

**GENERAL DESCRIPTION**

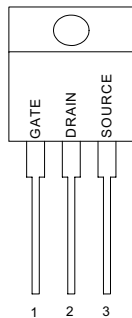
This Power MOSFET is designed for low voltage, high speed power switching applications such as switching regulators, converters, solenoid and relay drivers.

**FEATURES**

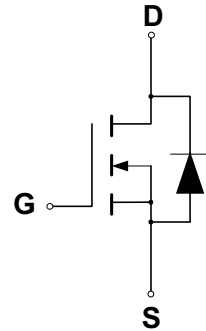
- ◆ Higher Current Rating
- ◆ Lower  $r_{DS(ON)}$ , Lower Capacitances
- ◆ Lower Total Gate Charge
- ◆ Tighter VSD Specifications
- ◆ Avalanche Energy Specified

**PIN CONFIGURATION**

TO-220  
Top View



**SYMBOL**



N-Channel MOSFET

**ORDERING INFORMATION**

Part Number	Package
IRF6N40	TO-220

**ABSOLUTE MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Drain to Current – Continuous	$I_D$	6.0	A
– Pulsed (Note 1)	$I_{DM}$	21	
Gate-to-Source Voltage – Continue	$V_{GS}$	$\pm 20$	V
Total Power Dissipation	$P_D$	96	W
Derate above 25°C		0.77	W/°C
Single Pulse Drain-to-Source Avalanche Energy – $T_J = 25^\circ\text{C}$ ( $V_{DD} = 100\text{V}$ , $V_{GS} = 10\text{V}$ , $I_L = 6\text{A}$ , $L = 10\text{mH}$ , $R_G = 25\Omega$ )	$E_{AS}$	180	mJ
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	°C
Thermal Resistance – Junction to Case	$\theta_{JC}$	1.70	°C/W
– Junction to Ambient	$\theta_{JA}$	62	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	$T_L$	300	°C

### ELECTRICAL CHARACTERISTICS

Unless otherwise specified,  $T_J = 25^\circ\text{C}$ .

Characteristic	Symbol	IRF6N40			Units
		Min	Typ	Max	
Drain-Source Breakdown Voltage ( $V_{GS} = 0\text{ V}$ , $I_D = 250\ \mu\text{A}$ )	$V_{(BR)DSS}$	400			V
Drain-Source Leakage Current ( $V_{DS} = 400\text{V}$ , $V_{GS} = 0\text{ V}$ ) ( $V_{DS} = 400\text{V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125^\circ\text{C}$ )	$I_{DSS}$			25 100	$\mu\text{A}$
Gate-Source Leakage Current-Forward ( $V_{gsf} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$ )	$I_{GSSF}$			100	nA
Gate-Source Leakage Current-Reverse ( $V_{gsr} = -20\text{ V}$ , $V_{DS} = 0\text{ V}$ )	$I_{GSSR}$			-100	nA
Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$ )	$V_{GS(th)}$	2.0		4.0	V
Static Drain-Source On-Resistance ( $V_{GS} = 10\text{ V}$ , $I_D = 3\text{A}$ ) (Note 4)	$R_{DS(on)}$			1.0	$\Omega$
Forward Transconductance ( $V_{DS} = 50\text{V}$ , $I_D = 3\text{ A}$ ) (Note 4)	$g_{FS}$	2.9			mhos
Input Capacitance	$(V_{DS} = 25\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{iss}$	515	720	pF
Output Capacitance		$C_{oss}$	185	260	pF
Reverse Transfer Capacitance		$C_{rss}$	15	30	pF
Turn-On Delay Time	$(V_{DD} = 200\text{ V}$ , $I_D = 6\text{ A}$ , $R_G = 9.1\Omega$ , $V_{GS} = 10\text{ V}$ ) (Note 4)	$t_{d(on)}$	7	10	ns
Rise Time		$t_r$	11	20	ns
Turn-Off Delay Time		$t_{d(off)}$	19	40	ns
Fall Time		$t_f$	10	20	ns
Total Gate Charge	$(V_{DS} = 320\text{V}$ , $I_D = 6\text{A}$ , $V_{GS} = 10\text{ V}$ ) (Note 4)	$Q_g$	9.5		nC
Gate-Source Charge		$Q_{gs}$	2		nC
Gate-Drain Charge		$Q_{gd}$	3		nC
Internal Drain Inductance (Measured from the drain lead 0.25" from package to center of die)	$L_D$		4.5		nH
Internal Drain Inductance (Measured from the source lead 0.25" from package to source bond pad)	$L_S$		7.5		nH
<b>SOURCE-DRAIN DIODE CHARACTERISTICS</b>					
Reverse Recovery Charge	$I_F = 6\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$ , $T_J = 25^\circ\text{C}$ (Note 4)	$Q_{rr}$		1.6	$\mu\text{C}$
Forward Turn-On Time		$t_{on}$		**	
Reverse Recovery Time		$t_{rr}$		270	
Diode Forward Voltage	$I_S = 6\text{A}$ , $V_{GS} = 0\text{ V}$ , $T_J = 25^\circ\text{C}$ (Note 4)	$V_{SD}$		1.5	V

**Note**

- (1) Repetitive rating; pulse width limited by max. junction temperature
- (2)  $V_{DD} = 50\text{V}$ , starting  $T_J = 25^\circ\text{C}$ ,  $L=24\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 4.5\text{A}$
- (3)  $I_{SD} \leq 4.5\text{A}$ ,  $di/dt \leq 75\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$
- (4) Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$

