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IRF320, IRF321, IRF322, IRF323

2.8A and 3.3A, 350V and 400V, 1.8 and 2.5 Ohm, N-Channel Power MOSFETs

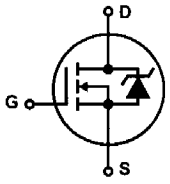
Features

- **2.8A and 3.3A, 350V and 400V**
- **$r_{DS(ON)}$ = 1.8Ω and 2.5Ω**
- **Single Pulse Avalanche Energy Rated**
- **SOA is Power Dissipation Limited**
- **Nanosecond Switching Speeds**
- **Linear Transfer Characteristics**
- **High Input Impedance**
- **Majority Carrier Device**

Description

These are N-Channel enhancement mode silicon gate power field effect transistors. They are advanced power MOSFETs designed, tested, and guaranteed to withstand a specified level of energy in the breakdown avalanche mode of operation. All of these power MOSFETs are designed for applications such as switching regulators, switching convertors, motor drivers, relay drivers, and drivers for high power bipolar switching transistors requiring high speed and low gate drive power. These types can be operated directly from integrated circuits.

Symbol



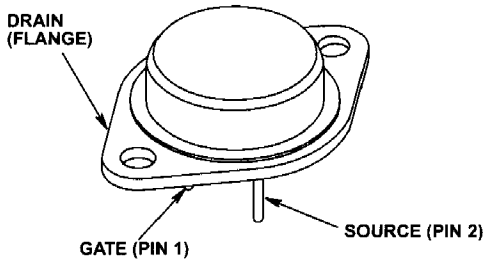
Ordering Information

PART NUMBER	PACKAGE	BRAND
IRF320	TO-204AA	IRF320
IRF321	TO-204AA	IRF321
IRF322	TO-204AA	IRF322
IRF323	TO-204AA	IRF323

NOTE: When ordering, use the entire part number.

Packaging

JEDEC TO-204AA



NJ Semi-Conductors reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by NJ Semi-Conductors is believed to be both accurate and reliable at the time of going to press. However, NJ Semi-Conductors assumes no responsibility for any errors or omissions discovered in its use. NJ Semi-Conductors encourages customers to verify that datasheets are current before placing orders.

Quality Semi-Conductors

Absolute Maximum Ratings $T_C = 25^oC$, Unless Otherwise Specified

	IRF320	IRF321	IRF322	IRF323	UNITS
Drain to Source Breakdown Voltage (Note 1) ..... V_{DS}	400	350	400	350	V
Drain to Gate Voltage (R_{GS} = 20kΩ) (Note 1) ..... V_{DGR}	400	350	400	350	V
Continuous Drain Current ..... I_D	3.3	3.3	2.8	2.8	A
$T_C = 100^oC$ ..... I_D	2.1	2.1	1.8	1.8	A
Pulsed Drain Current (Note 3) ..... I_{DM}	13	13	11	11	A
Gate to Source Voltage ..... V_{GS}	±20	±20	±20	±20	V
Maximum Power Dissipation ..... P_D	50	50	50	50	W
Linear Derating Factor	0.4	0.4	0.4	0.4	W/°C
Single Pulse Avalanche Energy Rating (Note 4) ..... E_{AS}	190	190	190	190	mJ
Operating and Storage Temperature ..... T_J, T_{STG}	-55 to 150	-55 to 150	-55 to 150	-55 to 150	°C
Maximum Temperature for Soldering					
Leads at 0.063in (1.6mm) from Case for 10s ..... T_L	300	300	300	300	°C
Package Body for 10s, See TB334 ..... T_{pkg}	260	260	260	260	°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

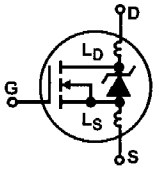
NOTE:

1. $T_J = 25^oC$ to 125^oC.

