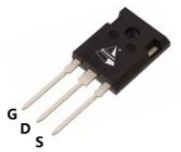
N-channel Power MOSFET

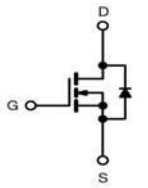
PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	700	
$R_{DS(on)}$ max. at 25°C (mΩ)	V_{GS}=10V	38
Q_g max. (nC)	250	
Q_{gs} (nC)	33	
Q_{gd} (nC)	65	
Configuration	single	

Features

- New Technology For High Voltage Device
- ID=69A(Vgs=10V)
- Ultra Low Gate Charge
- Improved dv/dt Capability
- RoHS Compliant



TO-247



Schematic diagram

Applications

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

ORDERING INFORMATION	
Device	SPA65R38G
Device Package	TO-247
Marking	65R38G

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

Parameter	Symbol	Limit	Unit
Drain to Source Voltage	V_{DSS}	650	V
Continuous Drain Current (@T_C=25°C)	I_D	69 (1)	A
Continuous Drain Current (@T_C=100°C)		43 (1)	A
Drain current pulsed (2)	I_{DM}	276 (1)	A
Gate to Source Voltage	V_{GS}	±30	V
Single pulsed Avalanche Energy (3)	E_{AS}	2300	mJ
MOSFET dv/dt ruggedness (@V_{DS}=0~400V)	dv/dt	30	V/ns
Peak diode Recovery dv/dt (4)	dv/dt	20	V/ns
Total power dissipation (@T_C=25°C)	P_D	625	W
Derating Factor above 25°C		5	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 = 47mH, I_{AS} = 10A, V_{DD} = 50V, R_G=25Ω, Starting at T_J = 25°C
4. I_{SD} ≤ I_D, di/dt = 100A/us, V_{DD} ≤ BV_{DSS}, Starting at T_J =25°C

THERMAL CHARACTERISTICS			
Parameter	**Symbol**	**Value**	**Unit**
Thermal resistance, Junction to case	R_{thjc}	0.2	°C/W
Thermal resistance, Junction to ambient	R_{thja}	34	°C/W

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise specified)						
Parameter	**Symbol**	**Test conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Off Characteristics						
Drain to source breakdown voltage	BV_{DSS}	V_{GS}=0V, I_D=250uA	650	--	--	V
Breakdown voltage temperature coefficient	ΔBV_{DSS} / ΔTJ	I_D=250uA, referenced to 25°C	--	0.7	--	V/°C
Drain to source leakage current	I_{DSS}	V_{DS}=650V, V_{GS}=0V	--	--	1	uA
		V_{DS}=650V, T_C=125°C	--	--	10	uA
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
On Characteristics						
Gate threshold voltage	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250uA	2.5	--	4.5	V
Drain to source on state resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D =33A	--	32	38	mΩ
Forward Transconductance	Gfs	V_{DS} = 30 V, I_D = 33A	--	52	--	S
Dynamic Characteristics						
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=200V, f=1MHz	--	7850	--	pF
Output capacitance	C_{oss}		--	250	--	
Reverse transfer capacitance	C_{rss}		--	12	--	
Turn on delay time	$t_{d(on)}$	V_{DS}=380V, I_D=33A , R_G=18Ω, V_{GS}=10V	--	84	--	ns
Rising time	tr		--	77	--	
Turn off delay time	$t_{d(off)}$		--	510	--	
Fall time	t_f		--	120	--	
Total gate charge	Q_g	V_{DS}=520V, V_{GS}=10V, I_D=33A	--	200	250	nC
Gate-source charge	Q_{gs}		--	32	--	
Gate-drain charge	Q_{gd}		--	64	--	

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	--	--	69	A
Pulsed source current	I_{SM}		--	--	276	A
Diode forward voltage drop.	V_{SD}	I_S=69A, V_{GS}=0V	--	0.9	1.3	V
Reverse recovery time	T_{rr}	I_S=33A, V_{GS}=0V, dI_F/dt=100A/us	--	508	--	ns
Reverse recovery Charge	Qrr		--	10	--	uC

