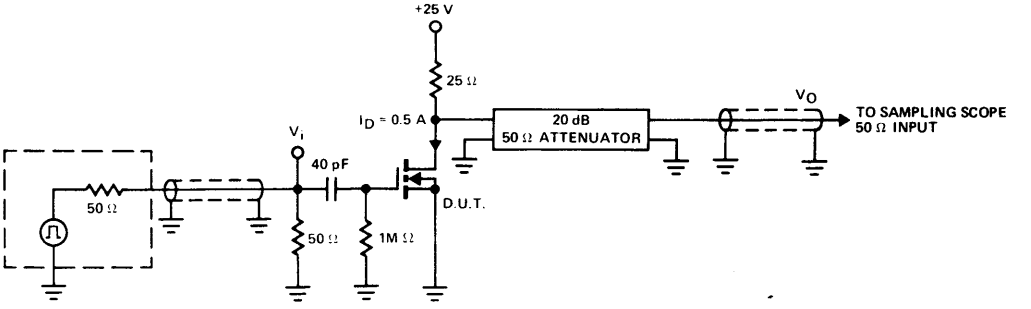


TYPICAL VMP 2 PERFORMANCE CURVES (Cont'd) (25°C unless otherwise noted)

Switching Waveforms

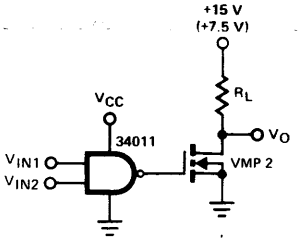


Switching Time Test Circuit

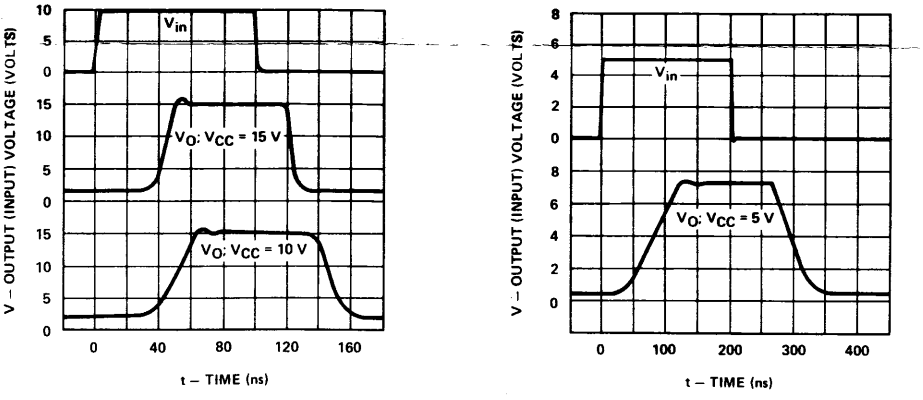


APPLICATIONS

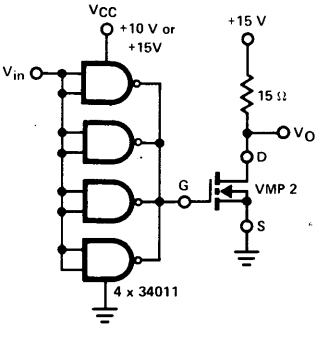
CMOS Compatible Switch



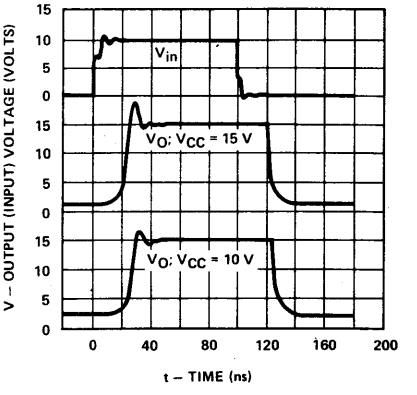
CMOS Switching Waveforms



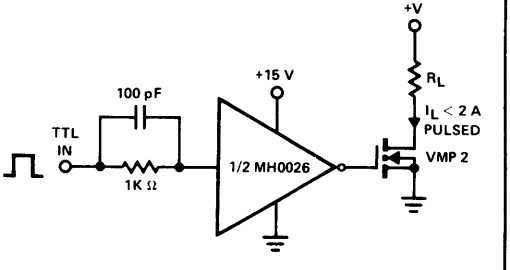
High Speed CMOS Compatible Switch



High Speed CMOS Switch Performance

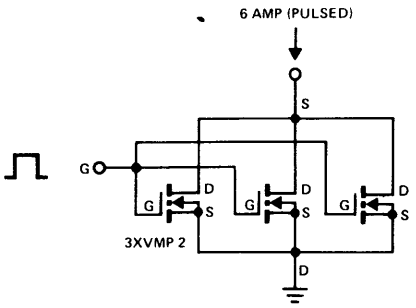


TTL Compatible High Speed High Current Switch

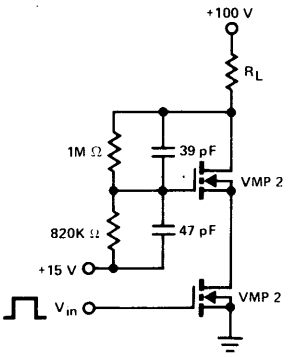


APPLICATIONS (Cont'd)

