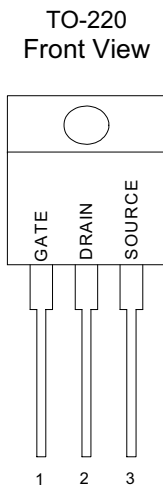**Suntac ELECTRONIC CORP**

GENERAL DESCRIPTION

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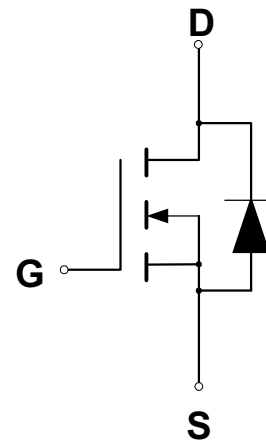
FEATURES

◆ Silicon Gate for Fast Switching Speeds

◆ Low $R_{DS(on)}$ to Minimize On-Losses. Specified at Elevated Temperature

◆ Rugged – SOA is Power Dissipation Limited

◆ Source-to-Drain Characterized for Use With Inductive Loads

PIN CONFIGURATION

TO-220
Front View

SYMBOL

N-Channel MOSFET

ORDERING INFORMATION

Part Number	Package
IRF640	TO-220

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain to Current — Continuous	I_D	18	A
— Pulsed	I_{DM}	72	
Gate-to-Source Voltage — Continue	V_{GS}	±20	V
— Non-repetitive	V_{GSM}	±40	V
Total Power Dissipation	P_D	125	W
Derate above 25℃		1.00	W/℃
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 150	℃
Single Pulse Drain-to-Source Avalanche Energy — T_J = 25℃ (V_{DD} = 100V, V_{GS} = 10V, I_L = 18A, L = 1.38mH, R_G = 25Ω)	E_{AS}	224	mJ
Thermal Resistance — Junction to Case	θ_{JC}	1.00	℃/W
— Junction to Ambient	θ_{JA}	62.5	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	℃

(1) Pulse Width and frequency is limited by TJ(max) and thermal response

IRF640

POWER MOSFET

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, T_J = 25℃.

Characteristic		Symbol	IRF640			Units
			Min	Typ	Max	
Drain-Source Breakdown Voltage (V_{GS} = 0 V, I_D = 250 μA)		$V_{(BR)DSS}$	200			V
Drain-Source Leakage Current (V_{DS} = Rated V_{DSS}, V_{GS} = 0 V) (V_{DS} = 0.8Rated V_{DSS}, V_{GS} = 0 V, T_J = 125℃)		I_{DSS}			0.025 1.0	mA
Gate-Source Leakage Current-Forward (V_{gsf} = 20 V, V_{DS} = 0 V)		I_{GSSF}			100	nA
Gate-Source Leakage Current-Reverse (V_{gsr} = 20 V, V_{DS} = 0 V)		I_{GSSR}			100	nA
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 250 μA)		$V_{GS(th)}$	2.0		4.0	V
Static Drain-Source On-Resistance (V_{GS} = 10 V, I_D = 10A) *		$R_{DS(on)}$			0.18	Ω
Drain-Source On-Voltage (V_{GS} = 10 V) (I_D = 5.0 A)		$V_{DS(on)}$			6.0	V
Forward Transconductance (V_{DS} = 50 V, I_D = 10 A) *		g_{FS}	6.8			mhos
Input Capacitance	(V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{iss}			1600	pF
Output Capacitance		C_{oss}			750	pF
Reverse Transfer Capacitance		C_{rss}			300	pF
Turn-On Delay Time	(V_{DD} = 30 V, I_D = 10 A, V_{GS} = 10 V, R_G = 4.7Ω) *	$t_{d(on)}$			30	ns
Rise Time		t_r			60	ns
Turn-Off Delay Time		$t_{d(off)}$			80	ns
Fall Time		t_f			60	ns
Total Gate Charge	(V_{DS} = 0.8Rated V_{DSS}, I_D = Rated I_D, V_{GS} = 10 V)*	Q_g		36	63	nC
Gate-Source Charge		Q_{gs}		16		nC
Gate-Drain Charge		Q_{gd}		26		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
SOURCE-DRAIN DIODE CHARACTERISTICS						
Forward On-Voltage(1)	(I_S = Rated I_D, d_{IS}/d_t = 100A/μs)	V_{SD}			1.5	V
Forward Turn-On Time		t_{on}		**		ns
Reverse Recovery Time		t_{rr}		450		ns

