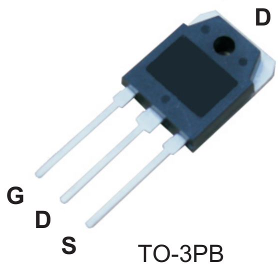
N-Channel Power MOSFET
14A, 500Volts

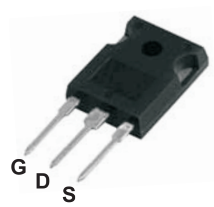
DESCRIPTION

The Nell **IRF450** is a three-terminal silicon device with current conduction capability of 14A, fast switching speed, low on-state resistance, breakdown voltage rating of 500V, and max. threshold voltage of 4 volts.

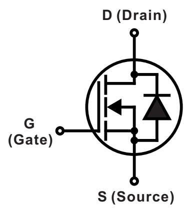
They are designed for use in applications such as switched mode power supplies, DC to DC converters, motor control, circuits UPS and general purpose switching applications.



TO-3PB
(IRF450B)



TO-247AB
(IRF450C)



FEATURES

- $R_{DS(ON)}$ = 0.40Ω @ V_{GS} = 10V
- Ultra low gate charge(150nC Max.)
- Low reverse transfer capacitance (C_{RSS} = 340pF typical)
- Fast switching capability
- 100% avalanche energy specified
- Improved dv/dt capability
- 150°C operation temperature

PRODUCT SUMMARY

I_D (A)	14
V_{DSS} (V)	500
$R_{DS(ON)}$ (Ω)	0.40 @ V_{GS} = 10V
Q_G(nC) max.	150

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C unless otherwise specified)

SYMBOL	PARAMETER	TEST CONDITIONS	VALUE	UNIT
V_{DSS}	Drain to Source voltage	T_J=25°C to 150°C	500	
V_{DGR}	Drain to Gate voltage	R_{GS}=20KΩ	500	V
V_{GS}	Gate to Source voltage		±20	
I_D	Continuous Drain Current (V_{GS}=10V)	T_C=25°C	14	
		T_C=100°C	8.7	
I_{DM}	Pulsed Drain current(Note 1)		56	A
I_{AR}	Avalanche current(Note 1)		8.7	
E_{AR}	Repetitive avalanche energy(Note 1)	I_{AR}=14A, R_{GS}=50Ω, V_{GS}=10V	19	mJ
E_{AS}	Single pulse avalanche energy(Note 2)	I_{AS}=14A, L=7.0mH	760	
dv/dt	Peak diode recovery dv/dt(Note 3)		3.5	V /ns
P_D	Total power dissipation	T_C=25°C	190	W
	Derate above 25°C		1.5	W /°C
T_J	Operation junction temperature		-55 to 150	
T_{STG}	Storage temperature		-55 to 150	°C
T_L	Maximum soldering temperature, for 10 seconds	1.6mm from case	300	
	Mounting torque, #6-32 or M3 screw		10 (1.1)	lbf·in (N·m)

Note: 1.Repetitive rating: pulse width limited by junction temperature.
2.I_{AS}=14A, L=7.0mH, V_{DD}=50V, R_G=25Ω, starting T_J =25°C.
3.I_{SD} ≤ 14A, di/dt ≤ 130A/μs, V_{DD} ≤ $V_{(BR)DSS}$, starting T_J = 25°C.

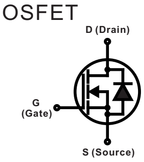
THERMAL RESISTANCE

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
$R_{th(j-c)}$	Thermal resistance, junction to case			0.65	
$R_{th(c-s)}$	Thermal resistance, case to heat sink		0.24		°C/W
$R_{th(j-a)}$	Thermal resistance, junction to ambient			40	

