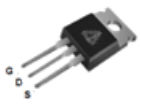
N-channel Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	700	
$R_{DS(on)}$ max. at 25°C (mΩ)	V_{GS}=10V	180
Q_g max. (nC)	75	
Q_{gs} (nC)	17	
Q_{gd} (nC)	26	
Configuration	single	

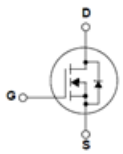
Features

- New Technology For High Voltage Device
- ID=20A(Vgs=10V)
- Ultra Low Gate Charge
- Improved dv/dt Capability
- RoHS Compliant

TO-220F



TO-220



Applications

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

ORDERING INFORMATION		
Device	SPC65R180G	SPB65R180G
Device Package	TO-220F	TO-220
Marking	65R180G	

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

Parameter	Symbol	Limit		Unit
		SPC65R180G	SPB65R180G	
Drain to Source Voltage	V_{DSS}	650	650	V
Continuous Drain Current (@T_C=25°C)	I_D	20 (1)	20 (1)	A
Continuous Drain Current (@T_C=100°C)		13 (1)	13 (1)	A
Drain current pulsed (2)	I_{DM}	60 (1)	60 (1)	A
Gate to Source Voltage	V_{GS}	±30	±30	V
Single pulsed Avalanche Energy (3)	E_{AS}	400	400	mJ
MOSFET dv/dt ruggedness (@V_{DS}=0~400V)	dv/dt	25	25	V/ns
Peak diode Recovery dv/dt (4)	dv/dt	15	15	V/ns
Total power dissipation (@T_C=25°C)	P_D	36	341	W
Derating Factor above 25°C		0.3	2.7	W/°C
Operating Junction Temperature & Storage Temperature	T_{STG}, T_J	-55 to + 150		°C
Maximum lead temperature for soldering purpose (5)	T_L	260		°C
Mounting torque (5)		0.4~0.6		N.m

Notes
1. Drain current is limited by maximum junction temperature.
2. Repetitive rating : pulse width limited by junction temperature.
3. L = 50mH, I_{AS} = 4A, V_{DD} = 50V, R_G=25Ω, Starting at T_J = 25°C
4. I_{SD} ≤ I_D, di/dt = 100A/us, V_{DD} ≤ 480V, Starting at T_J =25°C
5. Mounting consideration for TO220 Fullpack:
   M3 screw plus flat washer is suggested, free of burr between devices and contact area,
   the devices are to be mounted to a hole not larger than 3.6mm in contact diameter (chamfer included).

THERMAL CHARACTERISTICS

Parameter	Symbol	Value		Unit
		SPC65R180G	SPB65R180G	
Thermal resistance, Junction to case	R_{thjc}	3.5	0.36	°C/W
Thermal resistance, Junction to ambient	R_{thja}	50	56	°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	3	4	V
Drain to source on state resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D =10A		160	180	mΩ
Forward Transconductance	Gfs	V_{DS} = 20 V, I_D = 10A		14		S
Dynamic Characteristics						
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=200V, f=1MHz		2100		pF
Output capacitance	C_{oss}			69		
Reverse transfer capacitance	C_{rss}			8		
Turn on delay time	$t_{d(on)}$	V_{DS}=380V, I_D=20A , R_G=18Ω, V_{GS}=10V		27		ns
Rising time	tr			50		
Turn off delay time	$t_{d(off)}$			90		
Fall time	t_f			32		
Total gate charge	Q_g	V_{DS}=520V, V_{GS}=10V, I_D=20A		60	75	nC
Gate-source charge	Q_{gs}			17		
Gate-drain charge	Q_{gd}			26		

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			20	A
Pulsed source current	I_{SM}				60	A
Diode forward voltage drop.	V_{SD}	I_S=20A, V_{GS}=0V		0.9	1.3	V
Reverse recovery time	T_{rr}	I_S=20A, V_{GS}=0V, dI_F/dt=100A/us		360		ns
Reverse recovery Charge	Qrr			6.9		uC

