

**FAIRCHILD**

A Schlumberger Company

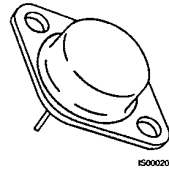
**IRF140-143/IRF540-543 T-39-13**  
**N-Channel Power MOSFETs,**  
**27 A, 60-100 V**

Power And Discrete Division

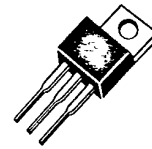
**Description**

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

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

**TO-204AE**

IRF140  
IRF141  
IRF142  
IRF143

**TO-220AB**

IRF540  
IRF541  
IRF542  
IRF543

**Product Summary**

Part Number	$V_{DSS}$	$R_{DS(on)}$	$I_D$ at $T_C = 25^\circ C$	$I_D$ at $T_C = 100^\circ C$	Case Style
IRF140	100 V	0.085 $\Omega$	27 A	17 A	TO-204AE
IRF141	60 V	0.085 $\Omega$	27 A	17 A	
IRF142	100 V	0.11 $\Omega$	24 A	15 A	
IRF143	60 V	0.11 $\Omega$	24 A	15 A	
IRF540	100 V	0.085 $\Omega$	27 A	17 A	TO-220AB
IRF541	60 V	0.085 $\Omega$	27 A	17 A	
IRF542	100 V	0.11 $\Omega$	24 A	15 A	
IRF543	60 V	0.11 $\Omega$	24 A	15 A	

**Notes**

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

IRF140-143/IRF540-543

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Maximum Ratings

Symbol	Characteristic	Rating IRF140/142 IRF540/542	Rating IRF141/143 IRF541/543	Unit
V <sub>DSS</sub>	Drain to Source Voltage <sup>1</sup>	100	60	V
V <sub>DGR</sub>	Drain to Gate Voltage <sup>1</sup> R <sub>GS</sub> = 20 kΩ	100	60	V
V <sub>GS</sub>	Gate to Source Voltage	± 20	± 20	V
T <sub>J</sub> , T <sub>stg</sub>	Operating Junction and Storage Temperatures	-55 to +150	-55 to +150	°C
T <sub>L</sub>	Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5 s	275	275	°C

Maximum Thermal Characteristics

		IRF140-143	IRF540-543	
R <sub>θJC</sub>	Thermal Resistance, Junction to Case	1.0	1.0	°C/W
P <sub>D</sub>	Total Power Dissipation at T <sub>C</sub> = 25°C	125	125	W
I <sub>DM</sub>	Pulsed Drain Current <sup>2</sup>	108	108	A

Electrical Characteristics (T<sub>C</sub> = 25°C unless otherwise noted)

Symbol	Characteristic	Min	Max	Unit	Test Conditions
<b>Off Characteristics</b>					
V <sub>(BR)DSS</sub>	Drain Source Breakdown Voltage <sup>1</sup> IRF140/142/540/542 IRF141/143/541/543	100 60		V	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA
I <sub>DSS</sub>	Zero Gate Voltage Drain Current		250 1000	μA	V <sub>DS</sub> = Rated V <sub>DSS</sub> , V <sub>GS</sub> = 0 V
I <sub>GSS</sub>	Gate-Body Leakage Current IRF140-143 IRF540-543		± 100 ± 500	nA	V <sub>DS</sub> = 0.8 x Rated V <sub>DSS</sub> , V <sub>GS</sub> = 0 V, T <sub>C</sub> = 125°C V <sub>GS</sub> = ± 20 V, V <sub>DS</sub> = 0 V
<b>On Characteristics</b>					
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.0	4.0	V	I <sub>D</sub> = 250 μA, V <sub>DS</sub> = V <sub>GS</sub>
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance <sup>2</sup> IRF140/141/540/541 IRF142/143/542/543		0.085 0.11	Ω	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 15 A
g <sub>fs</sub>	Forward Transconductance	6.0		S (Ω)	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 15 A

## IRF140-143/IRF540-543

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**Electrical Characteristics (Cont.)** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Characteristic	Min	Max	Unit	Test Conditions
<b>Dynamic Characteristics</b>					
$C_{iss}$	Input Capacitance		1600	pF	$V_{DS} = 25\text{ V}$ , $V_{GS} = 0\text{ V}$ $f = 1.0\text{ MHz}$
$C_{oss}$	Output Capacitance		800	pF	
$C_{rss}$	Reverse Transfer Capacitance		300	pF	
<b>Switching Characteristics</b> ( $T_C = 25^\circ\text{C}$ , Figures 1, 2), <sup>3</sup>					
$t_{d(on)}$	Turn-On Delay Time		30	ns	$V_{DD} = 45\text{ V}$ , $I_D = 15\text{ A}$ $V_{GS} = 10\text{ V}$ , $R_{GEN} = 4.7\ \Omega$ $R_{GS} = 4.7\ \Omega$
$t_r$	Rise Time		60	ns	
$t_{d(off)}$	Turn-Off Delay Time		80	ns	
$t_f$	Fall Time		30	ns	
$t_{d(on)}$	Turn-On Delay Time		60	ns	$V_{DD} = 25\text{ V}$ , $I_D = 15\text{ A}$ $V_{GS} = 10\text{ V}$ , $R_{GEN} = 50\ \Omega$ $R_{GS} = 50\ \Omega$
$t_r$	Rise Time		450	ns	
$t_{d(off)}$	Turn-Off Delay Time		150	ns	
$t_f$	Fall Time		200	ns	
$Q_g$	Total Gate Charge		60	nC	$V_{GS} = 10\text{ V}$ , $I_D = 34\text{ A}$ $V_{DD} = 35\text{ V}$