* Pulse Test: Pulse Width ≦300μs, Duty Cycle ≦2%

** Negligible, Dominated by circuit inductance
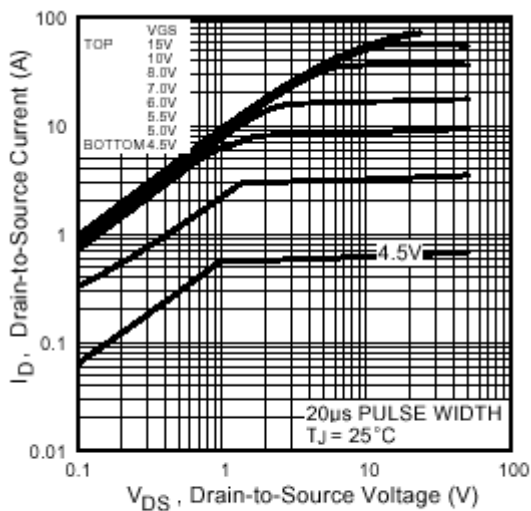
TYPICAL ELECTRICAL CHARACTERISTICS

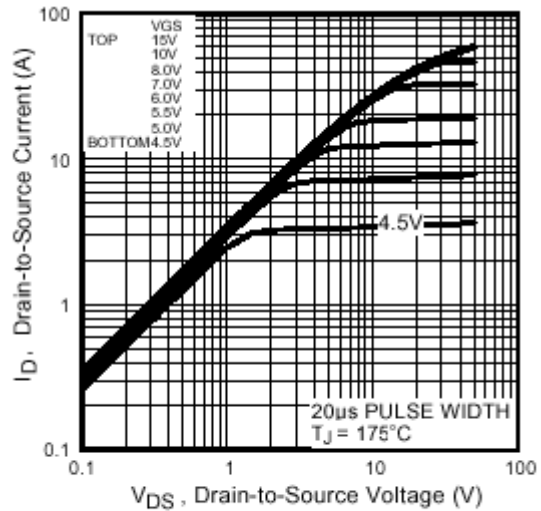Fig 1. Typical Output Characteristics
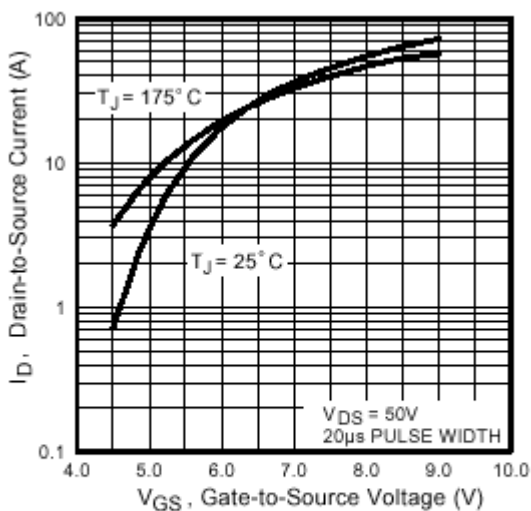
Fig 2. Typical Output Characteristics
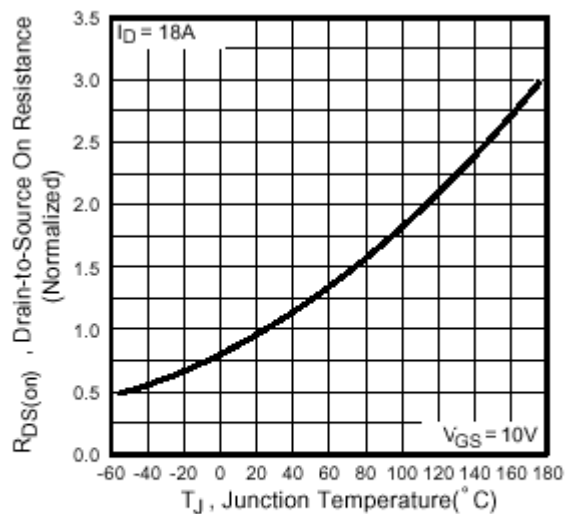
Fig 3. Typical Transfer Characteristics

