IRFP450
N-CHANNEL 500V-0.33Ω - 14A – TO-247
PowerMESH™ MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRFP450	500V	<0.4 Ω	14A

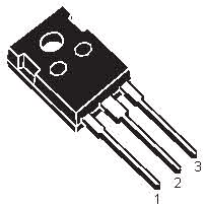
- Typical RDS(on) =0.33 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

DESCRIPTION

This power MOSFET is designed using the company's consolidated strip layout-based MESH OVERLAY ™ process. This technology matches and improves the performances compared with standard parts from various sources.

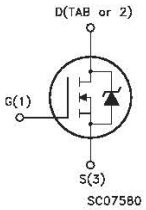
APPLICATIONS

- HIGH CURRENT SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- DC/DC COVERTERS FOR TELECOM, INDUSTRIAL, AND LIGHTING EQUIPMENT.



TO-247

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS}=0)	500	V
V_{DGR}	Drain-gate Voltage (R_{GS}=20kΩ)	500	V
V_{GS}	Gate-Source Voltage	±20	V
I_D	Drain Current (continuous) at Tc=25°C	14	A
ID	Drain Current (continuous) at Tc=100°C	8.7	A
IDM(•)	Drain Current (pulsed)	56	A
Ptot	Total Dissipation at Tc=25°C	190	W
	Derating Factor	1.5	W/°C
dv/dt(1)	Peak Diode Recovery Voltage slope	3.5	V/ns
Tstg	Storage Temperature	-65 to 150	°C
TJ	Max. Operating Junction Temperature	150	°C

(•)Pulse width limited safe operating area (1) I_{SD}≤14A, di/dt ≤130A/μs, V_{DD}≤$V_{(BR)DSS}$, T_j≤T_{JMAX}

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	0.66	°C/W
Rthj-amb	Thermal Resistance Junction-ambient	Max	30	°C/W
Rthc-sink	Thermal Resistance Case-sink	Typ	0.1	°C/W
Tl	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by TJ max)	14	A
E_{AS}	Single Pulse Avalanche Energy (starting T_J=25°C, I_D=I_{AR}, V_{DD}=50V)	800	mJ

ELECTRICAL CHARACTERISTICS (Tcase =25°C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D=250µA V_{GS}=0	500			V
I_{DD}	Zero Gate Voltage Drain Current (V_{GS}=0)	V_{DS}=Max Rating V_{DS}=Max Rating Tc=125°C			1 50	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS}=0)	V_{GS}=±20V			±100	nA

ON(*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS}=10 I_D=8.4A		0.33	0.4	Ω
$I_{D(on)}$	On State Drain Current	V_{DS}>$I_{D(on)}$ x $R_{DS(on)max}$ V_{GS}=10V	14			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
gfs(*)	Forward Transconductance	V_{DS}>$I_{D(on)}$ x $R_{DS(on)max}$ I_D=8.4A	9.3	13		S
Ciss Coss Crss	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS}=25V f=1MHz V_{GS}=0		2600 330 40		pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
td(on)	Turn-on Time	V_{DD}=250V I_D=7A		24		ns
tr	Rise Time	R_G=4.7 Ω V_{GS}=10V		14		ns
		(see test circuit, figure 1)				
Qg	Total Gate Charge	V_{DD}=400V I_D=14A V_{GS}=10V		75		nC
Qgs	Gate-Source Charge			13.5		nC
Qgd	Gate-Drain Charge			27		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	V_{DD}=400V I_D=14A		15		ns
tf	Fall Time	R_G=4.7 Ω V_{GS}=10V		25		ns
tc	Cross-over Time	(see test circuit, figure 3)		35		ns

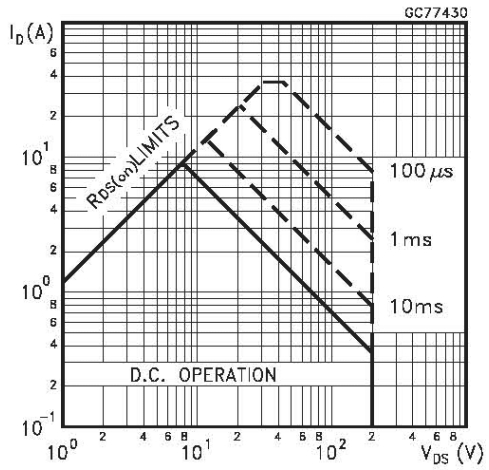
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				14	A
I_{SDM}(•)	Source-drain Current (pulsed)				56	A
V_{SD}(*)	Forward On Voltage	I_{SD}=14A V_{GS}=0			1.4	V
trr	Reverse Recovery Time	I_{SD}=14A di/dt=100A/µs V_{DD}=100V Tj=150°C		680		ns
Qrr	Reverse Recovery Charge	(see test circuit, figure 3)		9		µC
I_{RRM}	Reverse Recovery Current			26		A

