

Pb Free Plating Product

## IRF3205



### N-Channel Trench Process Power MOSFET Transistor

<p><b>General Description</b></p> <p>The IRF3205 is N-channel MOS Field Effect Transistor designed for high current switching applications. Rugged EAS capability and ultra low <math>R_{DS(ON)}</math> is suitable for PWM, load switching .</p> <p><b>Features</b></p> <ul style="list-style-type: none"> <li>● <math>V_{DS}=55V</math>; <math>I_D=105A @ V_{GS}=10V</math>; <math>R_{DS(ON)} &lt; 6.0m\Omega @ V_{GS}=10V</math></li> <li>● Ultra Low On-Resistance</li> <li>● High UIS and UIS 100% Test</li> </ul> <p><b>Application</b></p> <ul style="list-style-type: none"> <li>● Hard Switched and High Frequency Circuits</li> <li>● Uninterruptible Power Supply</li> <li>● Inverter Application</li> </ul>	<p>TO-220CB Top View</p> <p>Schematic Diagram</p> <p><math>V_{DS} = 55 V</math></p> <p><math>I_D = 105 A</math></p> <p><math>R_{DS(ON)} = 5.0 m\Omega</math></p>
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**Table 1. Absolute Maximum Ratings (TA=25°C)**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-Source Voltage ( $V_{GS}=0V$ )	55	V
$V_{GS}$	Gate-Source Voltage ( $V_{DS}=0V$ )	$\pm 25$	V
$I_{D(DC)}$	Drain Current (DC) at $T_c=25^\circ C$	105	A
$I_{D(DC)}$	Drain Current (DC) at $T_c=100^\circ C$	100	A
$I_{DM(pluse)}$	Drain Current-Continuous@ Current-Pulsed <sup>(Note 1)</sup>	420	A
dv/dt	Peak Diode Recovery Voltage	30	V/ns
$P_D$	Maximum Power Dissipation( $T_c=25^\circ C$ )	139	W
	Derating Factor	0.926	W/°C
$E_{AS}$	Single Pulse Avalanche Energy <sup>(Note 2)</sup>	625	mJ
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 175	°C

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2.EAS condition:  $T_J=25^\circ C, V_{DD}=40V, V_G=10V, R_G=25 \Omega$

**Table 2. Thermal Characteristic**

Symbol	Parameter	Value	Unit
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	1.08	°C/W