Fig1. Output characteristics

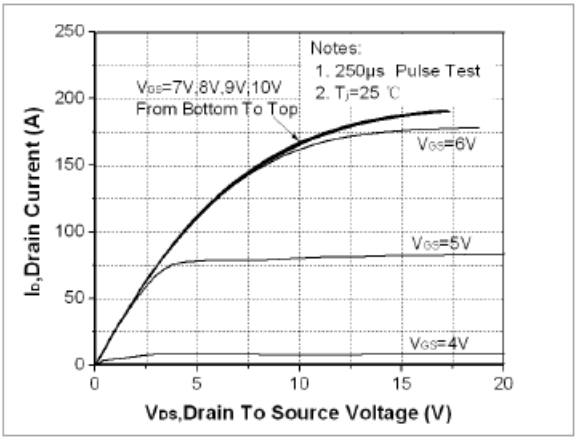


Fig2. Rdson vs. Drain Current and Gate Voltage

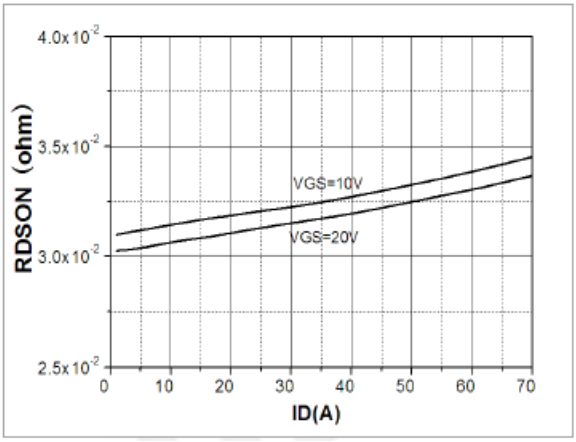


Fig3. Gate charge characteristics

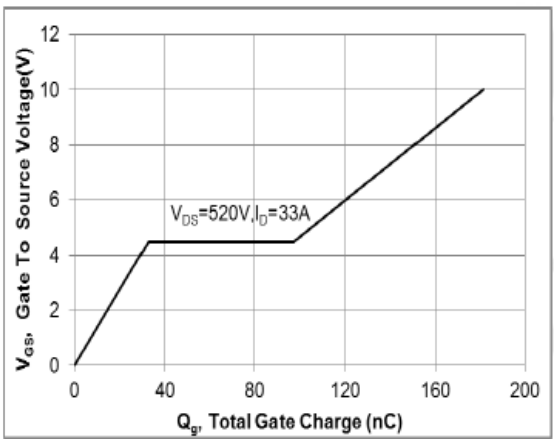


Fig 4. Capacitance Characteristics

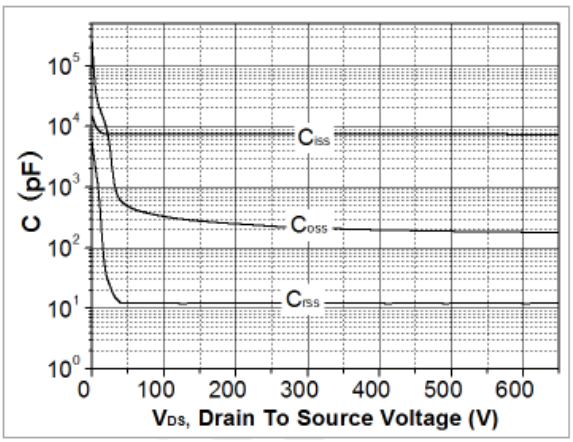


Fig 5. $R_{DS(ON)}$ vs junction temperature

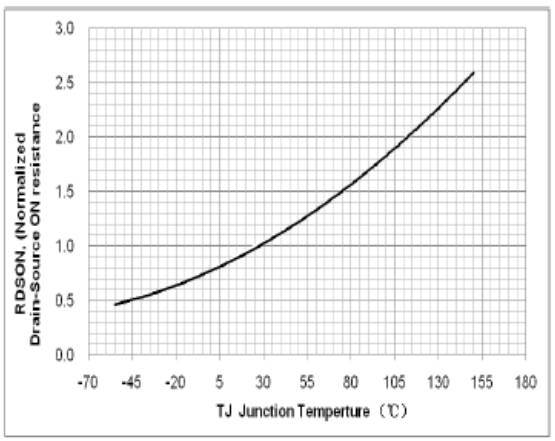