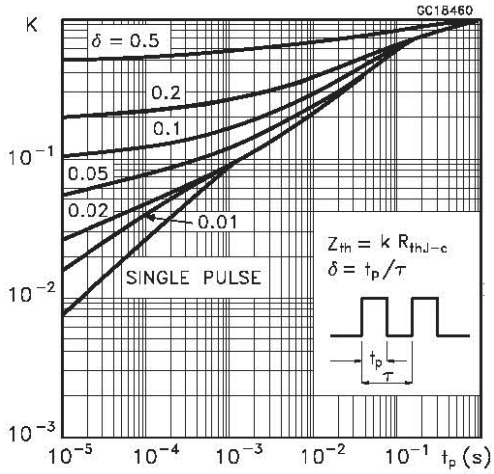
(*) Pulsed: Pulse duration = 300µs, duty cycle 1.5%

(•) Pulse width limited by safe operating area

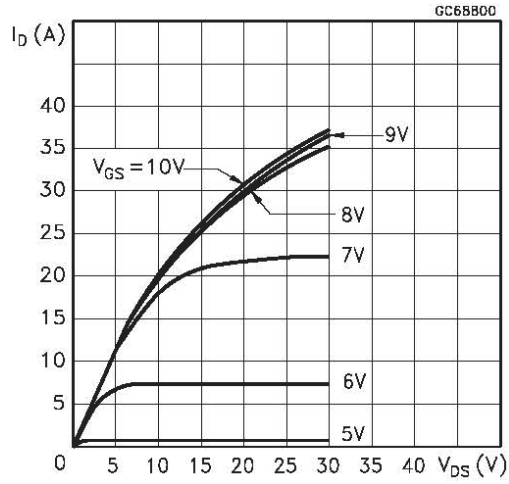
Safe Operating Area



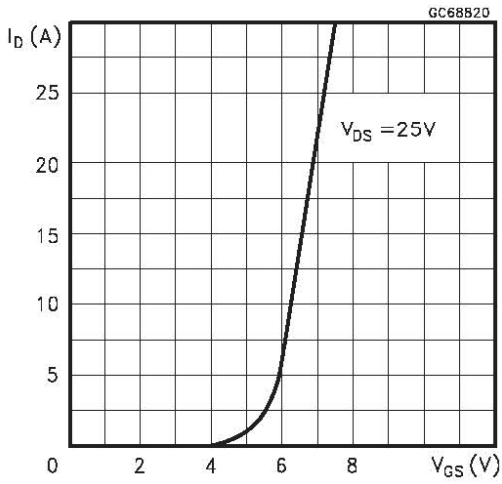
Thermal Impedance



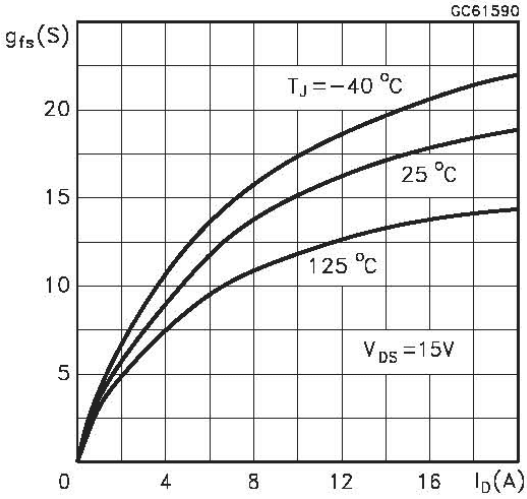
Output Characteristics



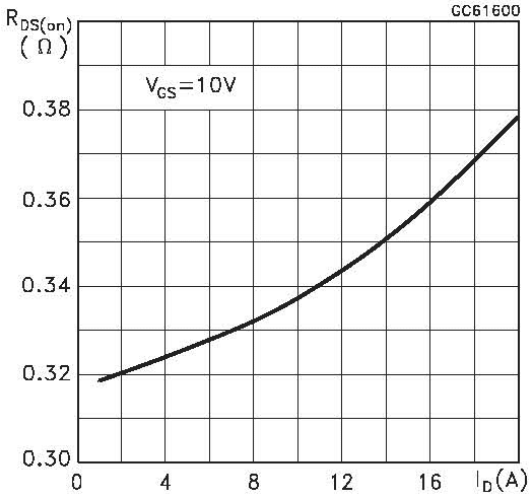