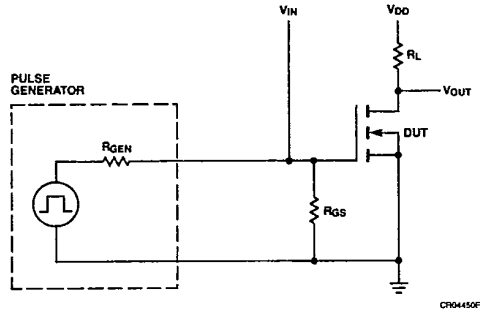
Symbol	Characteristic	Typ	Max	Unit	Test Conditions
<b>Source-Drain Diode Characteristics</b>					
$V_{SD}$	Diode Forward Voltage IRF140/141/540/541 IRF142/143/542/543	2.0	2.5	V	$I_S = 27\text{ A}$ ; $V_{GS} = 0\text{ V}$ $I_S = 24\text{ A}$ ; $V_{GS} = 0\text{ V}$
		2.0	2.3	V	
$t_{rr}$	Reverse Recovery Time	300		ns	$I_S = 4.0\text{ A}$ ; $di_S/dt = 25\text{ A}/\mu\text{S}$

**Notes**

- $T_J = +25^\circ\text{C}$  to  $+150^\circ\text{C}$
- Pulse width limited by  $T_J$
- Switching time measurements performed on LEM TR-58 test equipment.

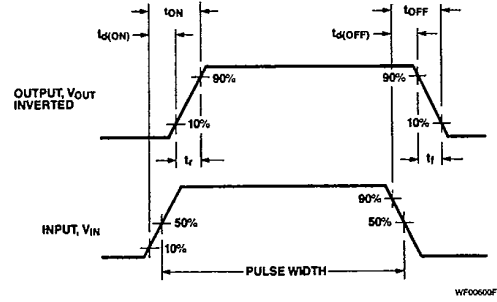
Typical Electrical Characteristics

Figure 1 Switching Test Circuit



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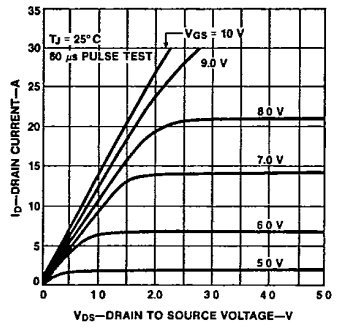
Figure 2 Switching Waveforms



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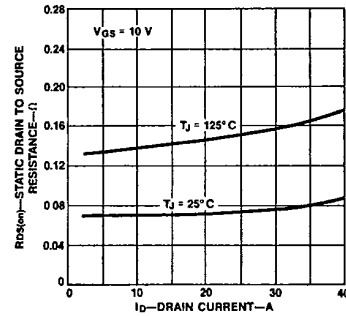
Typical Performance Curves

Figure 3 Output Characteristics



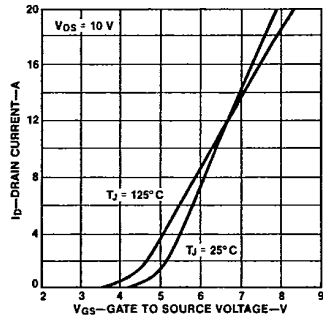
PC10040F

Figure 4 Static Drain to Source Resistance vs Drain Current



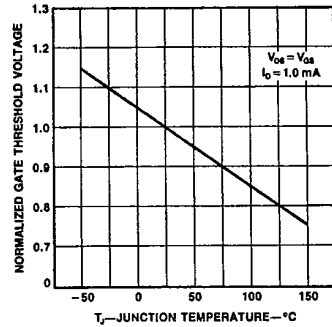
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Figure 5 Transfer Characteristics



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Figure 6 Temperature Variation of Gate to Source Threshold Voltage



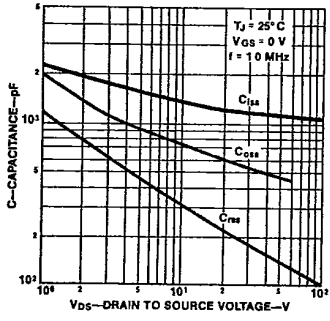
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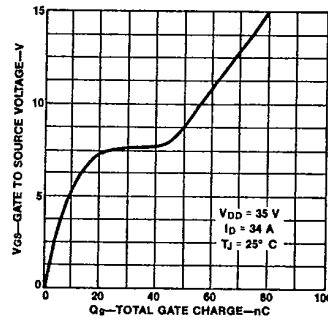
Typical Performance Curves (Cont.)

Figure 7 Capacitance vs Drain to Source Voltage



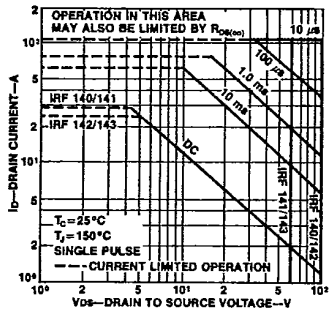
PC10070F

Figure 8 Gate to Source Voltage vs Total Gate Charge



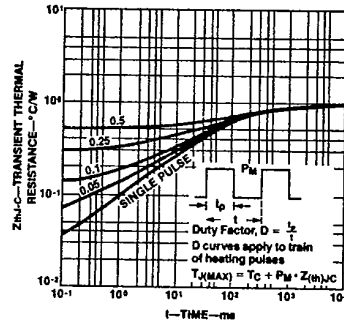
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Figure 9 Forward Biased Safe Operating Area



PC10090F

Figure 10 Transient Thermal Resistance vs Time



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