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

SYMBOL	PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
◎ STATIC						
$V_{(BR)DSS}$	Drain to source breakdown voltage	I_D = 250μA, V_{GS} = 0V	500			V
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown voltage temperature coefficient	I_D = 1mA, V_{DS} =V_{GS}		0.63		V/°C
I_{DSS}	Drain to source leakage current	V_{DS}=500V, V_{GS}=0V, T_C = 25°C			25.0	μA
		V_{DS}=400V, V_{GS}=0V, T_C=125°C			250	
I_{GSS}	Gate to source forward leakage current	V_{GS} = 20V, V_{DS} = 0V			100	nA
	Gate to source reverse leakage current	V_{GS} = -20V, V_{DS} = 0V			-100	
$R_{DS(ON)}$	Static drain to source on-state resistance	I_D = 8.4A, V_{GS} = 10V			0.40	Ω
$V_{GS(TH)}$	Gate threshold voltage	V_{GS}=V_{DS}, I_D=250μA	2.0		4.0	V
g_{fs}	Forward transconductance	V_{DS} = 50V, I_D = 8.4A	9.3			S
◎ DYNAMIC						
C_{ISS}	Input capacitance	V_{DS} = 25V, V_{GS} = 0V, f =1MHz		2600		pF
C_{OSS}	Output capacitance			720		
C_{RSS}	Reverse transfer capacitance			340		
$t_{d(ON)}$	Turn-on delay time	V_{DD} = 250V, V_{GS} = 10V I_D = 14A, R_G = 6.2Ω, R_D = 17Ω (Note1,2)		17		ns
t_r	Rise time			47		
$t_{d(OFF)}$	Turn-off delay time			92		
t_f	Fall time			44		
Q_G	Total gate charge	V_{DD} = 400V, V_{GS} = 10V I_D = 14A, (Note1,2)			150	nC
Q_{GS}	Gate to source charge				20	
Q_{GD}	Gate to drain charge (Miller charge)				80	
L_D	Internal drain inductance	Between lead, 6mm(0.25") form package and center of die contact		5		nH
L_S	Internal source inductance			13		

SOURCE TO DRAIN DIODE RATINGS AND CHARACTERISTICS (T_C = 25°C unless otherwise specified)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{SD}	Diode forward voltage	I_{SD} = 14A, V_{GS} = 0V			1.4	V
Is (I_{SD})	Continuous source to drain current	Integral reverse P-N junction diode in the MOSFET			14	A
I_{SM}	Pulsed source current				56	
t_{rr}	Reverse recovery time	I_{SD} = 14A, V_{GS} = 0V, dI_F/dt = 100A/μs		540	810	ns
Q_{rr}	Reverse recovery charge			4.8	7.2	μC

Note: 1. Pulse test: Pulse width ≤ 300μs, duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