Transfer Characteristics



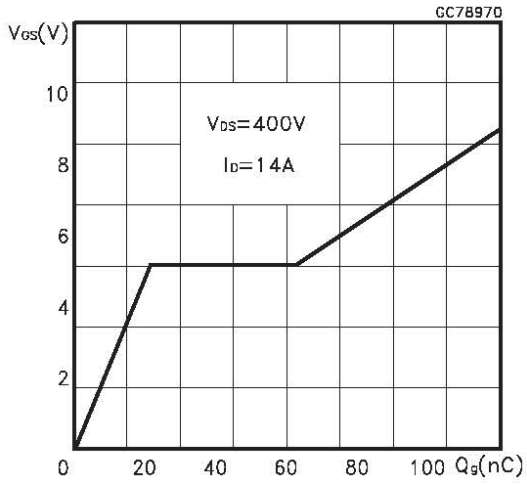
Transconductance



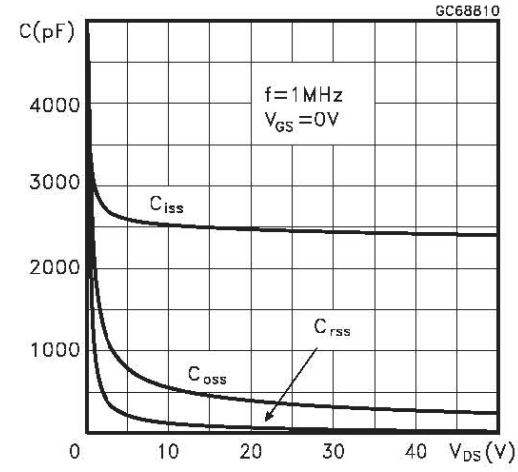
Static Drain-source On Resistance



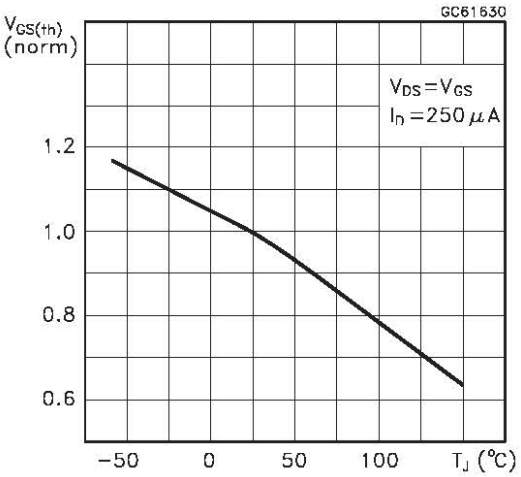
Gate Charge vs Gate-Source Voltage



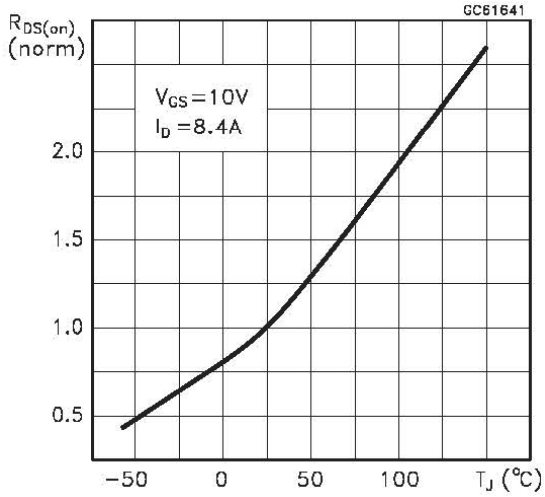
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance Vs Temperature



