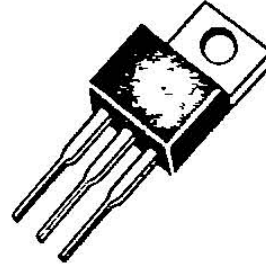


**Description**

These devices are n-channel, enhancement mode, power MOSFETs designed especially for high speed applications, such as switching power supplies, converters, AC and DC motor controls, relay and solenoid drivers and other pulse circuits.

- Low  $R_{DS(on)}$
- $V_{GS}$  Rated at  $\pm 20V$
- Silicon Gate for Fast Switching Speeds
- $I_{DSS}$ ,  $V_{DS(on)}$ , Specified at Elevated Temperature
- Rugged
- Low Drive Requirements
- Ease of Paralleling

**TO-220AB**



15C0010F

- IRF610
- IRF611
- IRF612
- IRF613
- MTP2N18
- MTP2N20

**Maximum Ratings**

Symbol	Characteristic	Ratings IRF610/612 MTP2N20	Rating MTP2N18	Rating IRF611/613	Unit
$V_{DSS}$	Drain to Source Voltage <sup>1</sup>	200	180	150	V
$V_{DGR}$	Drain to Gate Voltage <sup>1</sup> $R_{GS}=20k\Omega$	200	180	150	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	$\pm 20$	$\pm 20$	V
$T_J, T_{stg}$	Operating Junction and Storage Temperature	-55 to +150	-55 to +150	-55 to +150	
TL	Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5S	275	275	275	

**Maximum On-State Characteristics**

		IRF610/611	MTP2M18/20	IRF612/613	
$R_{DS(on)}$	Static Drain-to-Source On Resistance	1.5	1.8	2.4	$\Omega$
$I_D$	Drain Current				A
	Continuous at $T_c=25$	2.5	3.25	2.0	
	Continuous at $T_c=100$	1.5	2.25	1.25	
	Pulsed	10	9.0	8.0	

**Maximum Thermal Characteristics**

$R_{\theta JC}$	Thermal Resistance Junction to Case	6.4	2.5	6.4	/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	80	80	80	/W
$P_D$	Total Power Dissipation At $T_c=25$	20	50	20	W

**Notes**

For information concerning connection diagram and package outline, refer to Section 7.



**IRF610-613**  
**MTP2N18/20N20**  
**N-Channel Power Mosfets**  
**3.5A,150-220V**

**Electrical Characteristics** (Tc=25 unless otherwise noted)

Symbol	Characteristic	Min	Max	Unit	Test Conditions <sup>2</sup>
<b>Off Characteristics</b>					
V <sub>(BR)DSS</sub>	Drain Source Breakdown Voltage <sup>1</sup> IRF610/612/MTP2N20 MTP2N16 IRF611/613			V	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA
		200			
		180			
I <sub>DSS</sub>	Zero Gate Voltage Drain Current		250	μA	V <sub>DS</sub> =Rated V <sub>DSS</sub> , V <sub>GS</sub> =0V
			1000	μA	V <sub>DS</sub> =0.8 x Rated V <sub>DSS</sub> , V <sub>GS</sub> =0V, T <sub>C</sub> =125
I <sub>GSS</sub>	Gate-Body Leakage Current		±500	nA	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V
<b>On Characteristics</b>					
V <sub>GS(th)</sub>	Gate Threshold Voltage IRF610-613 MTP2N18/20			V	I <sub>D</sub> =250μA, V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =1mA, V <sub>DS</sub> =V <sub>GS</sub>
		2.0	4.0		
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance <sup>2</sup> IRF610/611 IRF612/613 MTP2N18/20			Ω	V <sub>GS</sub> =10V, I <sub>D</sub> =1.25A I <sub>D</sub> =1.0A
			1.5		
			2.4		
			1.8		
V <sub>DS(on)</sub>	Drain-Source On-Voltage 2 MTP2N18/2N20		4.4	V	V <sub>GS</sub> =10V; I <sub>D</sub> =2.0A
			3.6	V	V <sub>GS</sub> =10V; I <sub>D</sub> =1.0A; T <sub>C</sub> =100
g <sub>fs</sub>	Forward Transconductance	0.8		S(Ω)	V <sub>DS</sub> =10V, I <sub>D</sub> =1.25A
<b>Dynamic Characteristics</b>					
C <sub>iss</sub>	Input Capacitance		200	pF	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V f=1.0MHz
C <sub>oss</sub>	Output Capacitance		80	pF	
C <sub>rss</sub>	Reverse Transfer Capacitance		25	pF	
<b>Switching Characteristics</b> (Tc=25, Figures 11,12) <sup>3</sup>					
t <sub>d(on)</sub>	Turn-On Delay Time		15	ns	V <sub>DD</sub> =50V, I <sub>D</sub> =1.25A V <sub>GS</sub> =10V, R <sub>GEN</sub> =50Ω R <sub>GS</sub> =50Ω
t <sub>r</sub>	Rise Time		25	ns	
t <sub>d(off)</sub>	Turn-Off Delay Time		15	ns	
t <sub>f</sub>	Fall Time		15	ns	
Q <sub>g</sub>	Total Gate Charge		7.5	nC	V <sub>GS</sub> =10V, I <sub>D</sub> =3.0A V <sub>DD</sub> =45V

