

IRF540

N-CHANNEL 100V - 0.055 Ω - 22A TO-220 LOW GATE CHARGE STripFET™ II POWER MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D	
IRF540	100 V	<0.077 Ω	22 A	

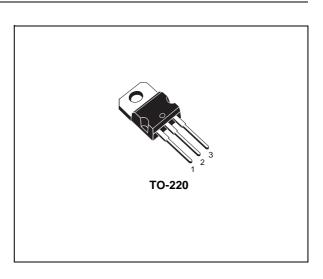
- TYPICAL $R_{DS}(on) = 0.055\Omega$
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

DESCRIPTION

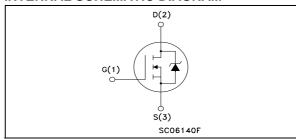
This MOSFET series realized with STMicroelectronics unique STripFET process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced highefficiency, high-frequency isolated DC-DC converters for Telecom and Computer applications. It is also intended for any applications with low gate drive requirements.

APPLICATIONS

- HIGH-EFFICIENCY DC-DC CONVERTERS
- UPS AND MOTOR CONTROL



INTERNAL SCHEMATIC DIAGRAM



Ordering Information

SALES TYPE	MARKING	PACKAGE	PACKAGING
IRF540	IRF540&	TO-220	TUBE

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	100	V
V_{DGR}	Drain-gate Voltage ($R_{GS} = 20 \text{ k}\Omega$)	100	V
V _{GS}	Gate- source Voltage	± 20	V
I _D	Drain Current (continuous) at T _C = 25°C	22	A
I _D	Drain Current (continuous) at T _C = 100°C	15	А
I _{DM} (•)	Drain Current (pulsed)	88	A
P _{tot}	Total Dissipation at T _C = 25°C	85	W
	Derating Factor	0.57	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	9	V/ns
E _{AS} (2)	Single Pulse Avalanche Energy	220	mJ
T _{stg}	Storage Temperature	-55 to 175	°C
Tj	Max. Operating Junction Temperature	-55 to 175	

^(•) Pulse width limited by safe operating area.

¹⁾ $I_{SD} \le 22A$, $di/dt \le 300A/\mu s$, $V_{DD} \le V_{(BR)DSS}$, $T_j \le T_{JMAX}$ (2) Starting $T_j = 25$ °C, $I_D = 12A$, $V_{DD} = 30V$

THERMAL DATA

Rthj-ca Rthj-a T _I		Max Max Typ	1.76 62.5 300	°C/W °C	
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ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	$I_D = 250 \ \mu A, \ V_{GS} = 0$	100			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	$V_{DS} = Max Rating$ $V_{DS} = Max Rating T_C = 125^{\circ}C$			1 10	μA μA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ± 20V			±100	nA

ON (1)

Symbol	Parameter	Test Conditions		Min.	Тур.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}$	$I_D = 250 \mu A$	2	3	4	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10 V	I _D = 11 A		0.055	0.077	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
g _{fs} (*)	Forward Transconductance	$V_{DS} = 25 \text{ V}$ $I_{D} = 11 \text{ A}$		20		S
C _{iss} C _{oss} C _{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25V$, $f = 1 MHz$, $V_{GS} = 0$		870 125 52		pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
t _{d(on)} t _r	Turn-on Delay Time Rise Time	$\begin{array}{ccc} V_{DD} = 50 \text{ V} & I_D = 12 \text{ A} \\ R_G = 4.7 \; \Omega & V_{GS} = 10 \text{ V} \\ \text{(Resistive Load, Figure 3)} \end{array}$		60 45		ns ns
Q _g Q _{gs} Q _{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V _{DD} = 80 V I _D = 22 A V _{GS} = 10V		30 6 10	41	nC nC nC

SWITCHING OFF

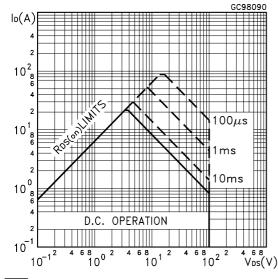
Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
t _{d(off)}	Turn-off Delay Time Fall Time	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$		50 20		ns ns

SOURCE DRAIN DIODE

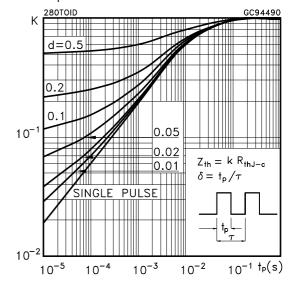
Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
I _{SD} I _{SDM} (•)	Source-drain Current Source-drain Current (pulsed)				22 88	A A
V _{SD} (*)	Forward On Voltage	I _{SD} = 22 A V _{GS} = 0			1.3	V
t _{rr} Q _{rr} IRRM	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$\begin{split} I_{SD} = 22 & A & \text{di/dt} = 100 \text{A/} \mu \text{s} \\ V_{DD} = 30 & V & T_j = 150 ^{\circ} \text{C} \\ \text{(see test circuit, Figure 5)} \end{split}$		100 375 7.5		ns nC A

^(*)Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %. (•)Pulse width limited by safe operating area.

