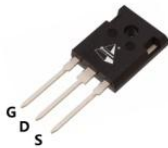




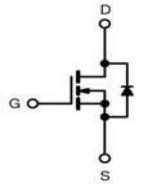
## N-channel Power MOSFET

## PRODUCT SUMMARY

$V_{DS}$ (V) at $T_J$ max.	550	
$R_{DS(on)}$ max. at 25°C (mΩ)	$V_{GS}=10V$	41
$Q_g$ max. (nC)	200	
$Q_{gs}$ (nC)	32	
$Q_{gd}$ (nC)	48	
Configuration	single	



TO-247



Schematic diagram

## Features

- New Technology For High Voltage Device
- $I_D=55A(V_{GS}=10V)$
- Ultra Low Gate Charge
- Improved dv/dt Capability
- RoHS Compliant

## Applications

- Switching Mode Power Supplies (SMPS)
- Power factor correction ( PFC )
- Uninterruptible Power Supply ( UPS )

## ORDERING INFORMATION

Device	SPA50R41GF
Device Package	TO-247
Marking	50R41GF

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain to Source Voltage	$V_{DSS}$	500	V
Continuous Drain Current (@ $T_C=25^\circ\text{C}$ )	$I_D$	55 <sup>(1)</sup>	A
Continuous Drain Current (@ $T_C=100^\circ\text{C}$ )		38 <sup>(1)</sup>	A
Drain current pulsed <sup>(2)</sup>	$I_{DM}$	220	A
Gate to Source Voltage	$V_{GS}$	$\pm 30$	V
Single pulsed Avalanche Energy <sup>(3)</sup>	$E_{AS}$	1920	mJ
MOSFET dv/dt ruggedness (@ $V_{DS}=0\sim 400V$ )	dv/dt	30	V/ns
Peak diode Recovery dv/dt <sup>(4)</sup>	dv/dt	20	V/ns
Total power dissipation (@ $T_C=25^\circ\text{C}$ )	$P_D$	340	W
Derating Factor above 25°C		2.7	W/°C
Operating Junction Temperature & Storage Temperature	$T_{STG}, T_J$	-55 to + 150	°C
Maximum lead temperature for soldering purpose	$T_L$	260	°C

## Notes

1. Drain current is limited by maximum junction temperature.
2. Repetitive rating : pulse width limited by junction temperature.
3.  $L = 60mH, I_{AS} = 8A, V_{DD} = 50V, R_G=25\Omega$ , Starting at  $T_J = 25^\circ\text{C}$
4.  $I_{SD} \leq I_D, di/dt = 100A/us, V_{DD} \leq BV_{DSS}$ , Starting at  $T_J = 25^\circ\text{C}$



THERMAL CHARACTERISTICS			
Parameter	Symbol	Value	Unit
Thermal resistance, Junction to case	$R_{thjc}$	0.36	°C/W
Thermal resistance, Junction to ambient	$R_{thja}$	34	°C/W

ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise specified )						
Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
Drain to source breakdown voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	500	--	--	V
Breakdown voltage temperature coefficient	$\Delta BV_{DSS} / \Delta T_J$	$I_D=250\mu A$ , referenced to $25^\circ\text{C}$	--	0.7	--	V/°C
Drain to source leakage current	$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$	--	--	10	$\mu A$
		$V_{DS}=400V, T_C=125^\circ\text{C}$	--	20	--	$\mu A$
Gate to source leakage current, forward	$I_{GSS}$	$V_{GS}=30V, V_{DS}=0V$	--	--	100	nA
Gate to source leakage current, reverse		$V_{GS}=-30V, V_{DS}=0V$	--	--	-100	nA
<b>On Characteristics</b>						
Gate threshold voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	3.5	4.5	V
Drain to source on state resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=27A$	--	35	41	m $\Omega$
Forward Transconductance	$G_{fs}$	$V_{DS} = 30 V, I_D = 27A$	--	48	--	S
<b>Dynamic Characteristics</b>						
Input capacitance	$C_{iss}$	$V_{GS}=0V, V_{DS}=200V, f=1\text{MHz}$	--	6200	--	pF
Output capacitance	$C_{oss}$		--	200	--	
Reverse transfer capacitance	$C_{riss}$		--	8	--	
Turn on delay time	$t_{d(on)}$	$V_{DS}=320V, I_D=27A, R_G=18\Omega, V_{GS}=10V$	--	63	--	ns
Rising time	$t_r$		--	55	--	
Turn off delay time	$t_{d(off)}$		--	420	--	
Fall time	$t_f$		--	80	--	
Total gate charge	$Q_g$	$V_{DS}=400V, V_{GS}=10V, I_D=33A$	--	130	200	nC
Gate-source charge	$Q_{gs}$		--	32	--	
Gate-drain charge	$Q_{gd}$		--	48	--	