**Electrical Characteristics (Cont.)** (Tc=25 unless otherwise noted)

Symbol	Characteristic	Typ	Max	Unit	Test Conditions
<b>Source-Drain Diode Characteristics</b>					
V <sub>SD</sub>	Diode Forward Voltage IRF610/611		2.0	V	I <sub>S</sub> =2.5A; V <sub>GS</sub> =0V
	IRF612/613		1.8	V	I <sub>S</sub> =2.0A; V <sub>GS</sub> =0V
t <sub>rr</sub>	Reverse Recovery Time	290		ns	I <sub>S</sub> =2.5A; dI <sub>S</sub> /dt=25A/μS

**Notes**

- T<sub>J</sub>=+25 to +150
- Pulse test; Pulse width ≤ 80μS, Duty Cycle ≤ 1%
- Switching time measurements performed on LEM TR-58 test equipment.

Typical Performance Curves

Figure 1 Output Characteristics

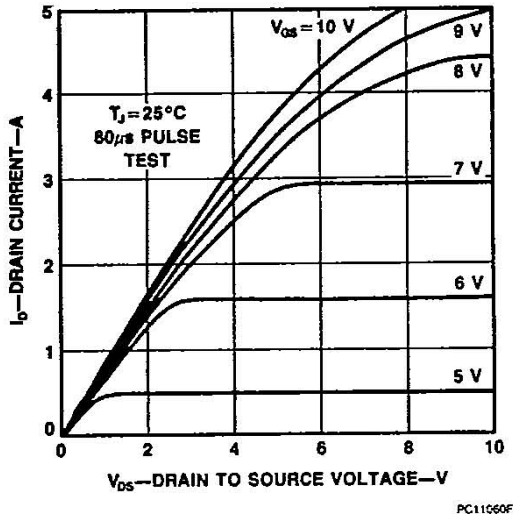


Figure 3 Transfer Characteristics

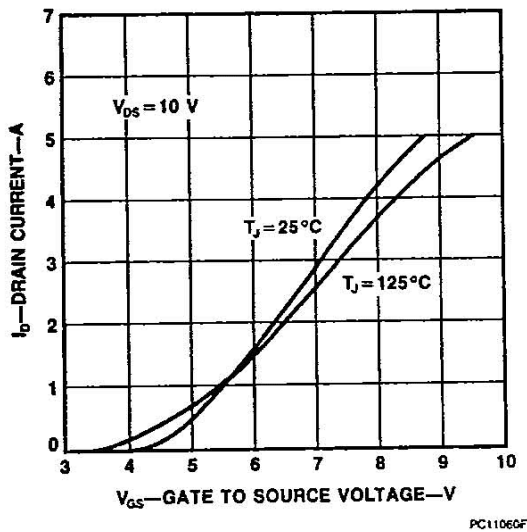


Figure 2 Static Drain to Source Resistance Vs Drain Current

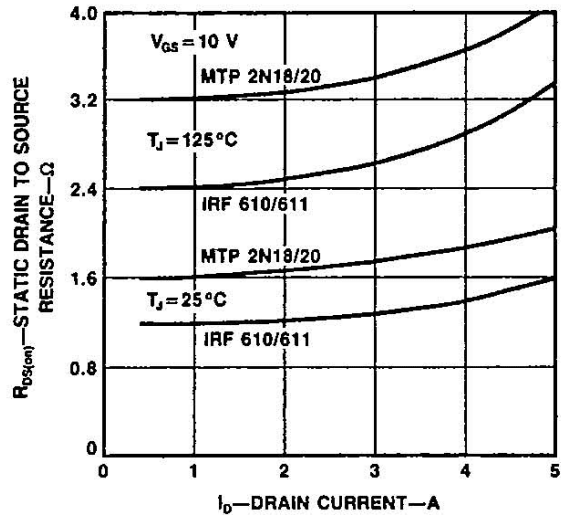
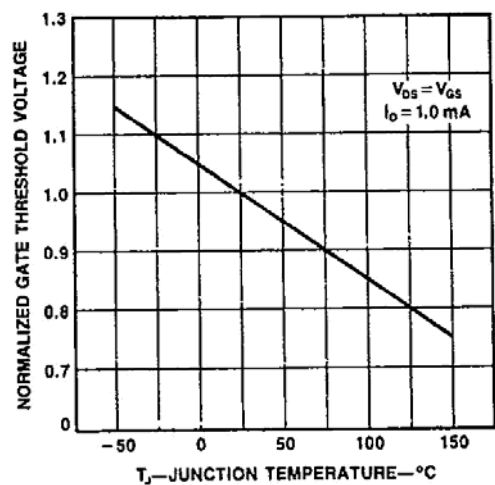
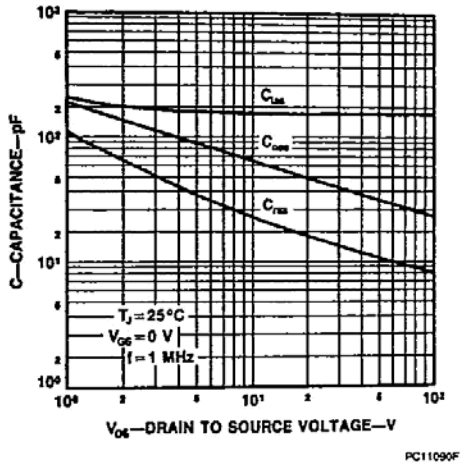


