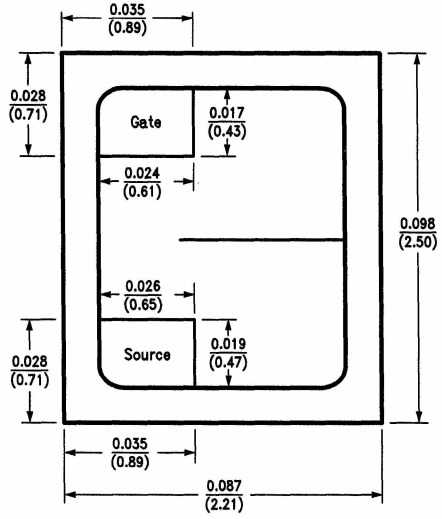
National Semiconductor

Process A1
N-Channel Power MOSFET



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DESCRIPTION

These dice are n-channel, enhancement mode, power MOSFETs designed especially for high power, high speed applications, such as power supplies, AC and DC motor control and high energy pulse circuits.

This process is available in the following device types:

TO-220 (Case 37)

IRF510

IRF511

IRF512

IRF513

MTP4N08

MTP4N10

Electrical Characteristics T_C = 25°C (unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Max	Units
V_{DSS}	Drain to Source Voltage (Note 1)	I_D = 250 μA; V_{GS} = 0V	100		V
I_{DSS}	Zero Gate Voltage Drain	V_{DS} = Rated Voltage V_{GS} = 0V		250	μA
I_{GSS}	Gate Leakage Current	V_{DS} = ±20V; V_{DS} = 0V		100	nA
$V_{GS(TH)}$	Gate Threshold Voltage	I_D = 250 μA; V_{DS} = V_{GS}	2.0	4.0	V
$R_{DS(ON)}$	Static On-Resistance (Note 2)	V_{GS} = 10V; I_D = 2.0A		0.60	Ω
g_{FS}	Forward Transconductance	V_{DS} = 10V; I_D = 2.0A	1.0		Siemens
C_{iss}	Input Capacitance	V_{DS} = 25V; V_{GS} = 0V f = 1 MHz		200	pF
C_{oss}	Output Capacitance			100	pF
C_{rss}	Reverse Transfer			30	pF
$t_{d(on)}$	Turn-On Delay Time (Note 3)	V_{DD} = 50V; I_D = 2.0A V_{GS} = 10V; R_{GEN} = 50Ω		20	ns
t_r	Rise Time	R_{GS} = 50Ω		25	ns
$t_{d(off)}$	Turn-Off Delay Time			25	ns
t_f	Fall Time			20	ns
Q_g	Total Gate Charge	V_{GS} = 10V; I_D = 8.0A V_{DD} = 40V		7.5	nC

Note 1: T_J = +25°C to +150°C.

Note 2: Pulse Test: Pulse Width ≤ 80 μs, Duty Cycle ≤ 1%.

Note 3: Switching time measurements performed on LEM TR-58 test equipment.

Process A1

Typical Performance Characteristics

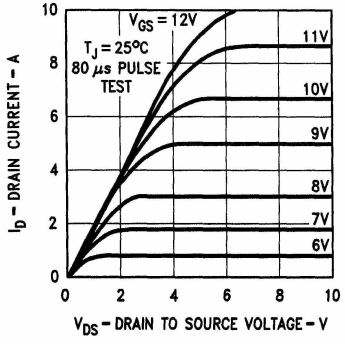

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FIGURE 1. Output Characteristics

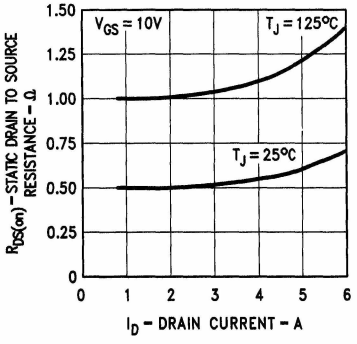

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FIGURE 2. Static Drain to Source Resistance vs Drain Current

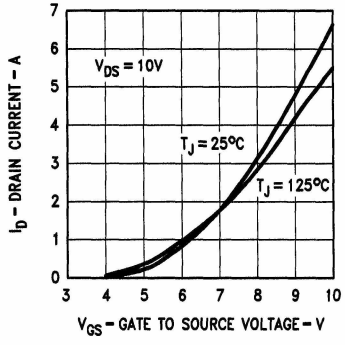

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FIGURE 3. Transfer Characteristics