\*\* Negligible, Dominated by circuit inductance

TYPICAL ELECTRICAL CHARACTERISTICS

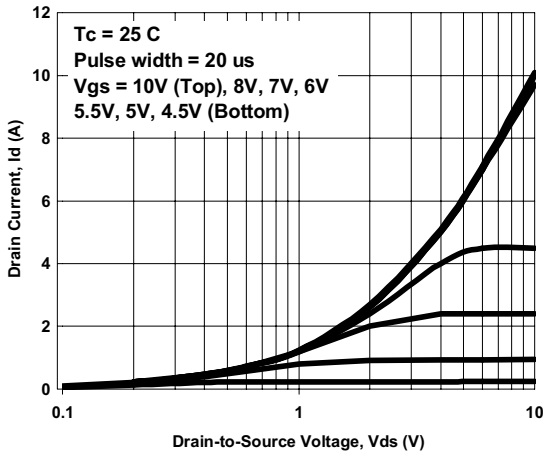


Figure 1. Id versus Vds Curve

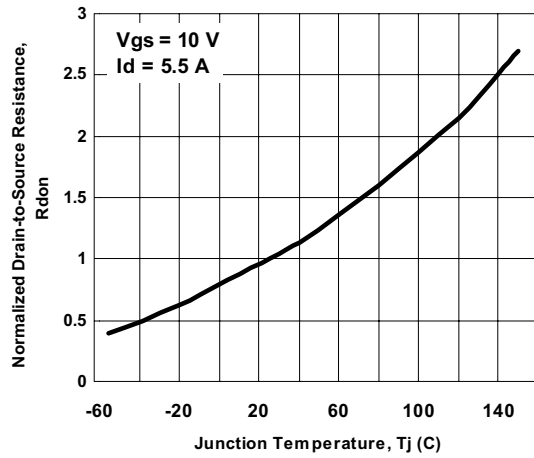


Figure 2. Rdon versus Tj Curve

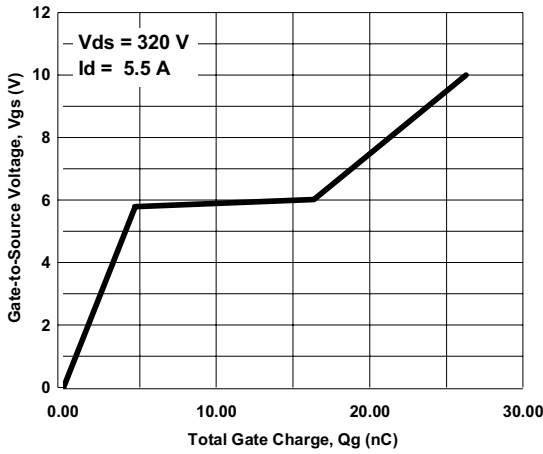


Figure 3. Vgs versus Qg Curve

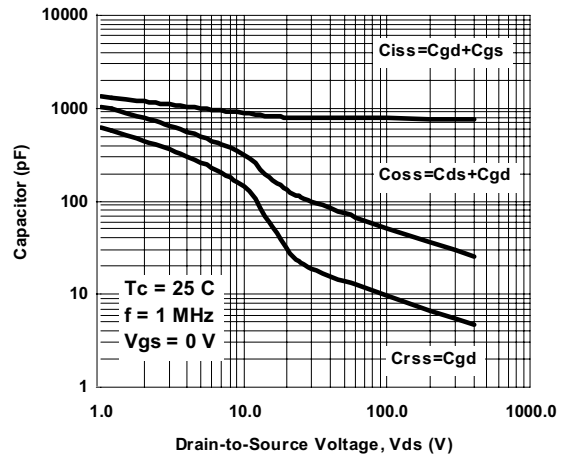


Figure 4. Capacitor versus Vds Curve

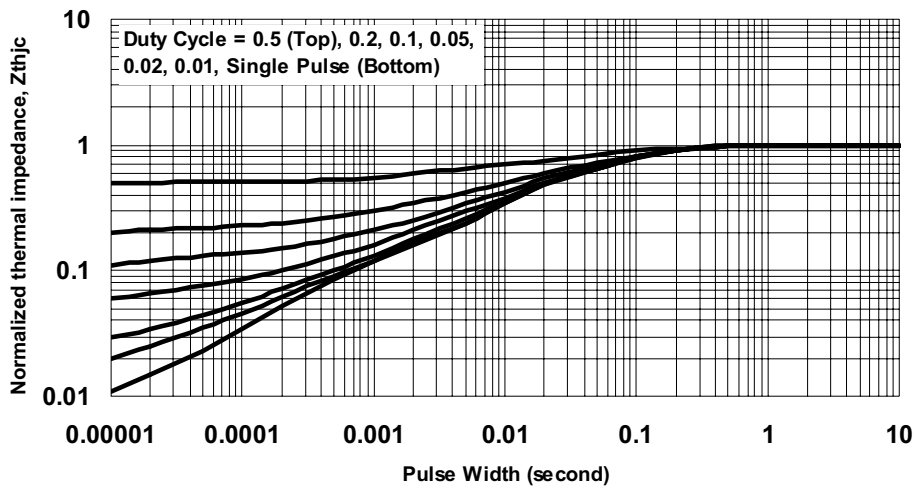


Figure 5. Transient thermal impedance Curve