

- ★ Super Low Gate Charge
- ★ Green Device Available
- ★ Excellent Cdv/dt effect decline
- ★ Advanced high cell density Trench technology

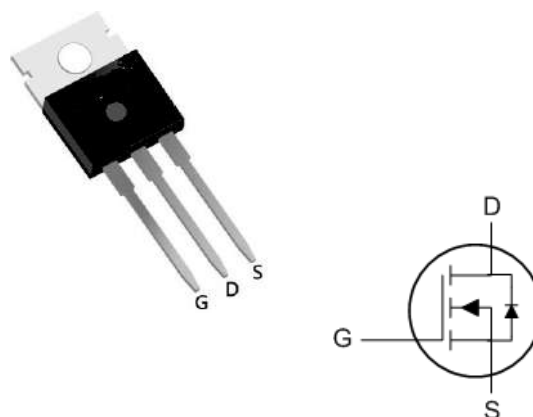
**Product Summary**

BVDSS	R <sub>DS(on)</sub>	I <sub>D</sub>
200V	170mΩ	18A

**Description**

The IRF640N is the highest performance trench N-ch MOSFETs with extreme high cell density, which provide excellent R<sub>DS(on)</sub> and gate charge for most of the synchronous buck converter applications.

The IRF640N meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

**TO220 Pin Configuration**

**Absolute Maximum Ratings**

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	200	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub> @T <sub>C</sub> =25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	18	A
I <sub>D</sub> @T <sub>C</sub> =100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	11.7	A
I <sub>DM</sub>	Pulsed Drain Current <sup>2</sup>	40	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	15	mJ
I <sub>AS</sub>	Avalanche Current	10	A
P <sub>D</sub> @T <sub>C</sub> =25°C	Total Power Dissipation <sup>3</sup>	83	W
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	°C

**Thermal Data**

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction-ambient <sup>1</sup>	---	60	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-Case <sup>1</sup>	---	1.1	°C/W

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	200	---	---	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =9A	---	---	170	mΩ
	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =9A	---	---	180	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.2	---	2.5	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =160V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =160V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =9A	---	22	---	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	2	---	Ω
Q <sub>g</sub>	Total Gate Charge (10V)	V <sub>DS</sub> =80V, V <sub>GS</sub> =10V, I <sub>D</sub> =9A	---	45	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	9	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	10.5	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =50V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3Ω I <sub>D</sub> =9A	---	13	---	ns
T <sub>r</sub>	Rise Time		---	8.2	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	25	---	
T <sub>f</sub>	Fall Time		---	11	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	---	2047	---	pF
C <sub>oss</sub>	Output Capacitance		---	109	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	70	---	

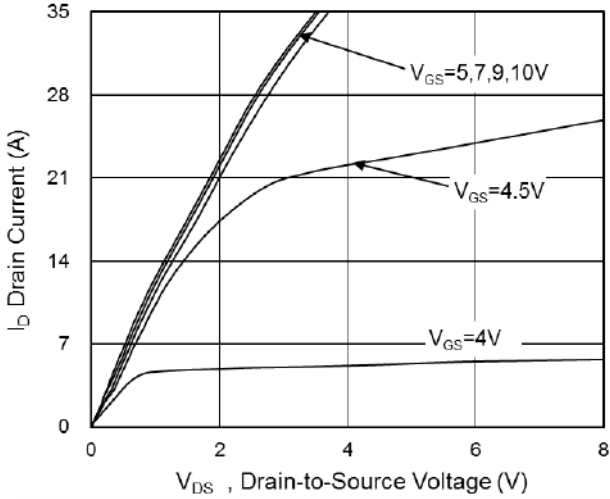
**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sup>1,5</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	18	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,5</sup>		---	---	40	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C	---	---	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =10A, dI/dt=100A/μs,	---	37	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge	T <sub>J</sub> =25°C	---	103	---	nC