SOURCE TO DRAIN DIODE RATINGS CHARACTERISTICS						
Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous source current	$I_S$	Integral reverse p-n Junction diode in the MOSFET	--	--	55	A
Pulsed source current	$I_{SM}$		--	--	165	A
Diode forward voltage drop.	$V_{SD}$	$I_S=55A, V_{GS}=0V$	--	0.9	1.3	V
Reverse recovery time	$T_{rr}$	$I_S=27A, V_{GS}=0V, di/dt=100A/\mu s$	--	210	--	ns
Reverse recovery Charge	$Q_{rr}$		--	2.5	--	$\mu C$



Fig1. Output characteristics

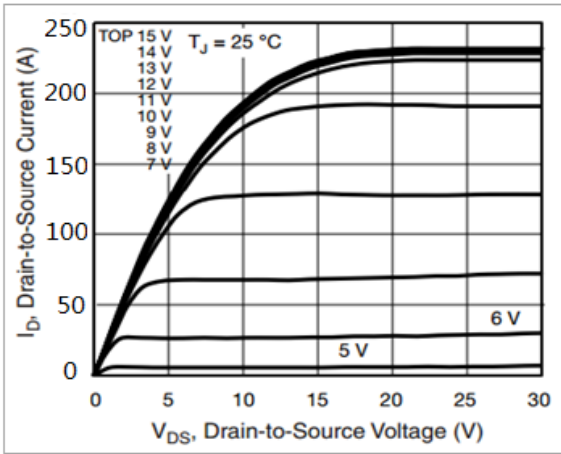


Fig2. Rds(on) vs. Drain Current and Gate Voltage

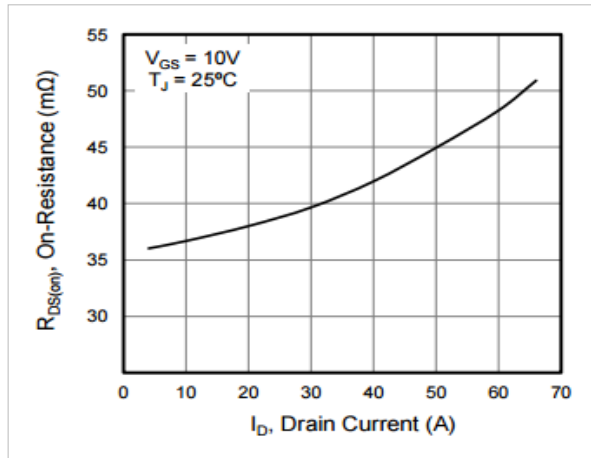


Fig3. Gate charge characteristics

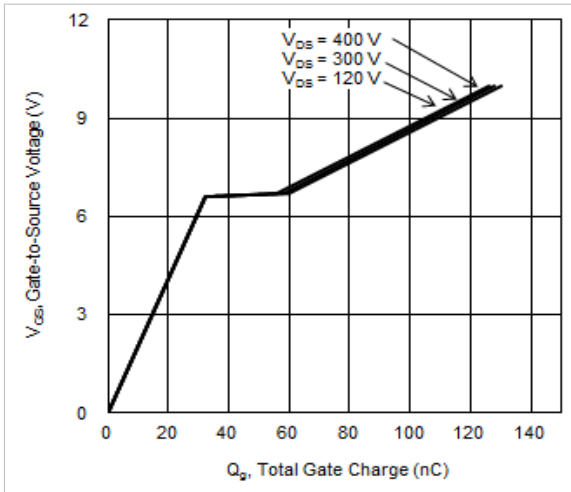


Fig 4. Capacitance Characteristics

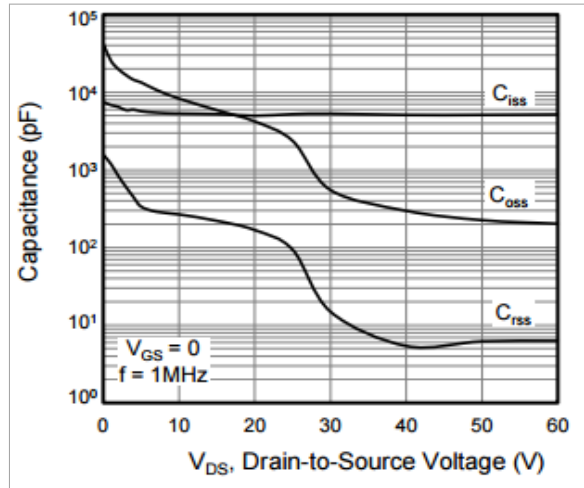


Fig 5. RDS(ON) vs junction temperature

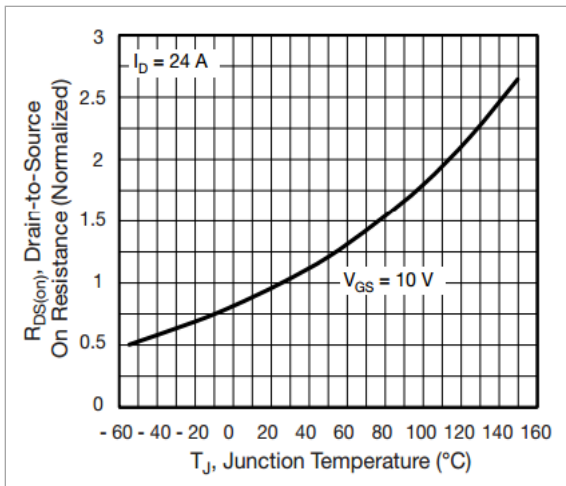


Fig 6. Temperature vs. Drain-to-Source Voltage