Fig 6. Temperature vs. Drain-to-Source Voltage

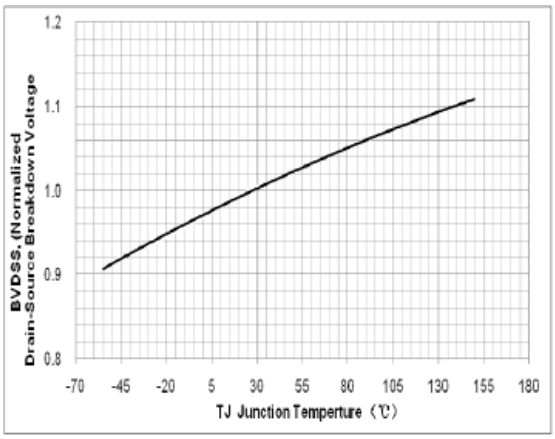


Fig 7 . Safe operating area

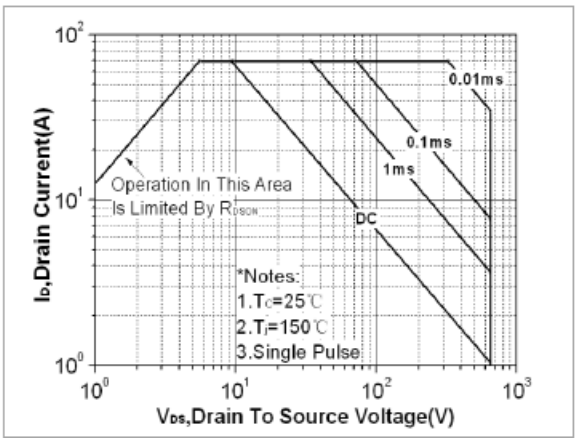


Fig 8 . Transient thermal impedance

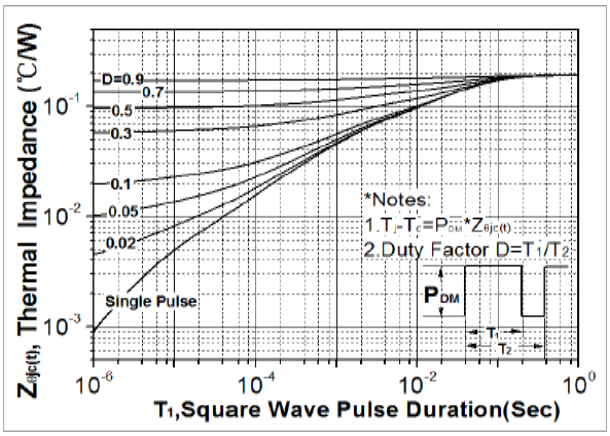


Fig 9. Forward characteristics of reverse diode

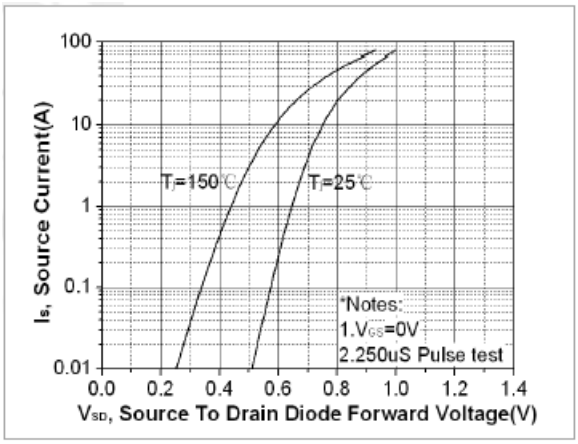
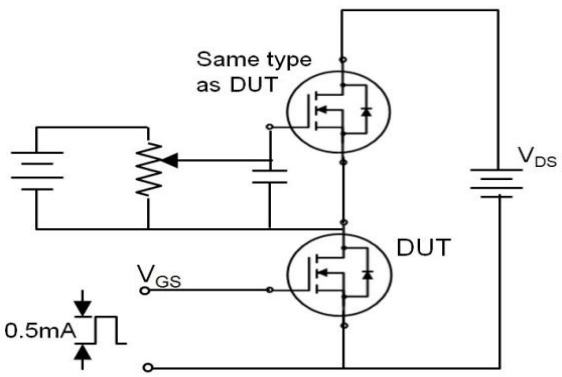