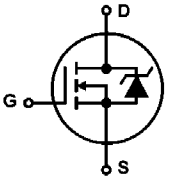
Electrical Specifications $T_C = 25^oC$, Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Drain to Source Breakdown Voltage	BV_{DSS}	I_D = 250μA, V_{GS} = 0V, (Figure 10)				
IRF320, IRF322			400	-	-	V
IRF321, IRF323			350	-	-	V
Gate to Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250μA	2.0	-	4.0	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = Rated BV_{DSS}, V_{GS} = 0V	-	-	25	μA
		V_{DS} = 0.8 x Rated BV_{DSS}, V_{GS} = 0V, $T_J = 125^oC$	-	-	250	μA
On-State Drain Current (Note 2)	$I_{D(ON)}$	$V_{DS} > I_{D(ON)} \times r_{DS(ON)MAX}$, V_{GS} = 10V (Figure 7)				
IRF320, IRF321			3.3	-	-	A
IRF322, IRF323			2.8	-	-	A
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ±20V			±100	nA
Drain to Source On Resistance (Note 2)	$r_{DS(ON)}$	I_D = 1.8A, V_{GS} = 10V, (Figures 8, 9)				
IRF320, IRF321			-	1.5	1.8	Ω
IRF322, IRF323			-	1.8	2.5	Ω
Forward Transconductance (Note 2)	g_{fs}	$V_{DS} \geq 10V$, I_D = 2.0A, (Figure 12)	1.7	2.7	-	S
Turn-On Delay Time	$t_{d(ON)}$	V_{DD} = 200V, $I_D \approx 3.3A$, $R_G = 18\Omega$, $R_L = 60\Omega$, V_{GS} = 10V, (Figures 17, 18) MOSFET Switching Times are Essentially Independent of Operating Temperature	-	10	15	ns
Rise Time	t_r		-	14	20	ns
Turn-Off Delay Time	$t_{d(OFF)}$		-	30	45	ns
Fall Time	t_f		-	13	20	ns
Total Gate Charge (Gate to Source + Gate to Drain)	$Q_{g(TOT)}$	V_{GS} = 10V, I_D = 3.3A, V_{DS} = 0.8 x Rated BV_{DSS}, $I_{G(REF)}$ = 1.5mA, (Figures 14, 19, 20) Gate Charge is Essentially Independent of Operating Temperature	-	12	20	nC
Gate to Source Charge	Q_{gs}		-	4	-	nC
Gate to Drain "Miller" Charge	Q_{gd}		-	8	-	nC

Electrical Specifications $T_C = 25^oC$, Unless Otherwise Specified **(Continued)**

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNITS
Input Capacitance	C_{ISS}	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz (Figure 11)		-	450	-	pF
Output Capacitance	C_{OSS}			-	100	-	pF
Reverse Transfer Capacitance	C_{RSS}			-	20	-	pF
Internal Drain Inductance	L_D	Measured Between the Contact Screw on the Flange that is Closer to Source and Gate Pins and the Center of Die	Modified MOSFET Symbol Showing the Internal Devices Inductances 	-	5.0	-	nH
Internal Source Inductance	L_S	Measured from the Source Lead, 6mm (0.25in) From the Flange and the Source Bonding Pad		-	12.5	-	nH
Thermal Resistance Junction to Case	$R_{\theta JC}$			-	-	2.5	$^oC/W$
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	Free Air Operation		-	-	30	$^oC/W$

Source to Drain Diode Specifications

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNITS
Continuous Source to Drain Current	I_{SD}	Modified MOSFET Symbol Showing the Integral Reverse P-N Junction Diode		-	-	3.3	A
Pulse Source to Drain Current (Note 3)	I_{SDM}			-	-	13	A
Source to Drain Diode Voltage (Note 2)	V_{SD}	$T_C = 25^oC$, I_{SD} = 3.3A, V_{GS} = 0V, (Figure 13)		-	-	1.8	V
Reverse Recovery Time	t_{rr}	$T_J = 25^oC$, I_{SD} = 3.3A, dI_{SD}/dt = 100A/µs		120	270	600	ns
Reverse Recovery Charge	Q_{RR}	$T_J = 25^oC$, I_{SD} = 3.3A, dI_{SD}/dt = 100A/µs		0.64	1.4	3.0	µC

NOTES:

2. Pulse test: pulse width ≤ 300µs, duty cycle ≤ 2%.