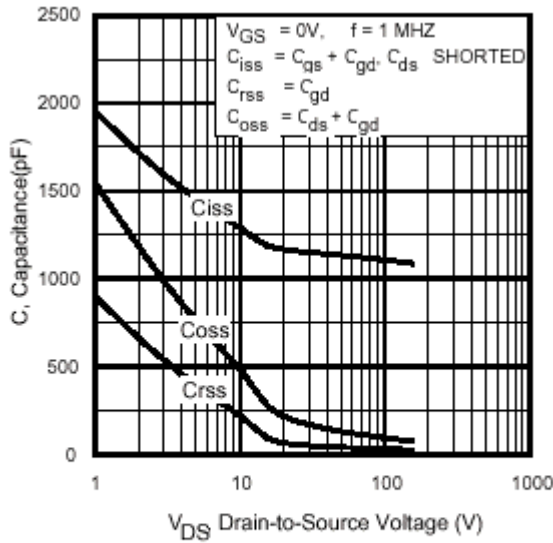Fig 4. Normalized On-Resistance
Vs. Temperature
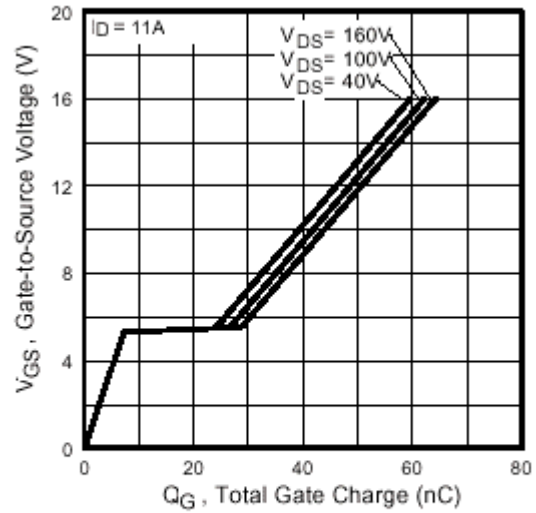
Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

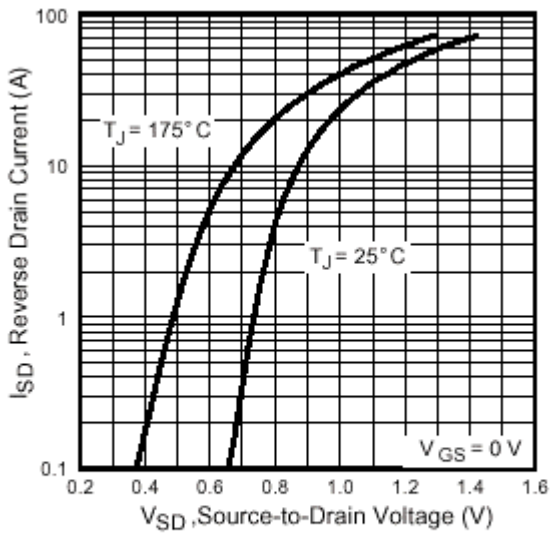
Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

Fig 7. Typical Source-Drain Diode Forward Voltage
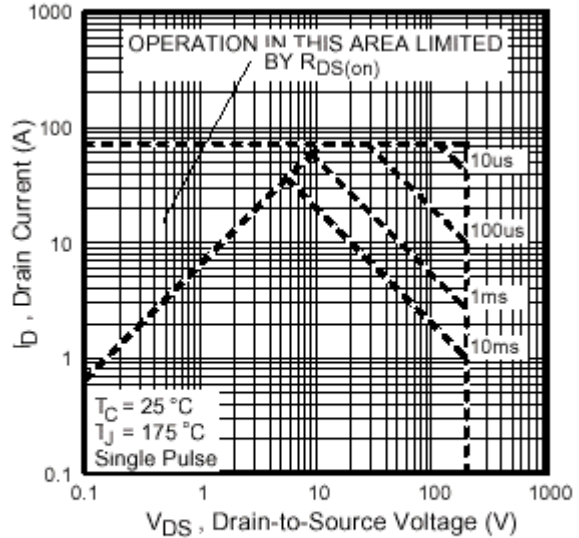