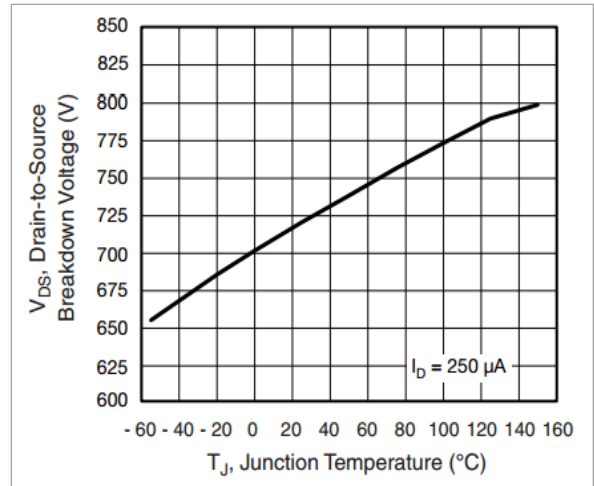


Fig 7 . Safe operating area

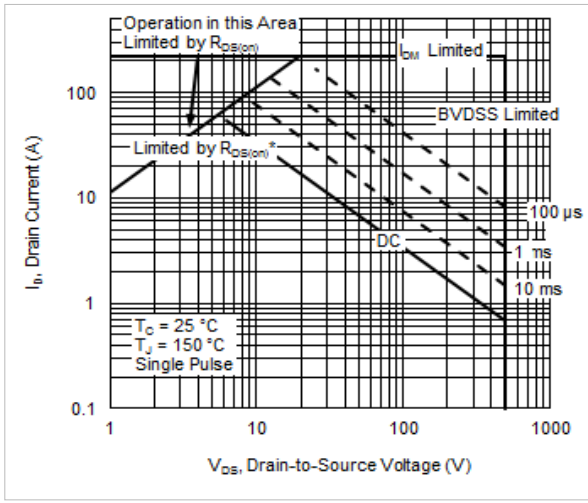


Fig 8 . Transient thermal impedance

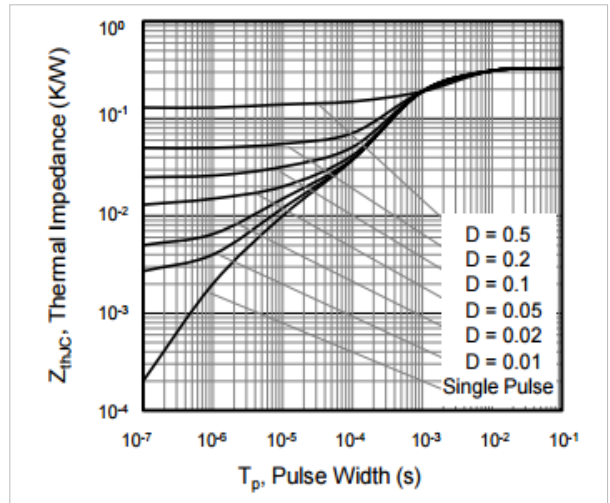


Fig 9. Forward characteristics of reverse diode

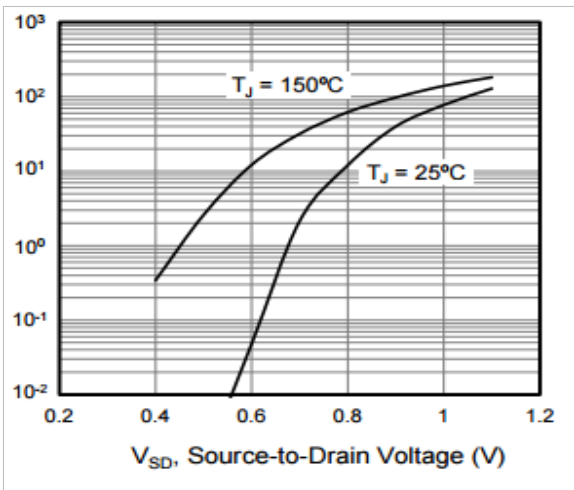


Fig 10. Gate charge test circuit & waveform

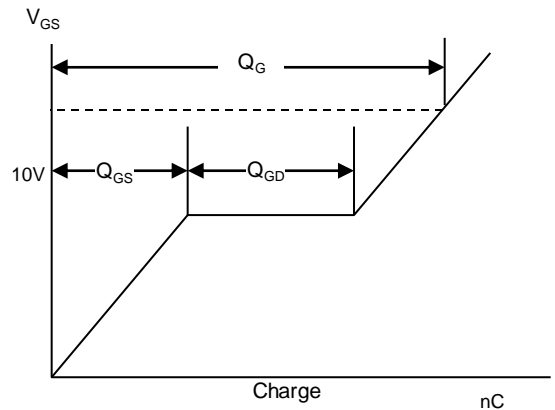
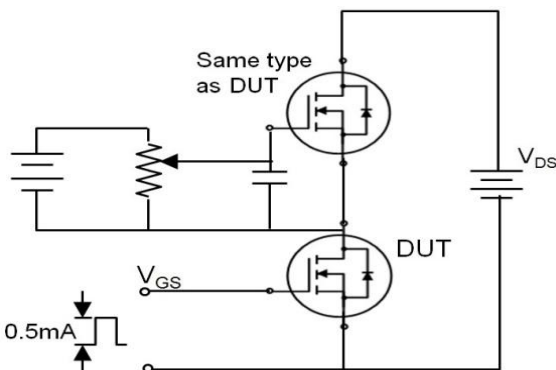