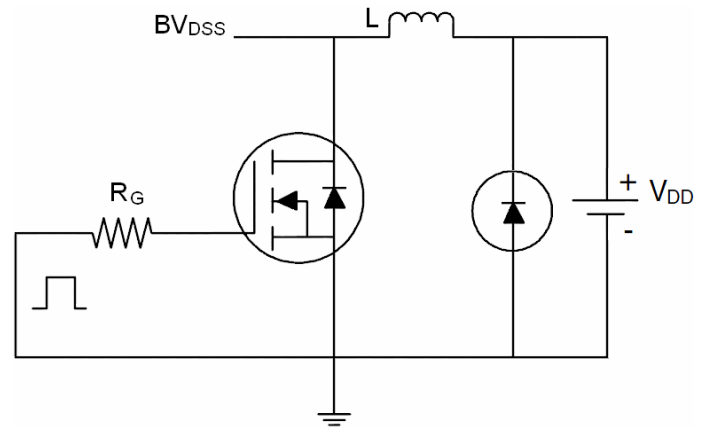
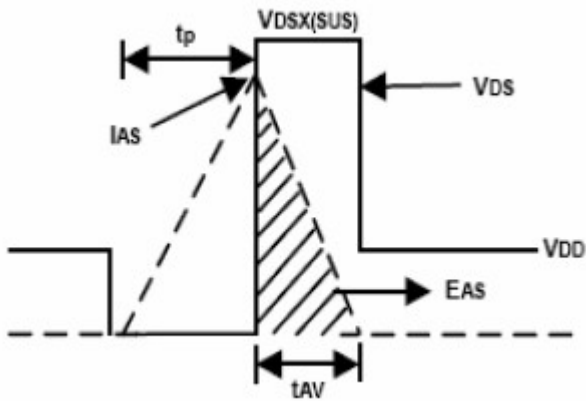
**Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>On/Off States</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	55			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current(Tc=25°C)	V <sub>DS</sub> =55V, V <sub>GS</sub> =0V			1	μA
I <sub>DSS</sub>	Zero Gate Voltage Drain Current(Tc=125°C)	V <sub>DS</sub> =55V, V <sub>GS</sub> =0V			1	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2		4	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =40A		5.0	6.0	mΩ
<b>Dynamic Characteristics</b>						
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =25V, I <sub>D</sub> =40A	25			S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz		5905		PF
C <sub>oss</sub>	Output Capacitance			905		PF
C <sub>rss</sub>	Reverse Transfer Capacitance			548		PF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =30V, I <sub>D</sub> =30A, V <sub>GS</sub> =10V		94		nC
Q <sub>gs</sub>	Gate-Source Charge			18		nC
Q <sub>gd</sub>	Gate-Drain Charge			25		nC
<b>Switching Times</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =30V, I <sub>D</sub> =2A, R <sub>L</sub> =15Ω V <sub>GS</sub> =10V, R <sub>G</sub> =2.5Ω		15		nS
t <sub>r</sub>	Turn-on Rise Time			18		nS
t <sub>d(off)</sub>	Turn-Off Delay Time			31		nS
t <sub>f</sub>	Turn-Off Fall Time			38		nS
<b>Source-Drain Diode Characteristics</b>						
I <sub>SD</sub>	Source-drain Current(Body Diode)			105		A
I <sub>SDM</sub>	Pulsed Source-Drain Current(Body Diode)			420		A
V <sub>SD</sub>	Forward On Voltage <sup>(Note 1)</sup>	T <sub>J</sub> =25°C, I <sub>SD</sub> =40A, V <sub>GS</sub> =0V		0.87	0.95	V
t <sub>rr</sub>	Reverse Recovery Time <sup>(Note 1)</sup>	T <sub>J</sub> =25°C, I <sub>F</sub> =75A di/dt=100A/μs		56		nS
Q <sub>rr</sub>	Reverse Recovery Charge <sup>(Note 1)</sup>			113		nC
t <sub>on</sub>	Forward Turn-on Time	Intrinsic turn-on time is negligible(turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> )				

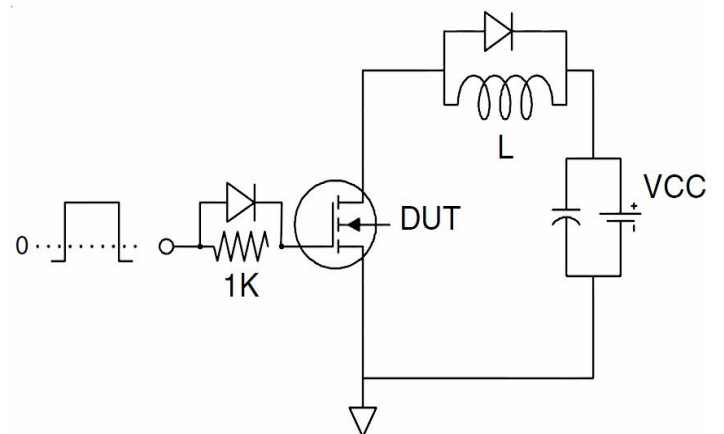
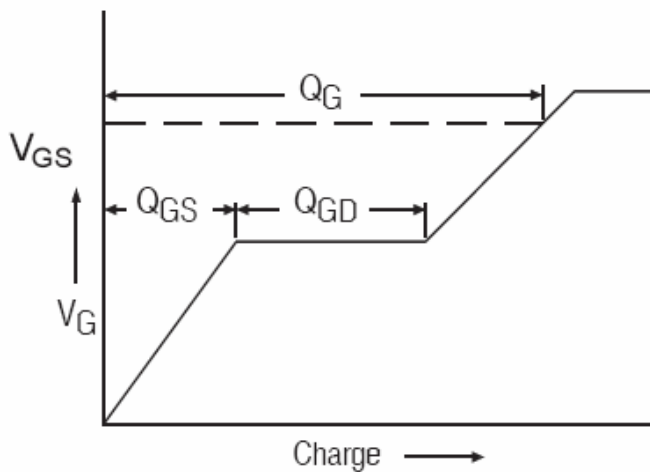
Notes 1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1.5%, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C