ORDERING INFORMATION SCHEME

IRF 450 B

MOSFET series
N-Channel,IRF series

Current and Voltage rating, I_D & V_{DS}
14A / 500V

Package type
B = TO-3PB
C = TO-247AB

■ TYPICAL CHARACTERISTICS

Fig.1 Typical output characteristics, T_C=25°C

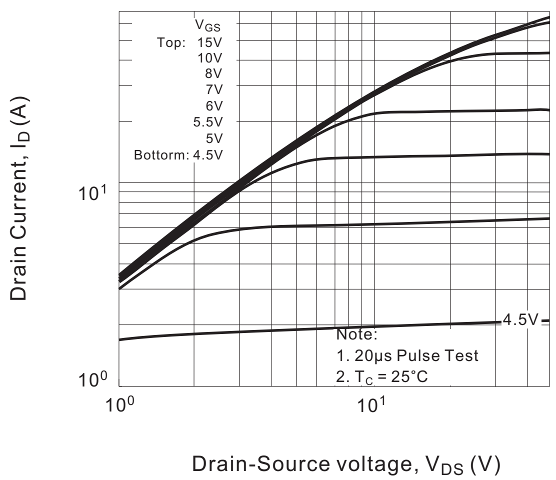


Fig.2 Typical transfer characteristics

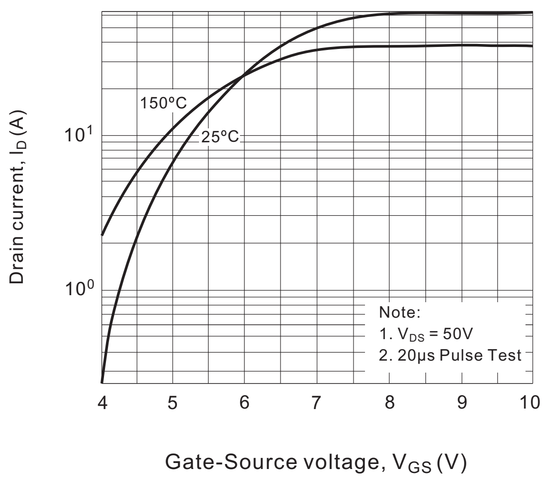


Fig.3 Typical output characteristics, T_C=150°C

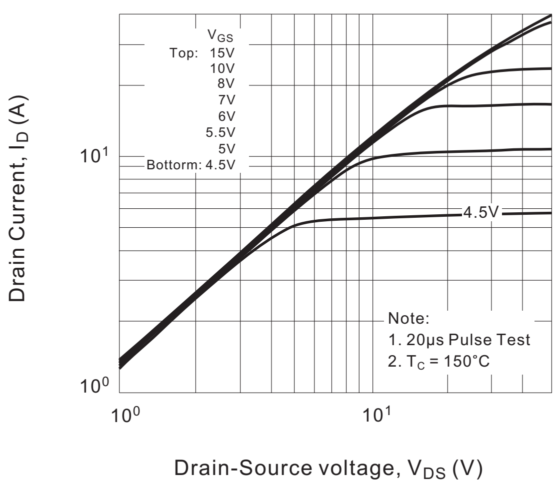