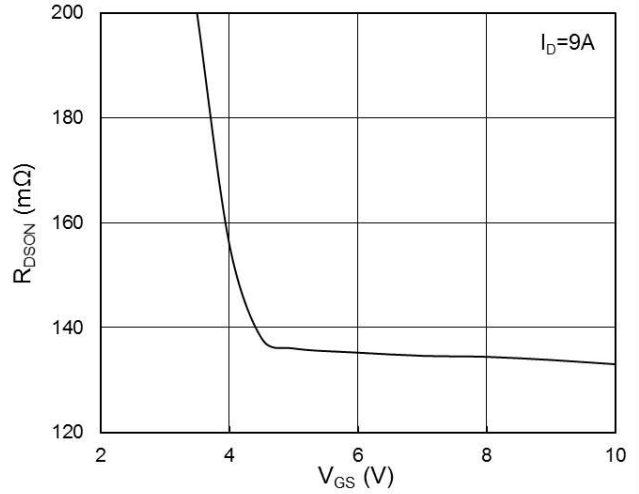
Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- 3.The EAS data shows Max. rating. The test condition is V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.3mH, I<sub>AS</sub>=10A
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

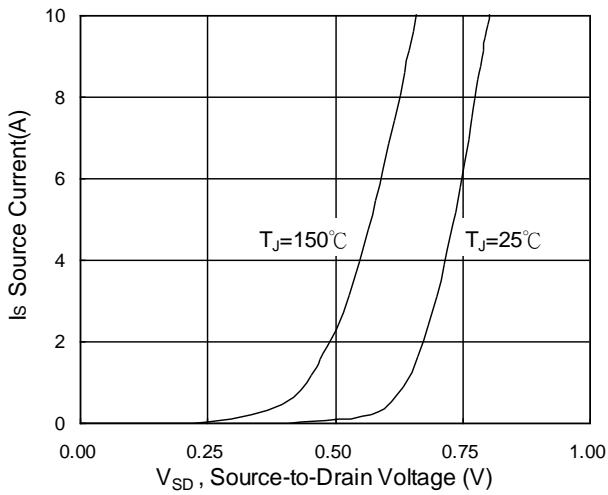
**Typical Characteristics**



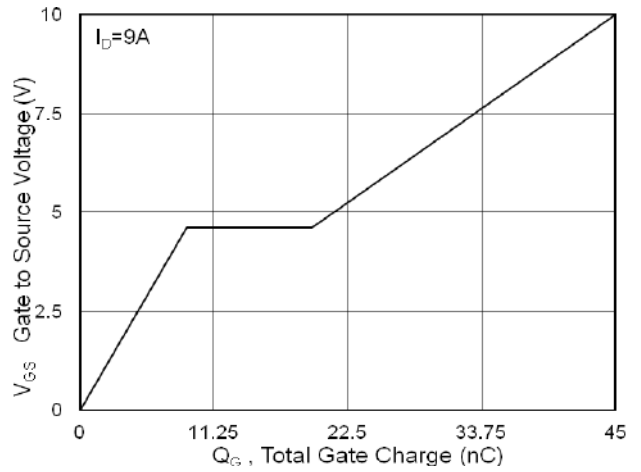
**Fig.1 Typical Output Characteristics**