## Test Circuit

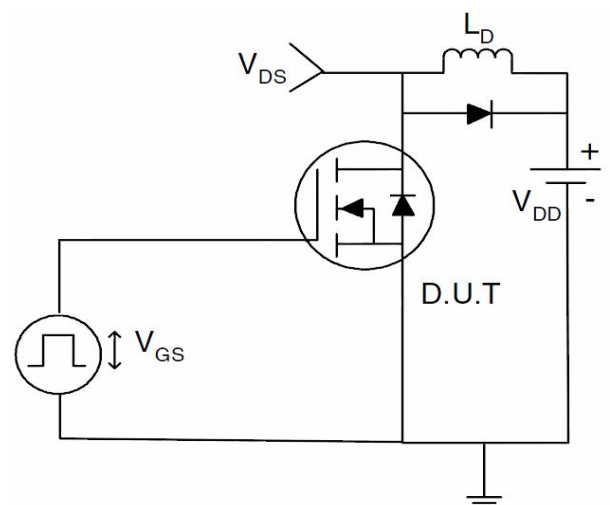
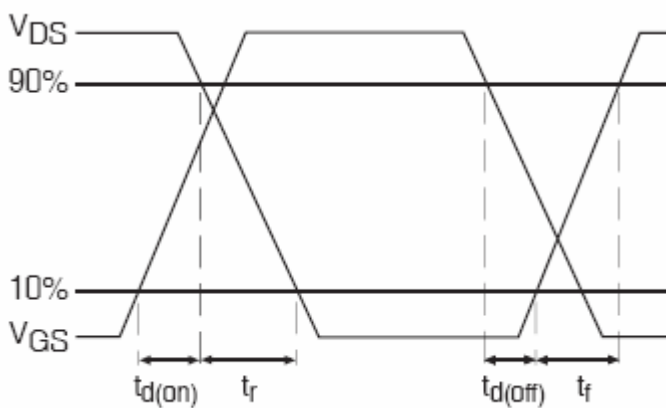
### 1) $E_{AS}$ Test Circuits



### 2) Gate Charge Test Circuit:

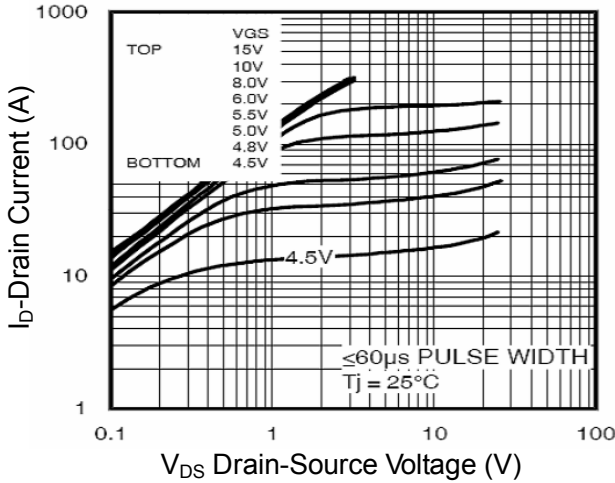


### 3) Switch Time Test Circuit:

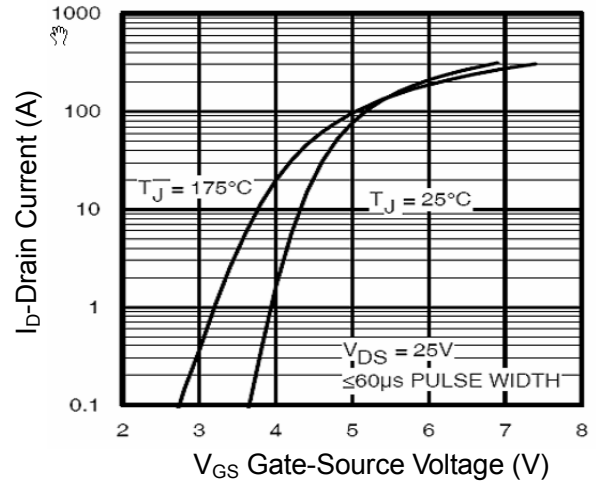


## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (Curves)