Fig.4 Normalized On-Resistance vs. Temperature

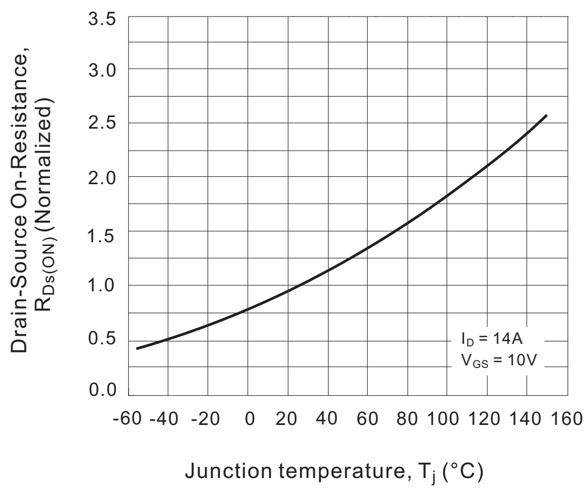


Fig.5 Typical capacitance vs. Drain-to-Source voltage

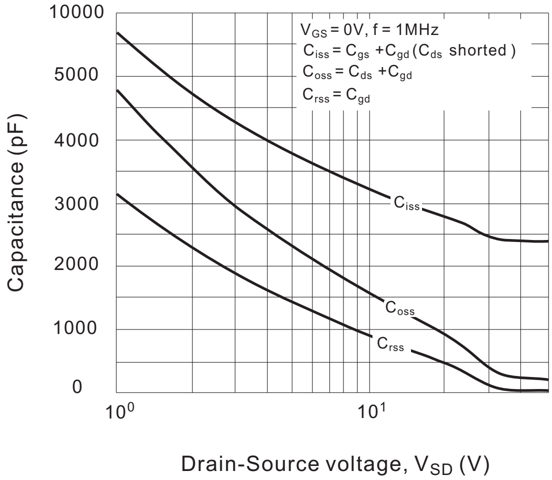


Fig.6 Typical source-drain diode forward voltage

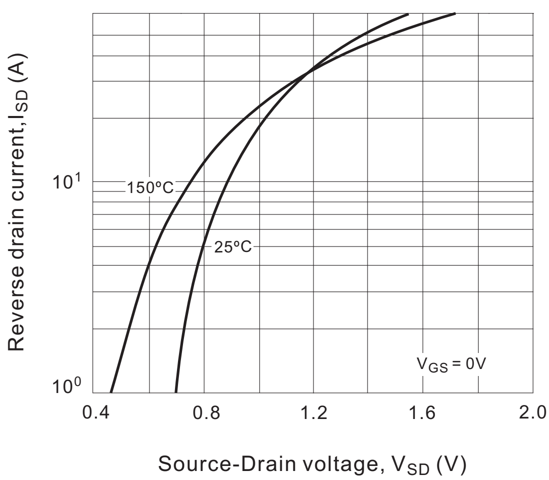


Fig.7 Typical gate charge vs. gate-to-source voltage

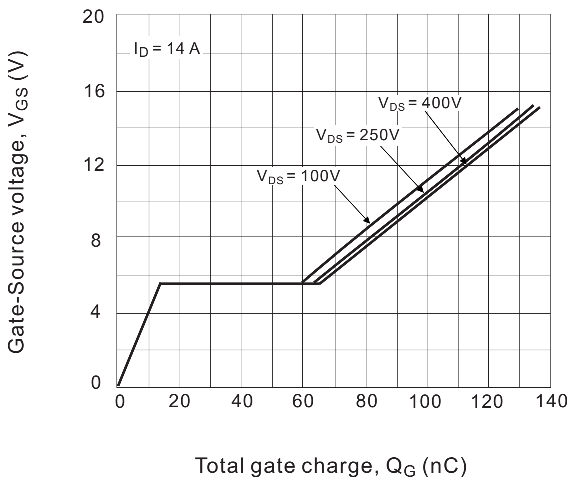


Fig.8 Maximum safe operating area