Source-drain Diode Forward Characteristics

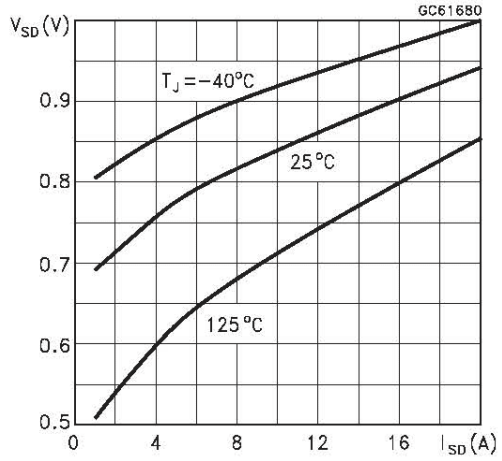


Fig. 1: Unclamped Inductive Load Test Circuit

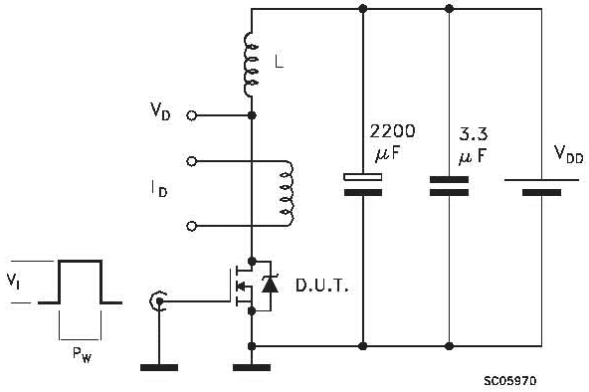


Fig. 3: Switching Times Test Circuit For Resistive Load

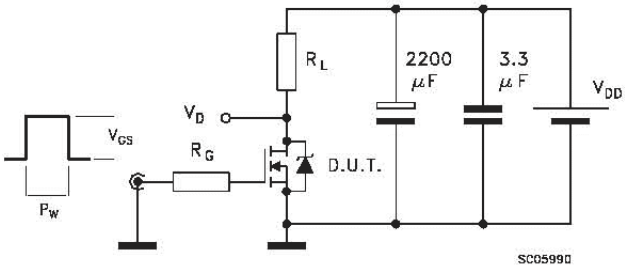


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times

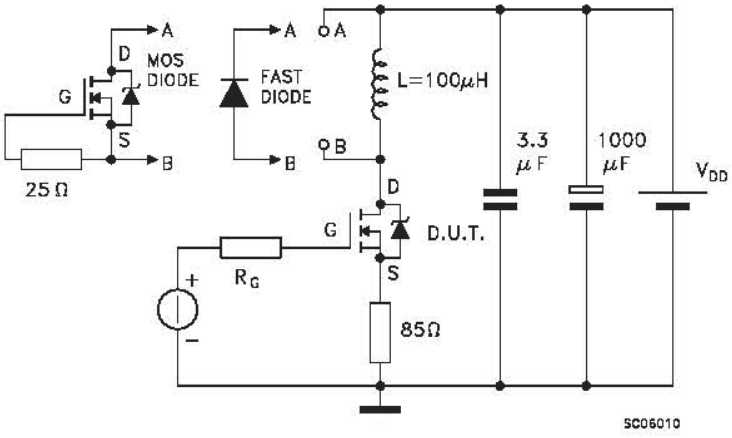


Fig.1: Unclamped Inductive Waveform

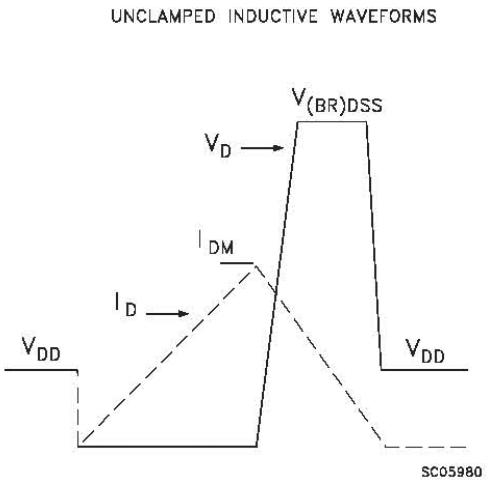
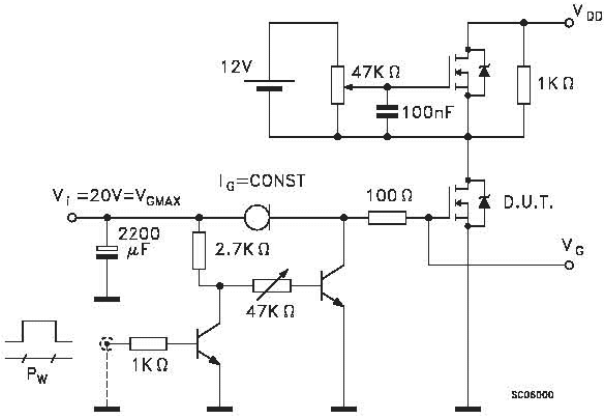


Fig. 4: Gate Charge test Circuit



TO-247 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		5.3	0.185		0.209
D	2.2		2.6	0.087		0.102
E	0.4		0.8	0.016		0.031
F	1		1.4	0.039		0.055
F3	2		2.4	0.079		0.094
F4	3		3.4	0.118		0.134
G		10.9			0.429	
H	15.3		15.9	0.602		0.626
L	19.7		20.3	0.776		0.779
L3	14.2		14.8	0.559	0.413	0.582
L4		34.6			1.362	
L5		5.5			0.217	
M	2		3	0.079		0.118
Dia	3.55		3.65	0.140		0.144