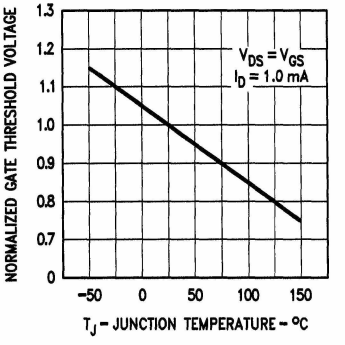

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FIGURE 4. Temperature Variation of Gate to Source Threshold Voltage

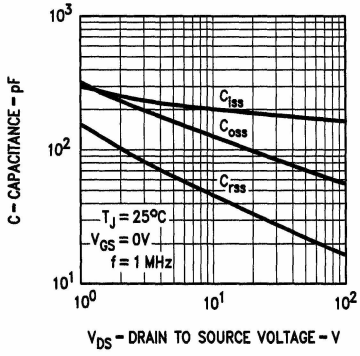

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FIGURE 5. Capacitance vs Drain to Source Voltage

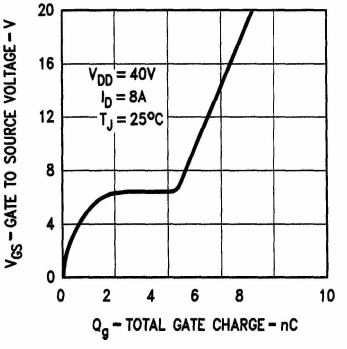

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FIGURE 6. Gate to Source Voltage vs Total Gate Charge

Typical Performance Characteristics (Continued)

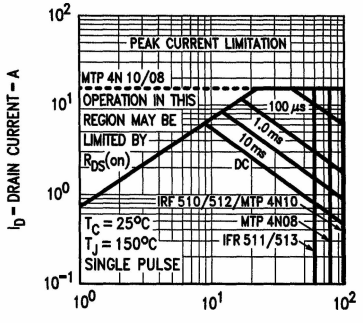

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FIGURE 7. Forward Biased Safe Operating Area for MTP4N08/4N10

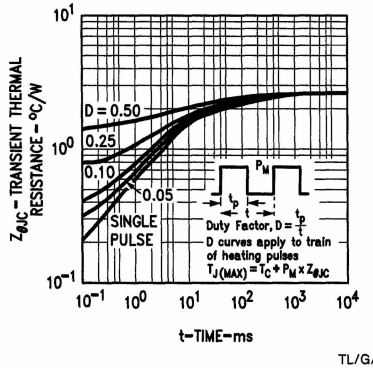

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FIGURE 8. Transient Thermal Resistance vs Time for MTP4N08/4N10

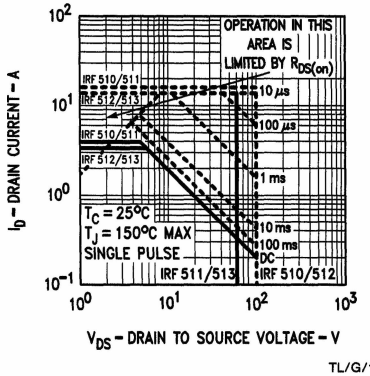

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FIGURE 9. Forward Biased Safe Operating Area for IRF510–513

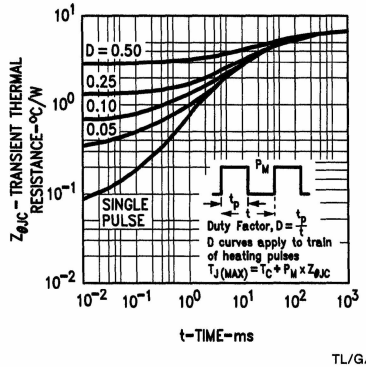

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FIGURE 10. Transient Thermal Resistance vs Time for IRF510–513

Typical Electrical Characteristics

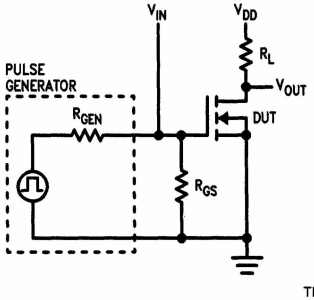

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FIGURE 11. Switching Test Circuit

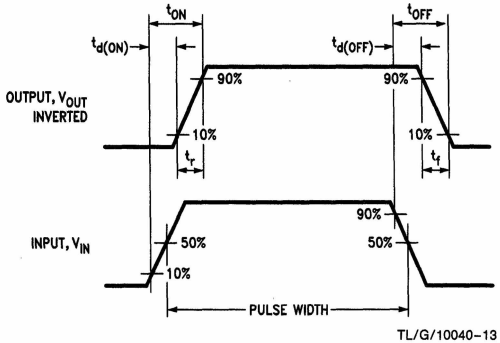

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FIGURE 12. Switching Waveforms