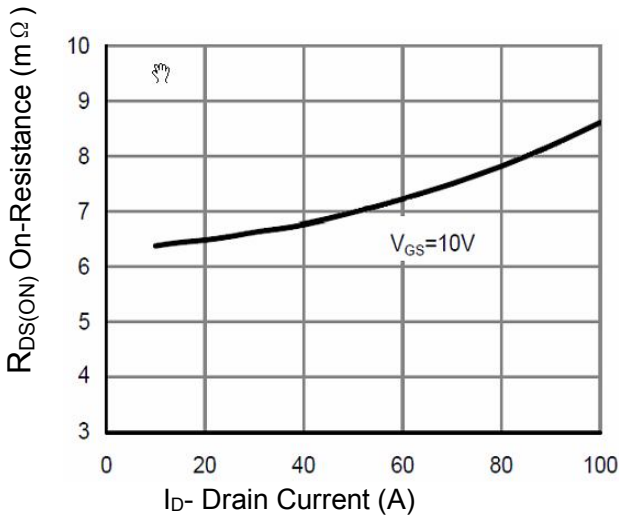
**Figure1. Output Characteristics**



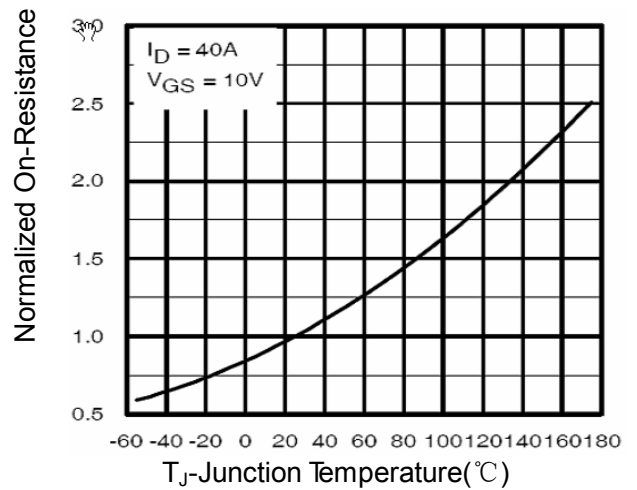
**Figure2. Transfer Characteristics**



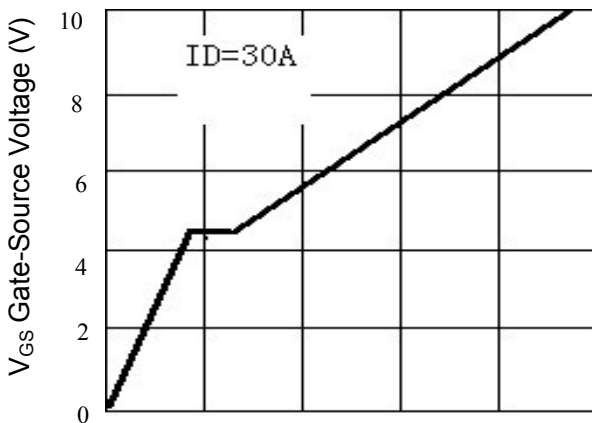
**Figure3. Rdson Vs Drain Current**



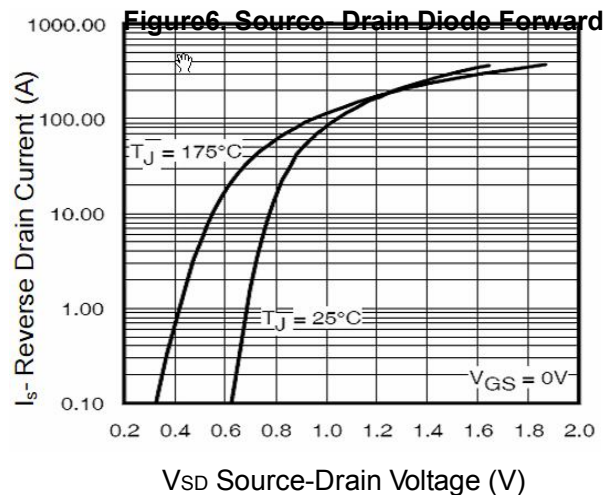
**Figure4. Rdson Vs Junction**



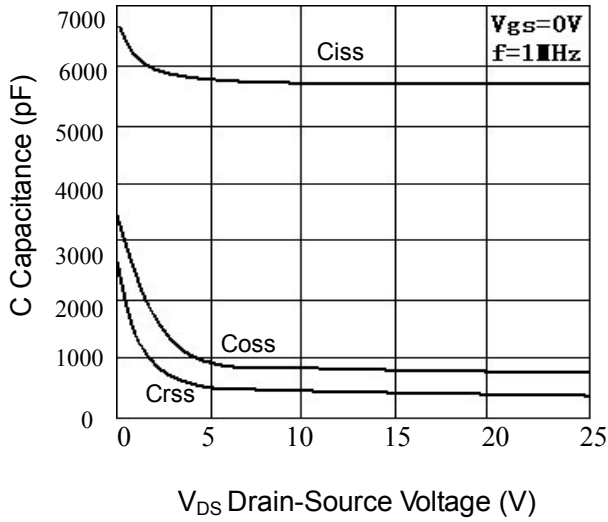