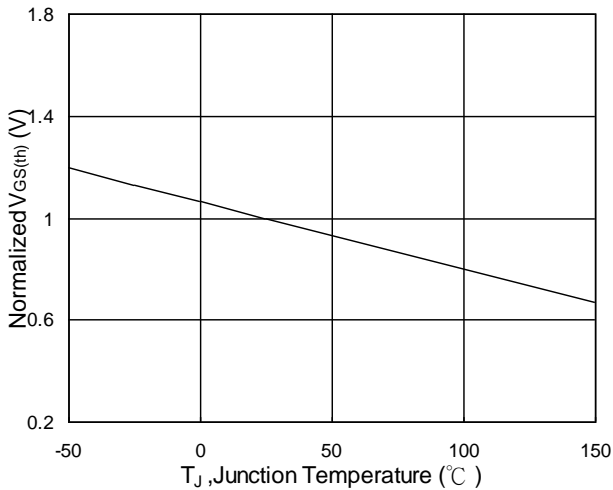
**Fig.2 On-Resistance vs. Gate-Source**



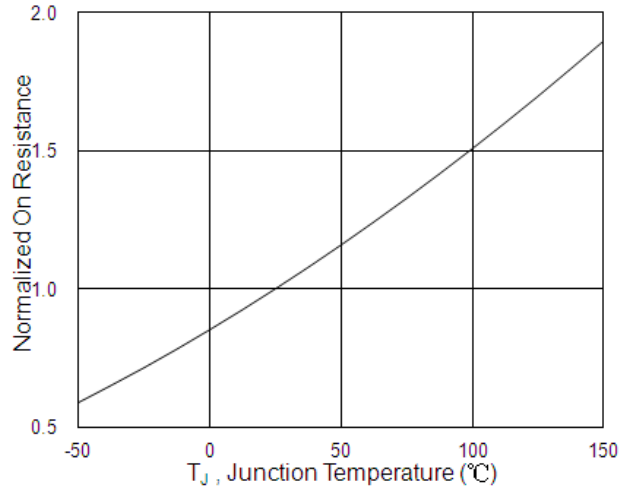
**Fig.3 Forward Characteristics Of Reverse**