Fig 10. Gate charge test circuit & waveform



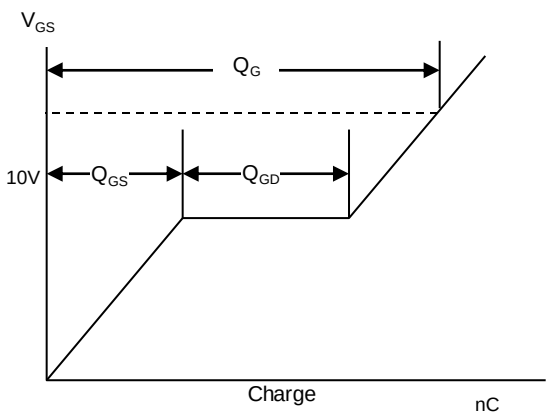


Fig 11. Switching time test circuit & waveform

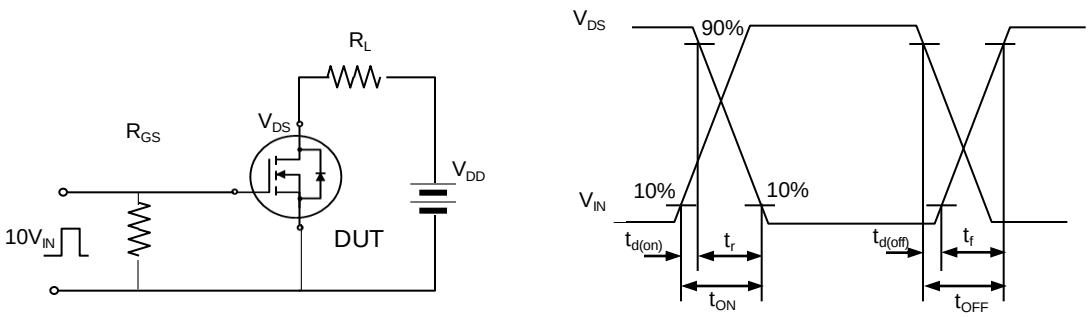


Fig 12. Unclamped Inductive switching test circuit & waveform

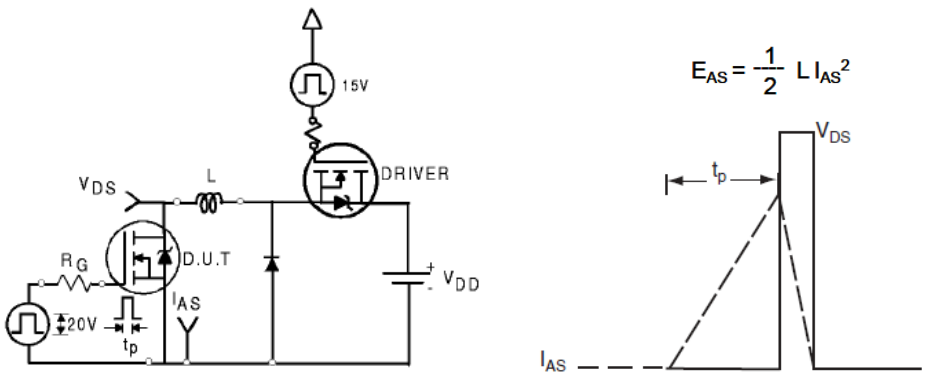
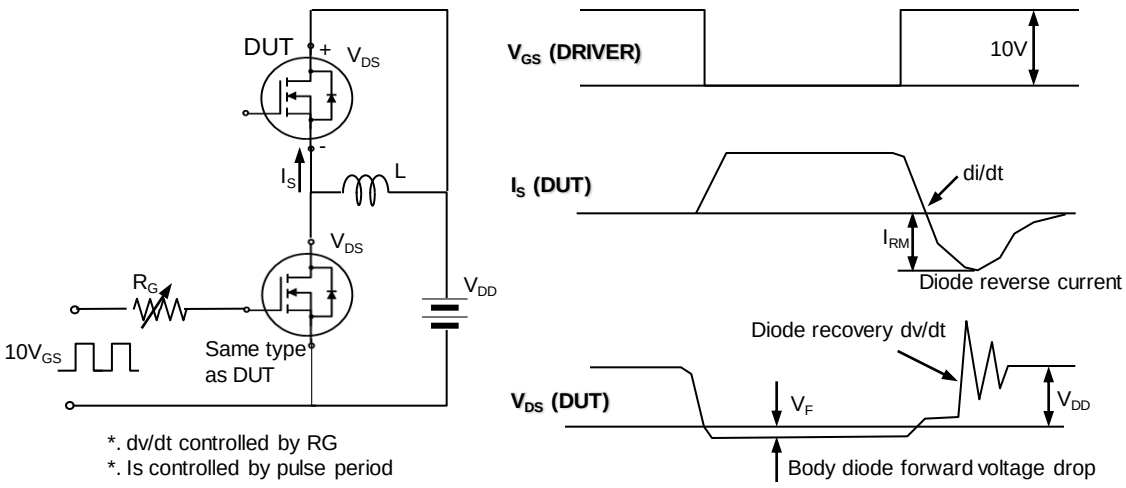


Fig 13. Peak diode recovery dv/dt test circuit & waveform



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