Figure 4 Temperature Variation of Gate to Source Threshold Voltage



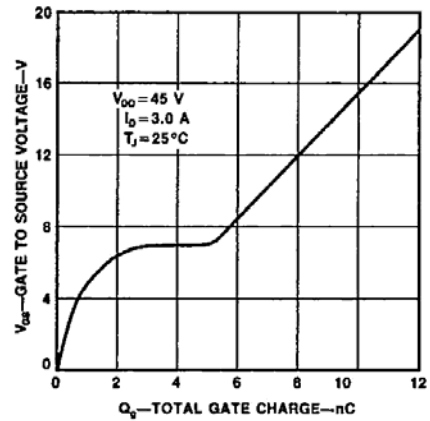
Typical Performance Curves (Cont.)

Figure 5 Capacitance vs Drain to Source Voltage



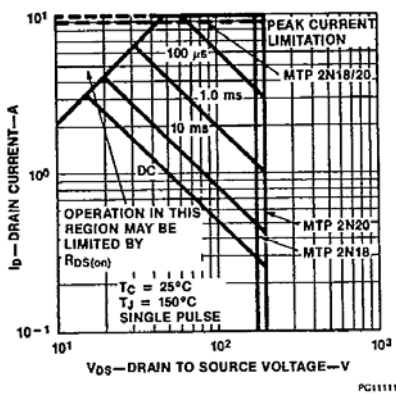
PC11090F

Figure 6 Gate to Source Voltage vs Total Gate Charge



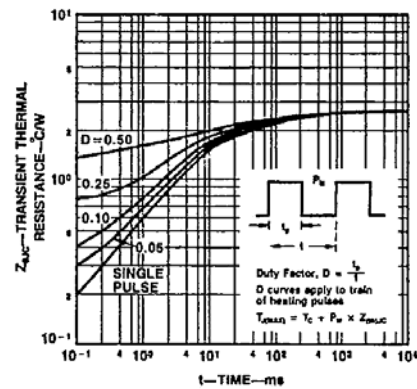
PC11100F

Figure 7 Forward Biased Safe Operating Area For MTP2N18/2N20



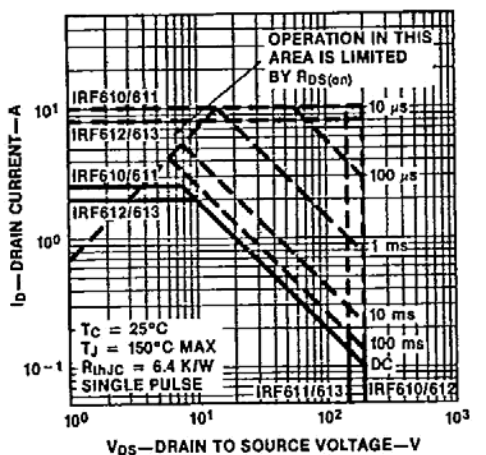
PC11111F

Figure 8 Transient Thermal Resistance vs Time for MTP2N18/2N20



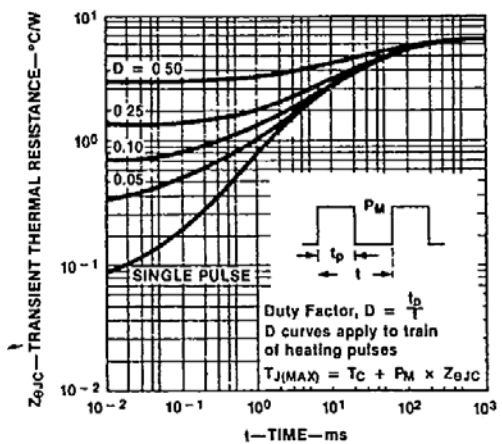
PC11051F

Figure 9 Forward Biased Safe Operating Area for IRF610-613



PC1208CF

Figure 10 Transient Thermal Resistance for IRF610-613



PC12076F

Typical Electrical Characteristics

Figure 11 Switching Test Circuit

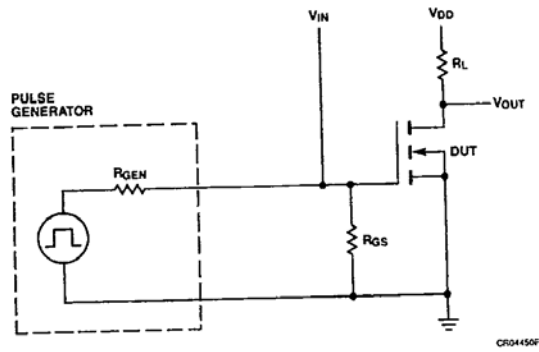


Figure 12 Switching Waveforms