**Fig.4 Gate-Charge Characteristics**

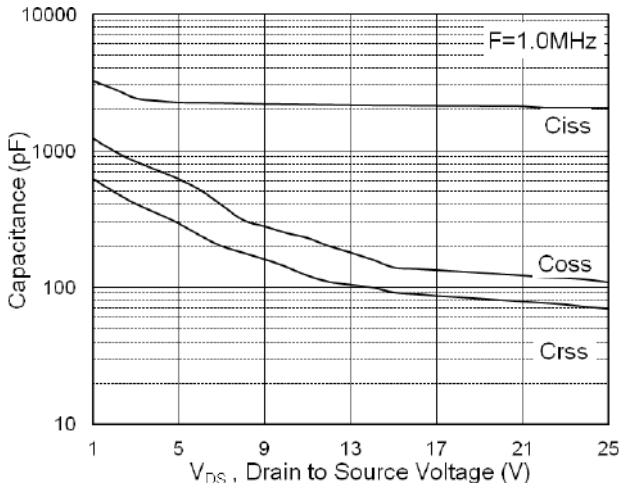


**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**

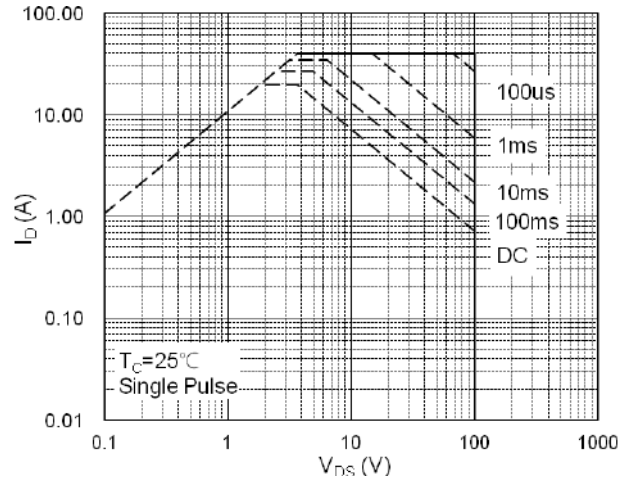


**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**

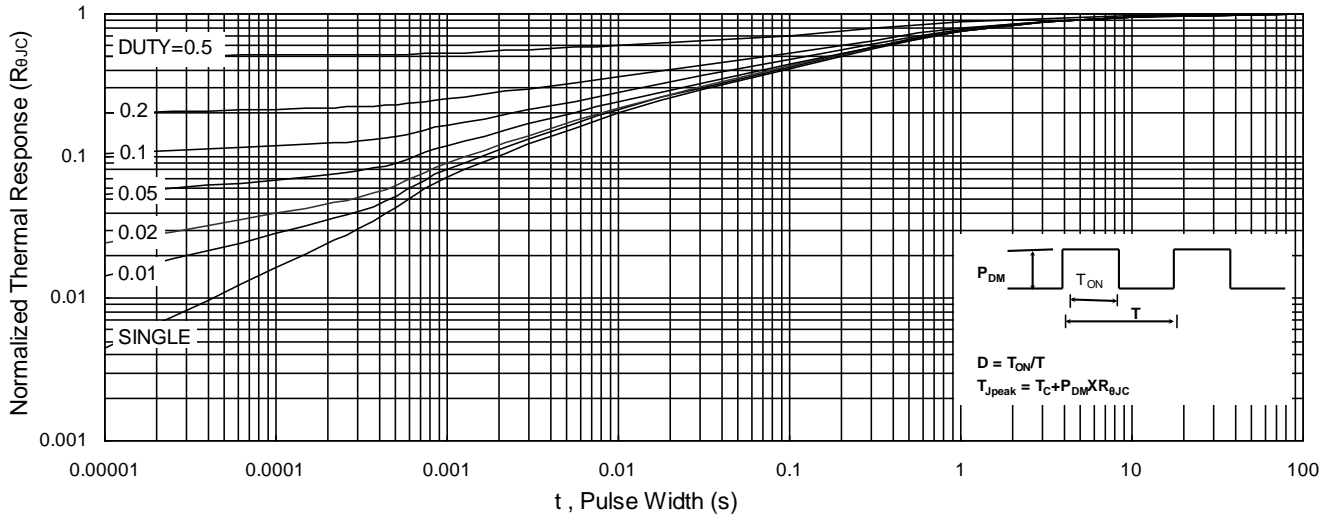
**N-Ch 200V Fast Switching MOSFETs**



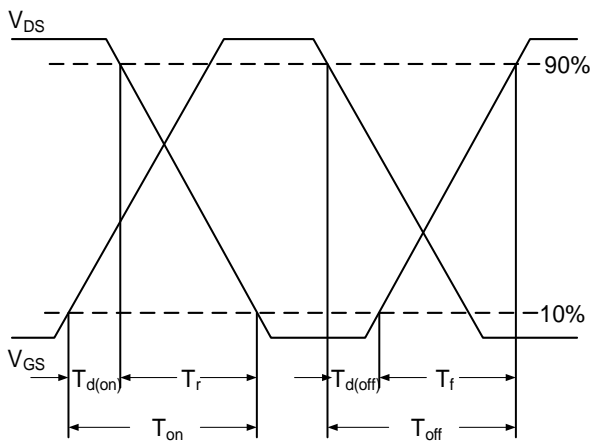
**Fig.7 Capacitance**



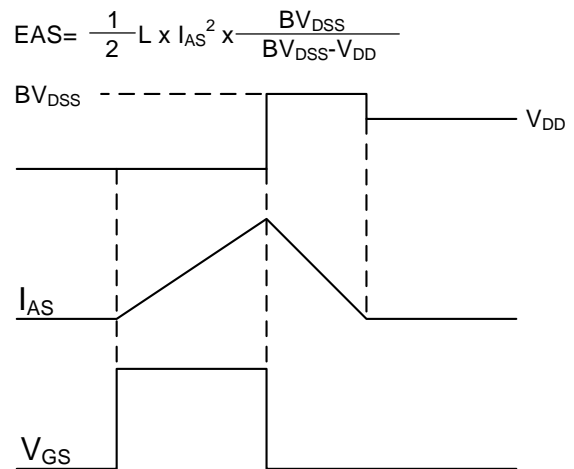
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**