**Figure5. Gate Charge**



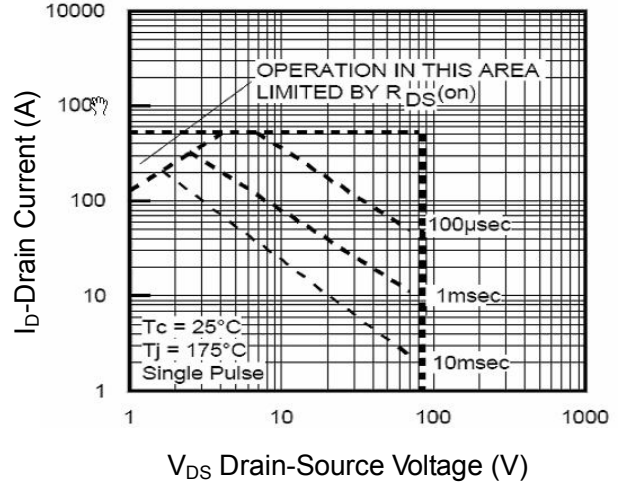
**Figure6. Source-Drain Diode Forward**



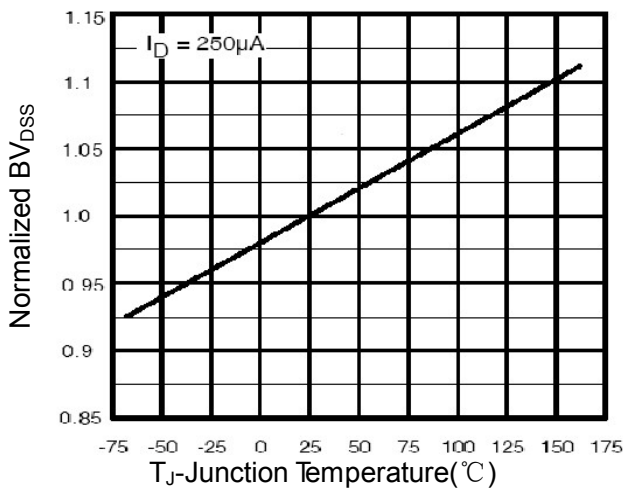
**Figure7. Capacitance vs Vds**



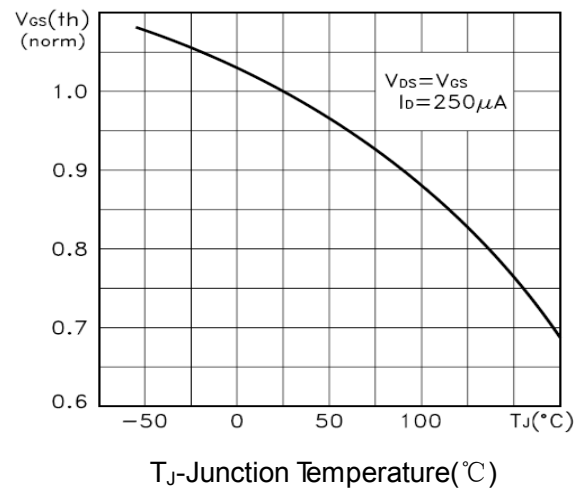
**Figure8. Safe Operation Area**



**Figure9. BVDSS vs Junction Temperature**



**Figure10. VGS(th) vs Junction Temperature**



**Figure11. Normalized Maximum Transient Thermal Impedance**