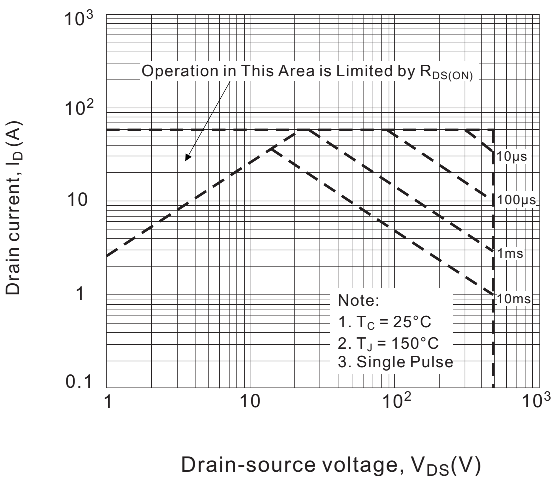


Fig.9 Maximum drain current vs. Case temperature

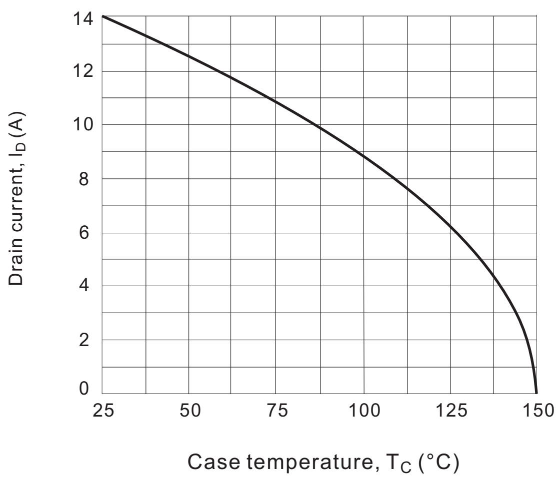


Fig.10 Maximum effective transient thermal impedance, Junction-to-Case

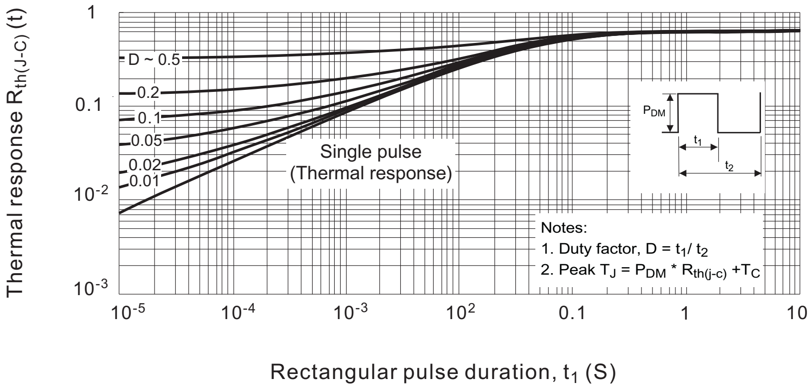


Fig.11a. Switching time test circuit

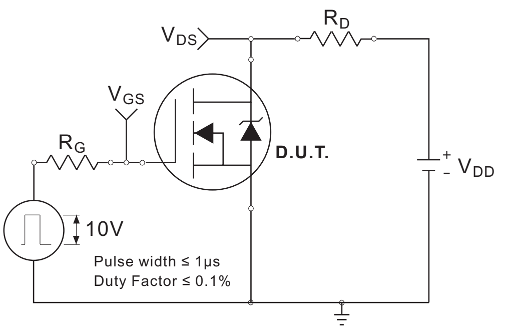


Fig.11b. Switching time waveforms

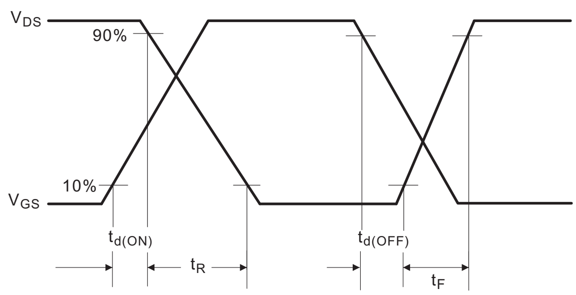
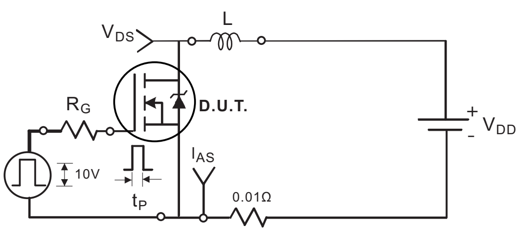