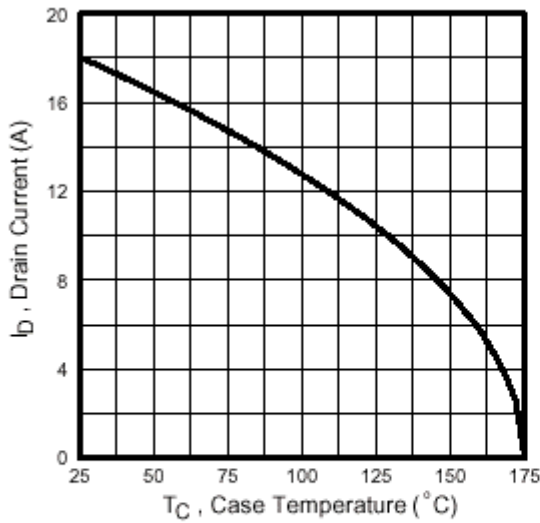**Fig 8.** Maximum Safe Operating Area

Fig 9. Maximum Drain Current Vs. Case Temperature
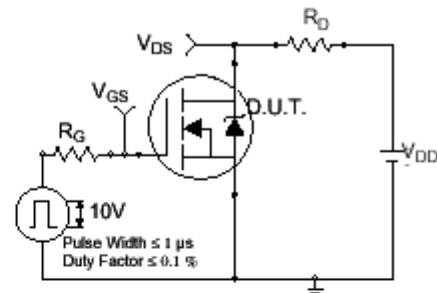

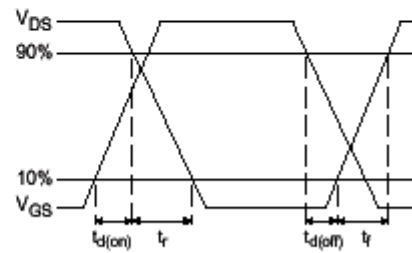**Fig 10a.** Switching Time Test Circuit
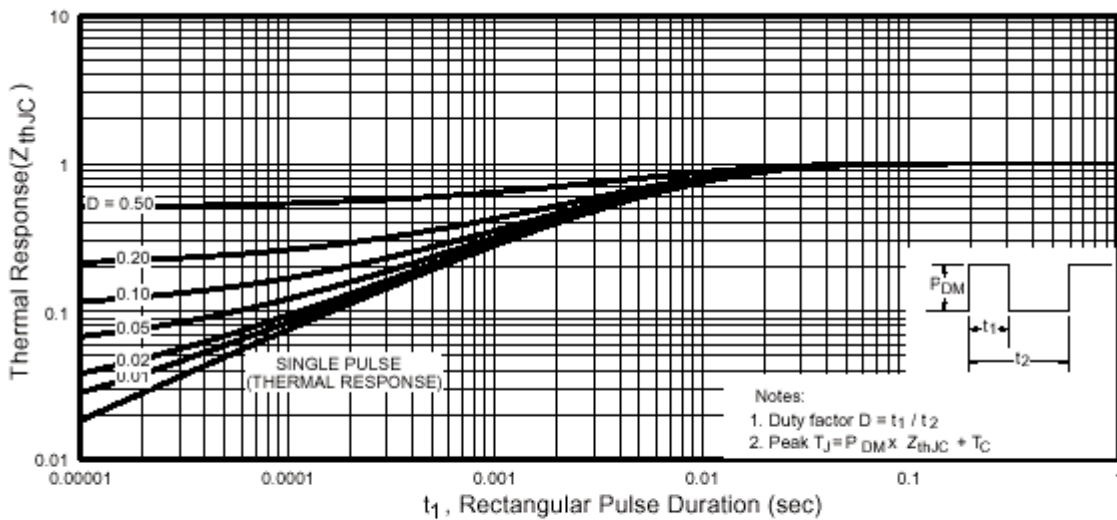

Fig 10b. Switching Time Waveforms

Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

PACKAGE DIMENSION

TO-220

D

F

φ

E1

A

E

c1

L1

L

PIN 1: GATE
PIN 2: DRAIN
PIN 3: SOURCE

e

b1

b

e1

A1

c

Front View

Side View

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.47	---	4.67	0.176	---	0.184
A1	2.52	---	2.82	0.099	---	0.111
b	0.71	---	0.91	0.028	---	0.036
b1	1.17	---	1.37	0.046	---	0.054
c	0.31	---	0.53	0.012	---	0.021
c1	1.17	---	1.37	0.046	---	0.054
D	10.01	---	10.31	0.394	---	0.406
E	8.50	---	8.90	0.335	---	0.350
E1	12.06	---	12.46	0.475	---	0.491
e	---	2.54	---	---	0.100	---
e1	4.98	---	5.18	0.196	---	0.204
F	2.59	---	2.89	0.102	---	0.114
L	13.40	---	13.80	0.528	---	0.543
L1	3.56	---	3.96	0.140	---	0.156
φ	3.79	---	3.89	0.149	---	0.153