Fig 11. Switching time test circuit & waveform

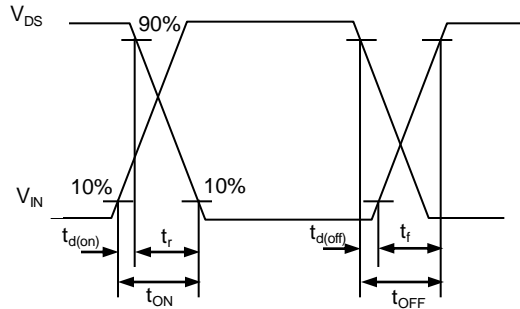
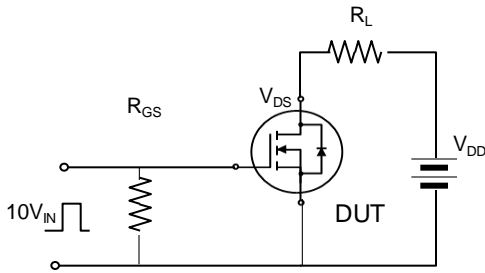


Fig 12. Unclamped Inductive switching test circuit & waveform

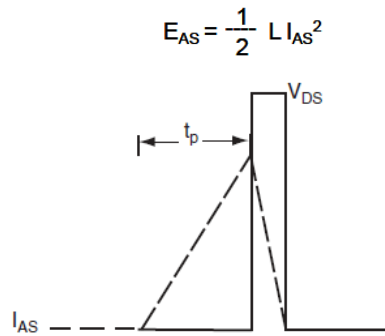
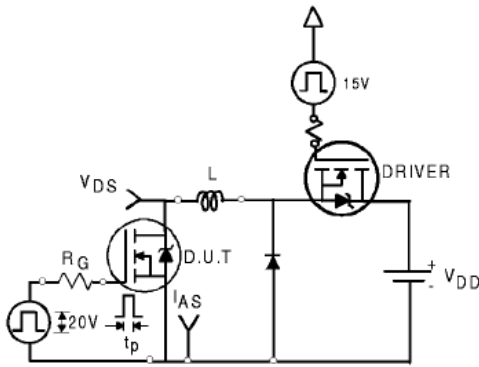
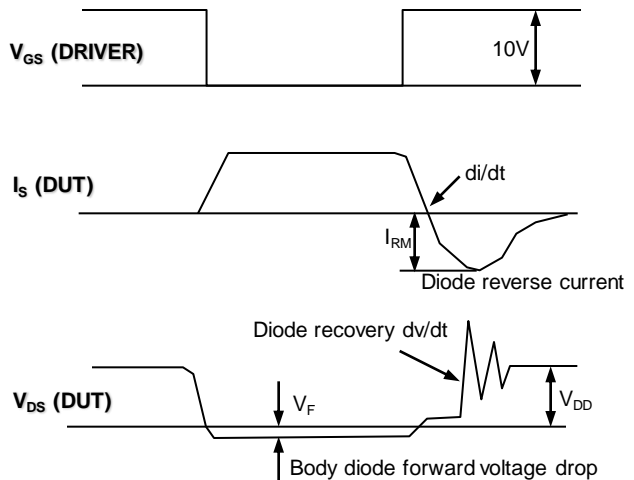
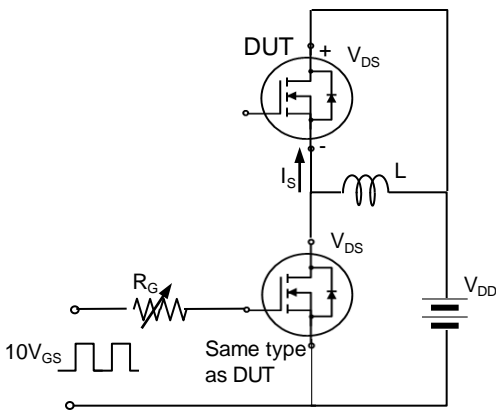


Fig 13. Peak diode recovery dv/dt test circuit & waveform



\*. dv/dt controlled by RG  
\*. I<sub>s</sub> controlled by pulse period



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