Fig.12a. Unclamped Inductive test circuit



Vary t_p to obtain required I_{AS}

Fig.12b. Unclamped Inductive waveforms

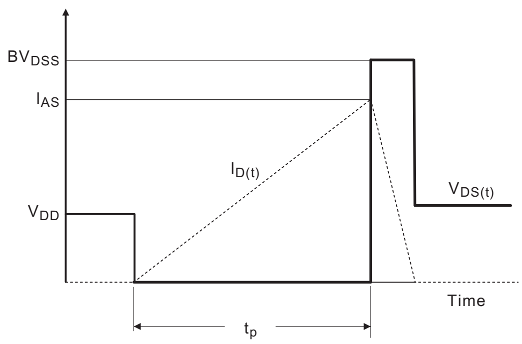


Fig.12c. Maximum avalanche energy vs. Drain current

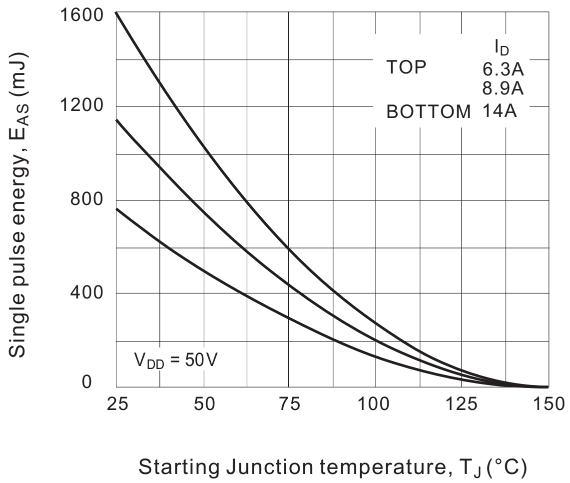


Fig.13a. Basic gate charge waveform

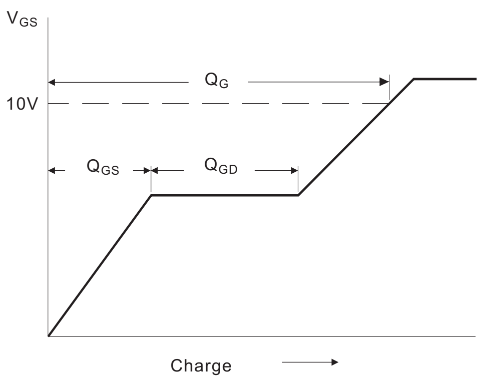


Fig.13b. Gate charge test circuit

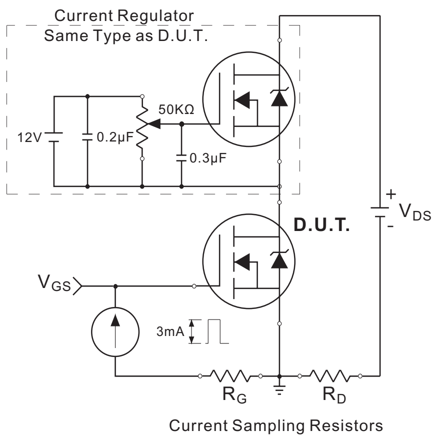
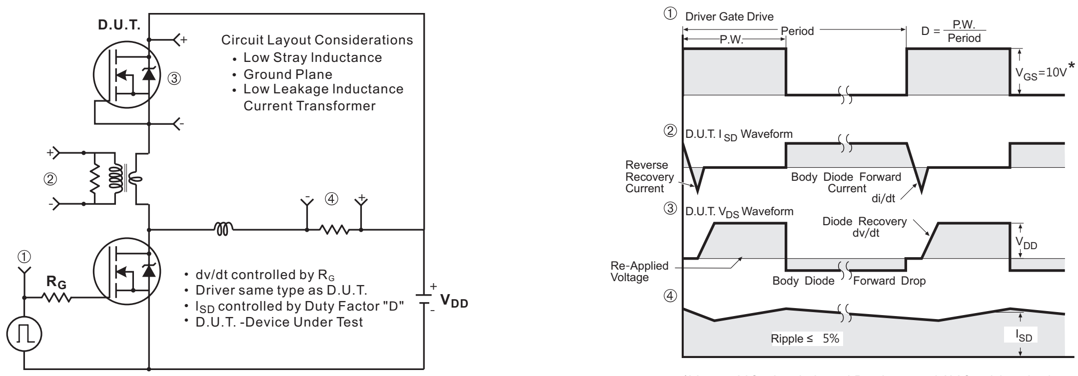
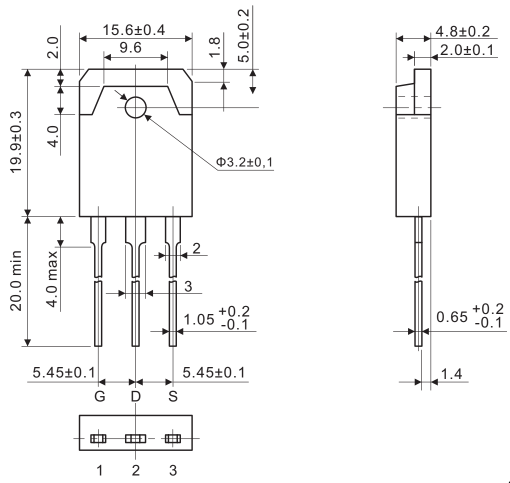


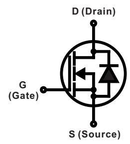
Fig.14 Peak diode recovery dv/dt test circuit for N-Channel MOSFET



*V_{GS} = 5V for Logic Level Devices and 3V for drive devices

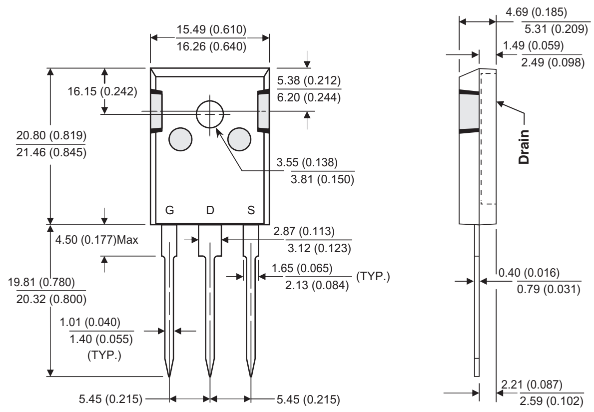
TO-3PB

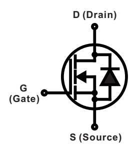




All dimensions in millimeters(inches)

TO-247AB





All dimensions in millimeters(inches)