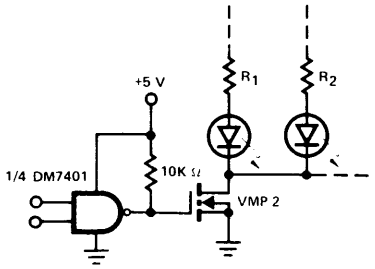
Parallel Operation



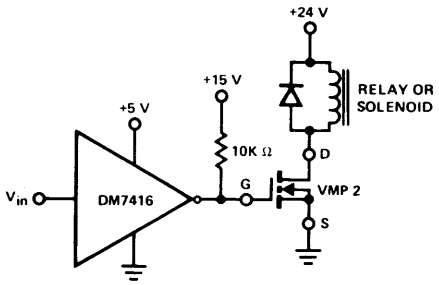
Series Operation



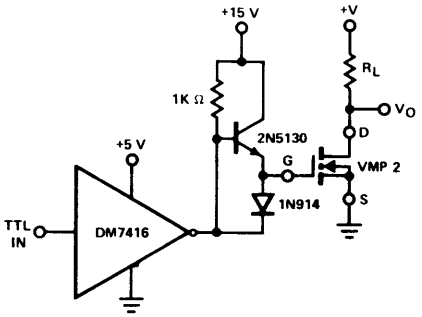
TTL Logic Compatible LED Driver



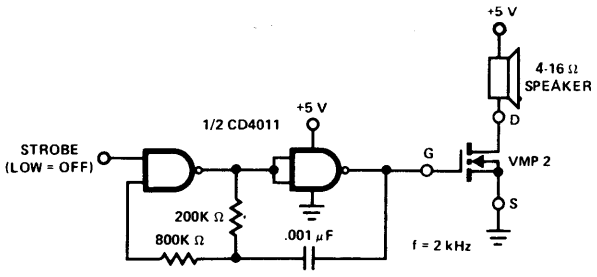
TTL Logic Compatible Solenoid Driver



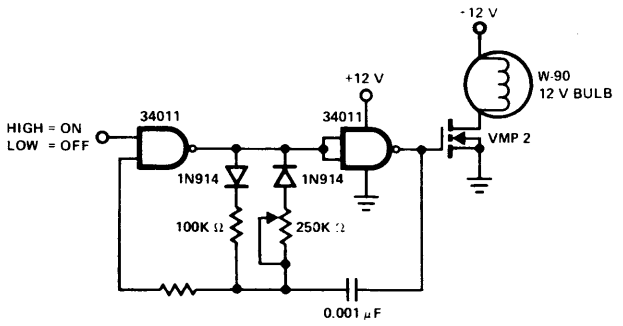
High Speed Open Collector TTL Interface



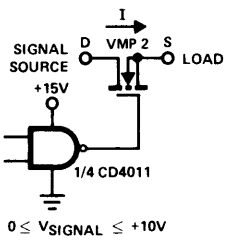
Audio Alarm



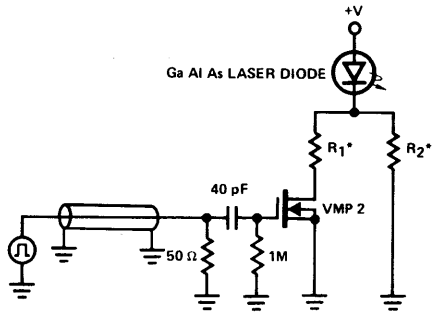
High Efficiency Light Dimmer



Low Resistance Analog Switch



Laser Diode Pulser



*R_1, R_2 SELECTED TO PROVIDE PROPER BIAS AND PULSE CURRENTS

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