Safe Operating Area

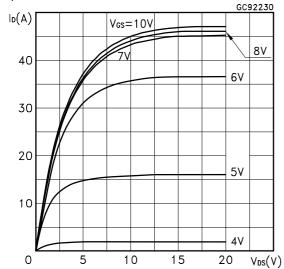


Thermal Impedance

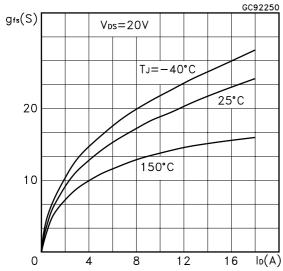


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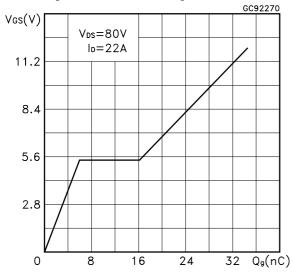
Output Characteristics



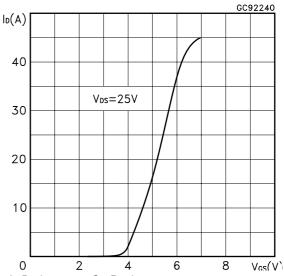
Transconductance



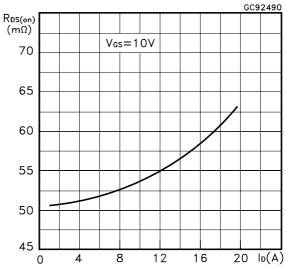
Gate Charge vs Gate-source Voltage



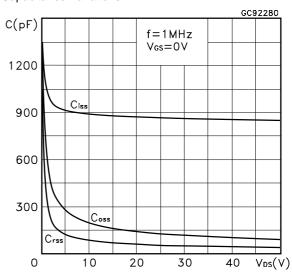
Transfer Characteristics



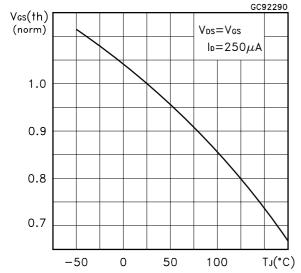
Static Drain-source On Resistance



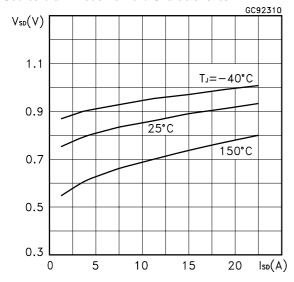
Capacitance Variations



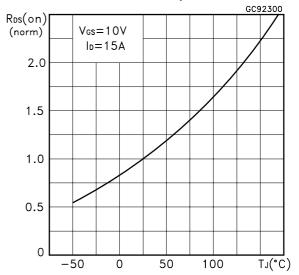
Normalized Gate Threshold Voltage vs Temperature



Source-drain Diode Forward Characteristics



Normalized on Resistance vs Temperature



Normalized Breakdown Voltage vs Temperature

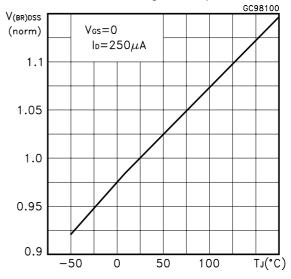


Fig. 1: Unclamped Inductive Load Test Circuit

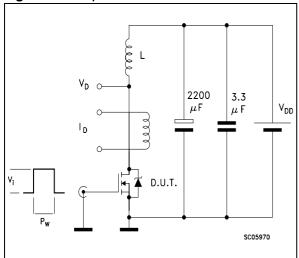


Fig. 3: Switching Times Test Circuits For Resistive Load

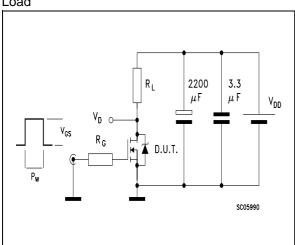


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times

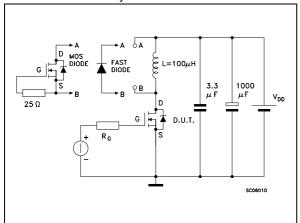


Fig. 2: Unclamped Inductive Waveform

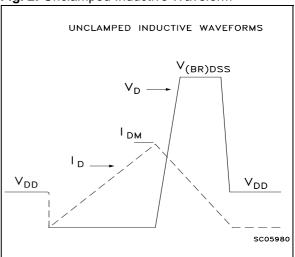
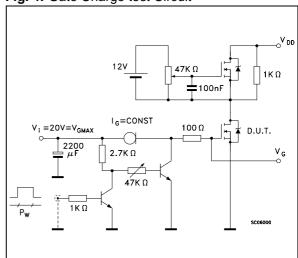
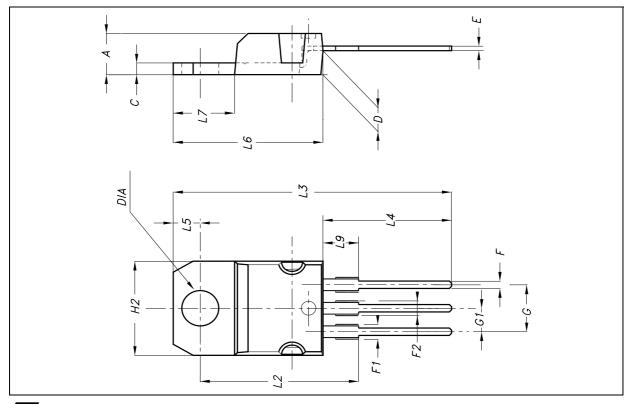


Fig. 4: Gate Charge test Circuit



TO-220 MECHANICAL DATA

DIM.		mm.			inch.	
Dilvi.	MIN.	TYP.	MAX.	MIN.	TYP.	TYP.
Α	4.4		4.6	0.173		0.181
С	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.40		2.70	0.094		0.106
H2	10		10.40	0.393		0.409
L2		16.40			0.645	
L3		28.90			1.137	
L4	13		14	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.20		6.60	0.244		0.260
L9	3.50		3.93	0.137		0.154
DIA	3.75		3.85	0.147		0.151



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