Fig1. Output characteristics

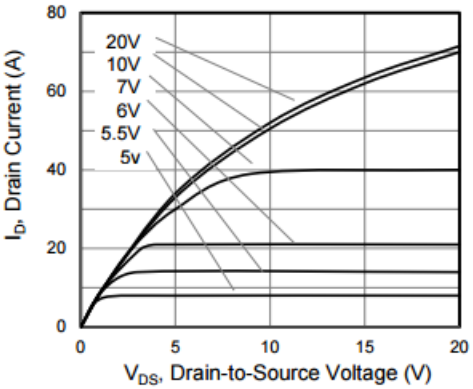


Fig2. On-Resistance vs. Drain Current

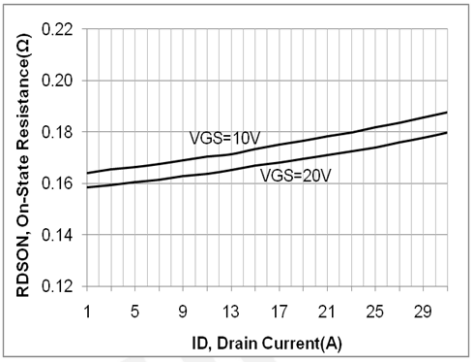


Fig3. Gate charge characteristics

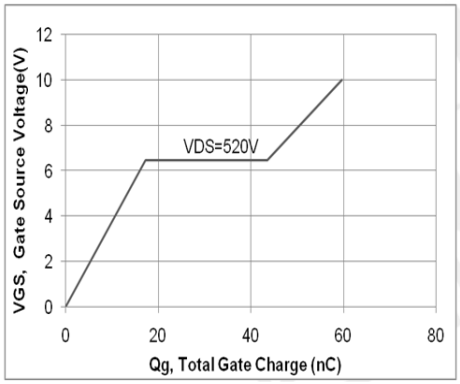


Fig 4. Capacitance Characteristics

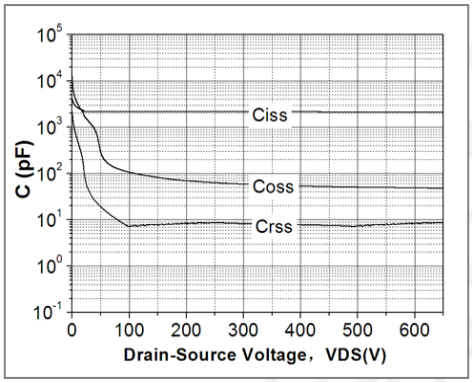


Fig 5. $R_{DS(ON)}$ vs junction temperature

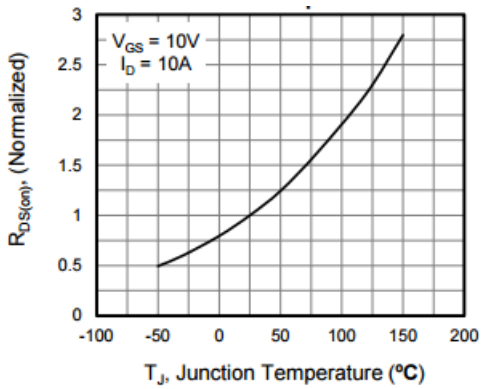


Fig 6. Threshold Voltage vs Junction Temperature

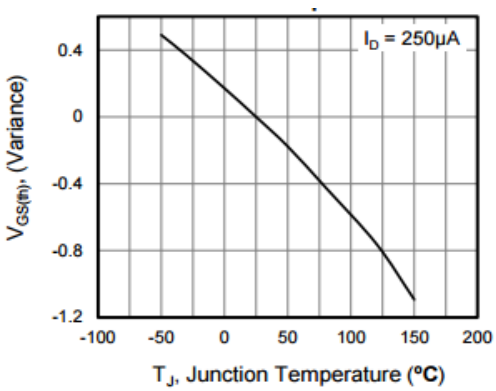


Fig 7 . Safe operating area (TO-220F)

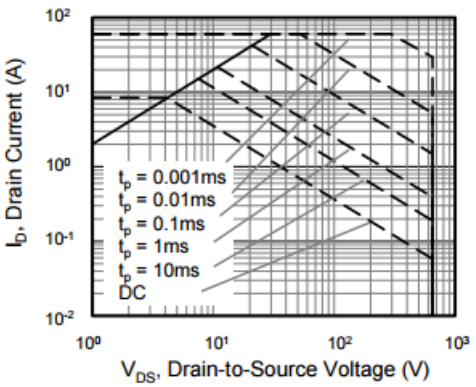


Fig 8 . Transient thermal impedance (TO-220F)

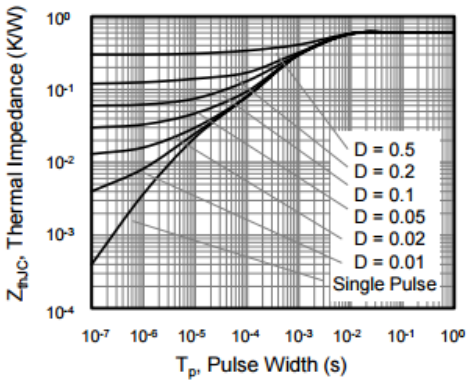


Fig 9 . Safe operating area (TO-220)

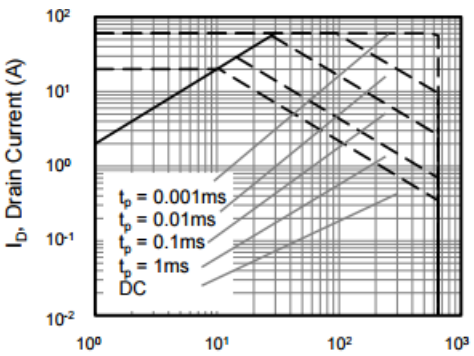


Fig 10 . Transient thermal impedance (TO-220)

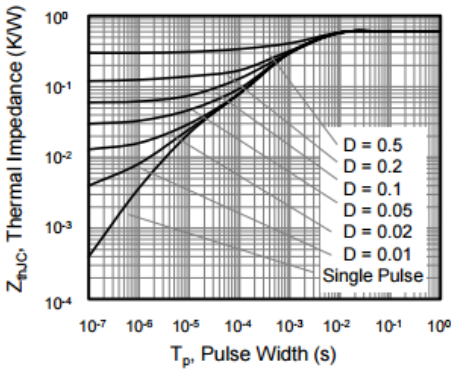


Fig 11. Forward characteristics of reverse diode

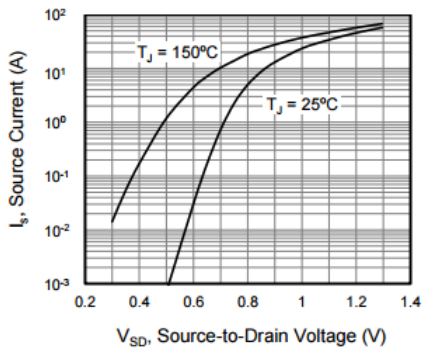


Fig 12 . Transfer characteristics

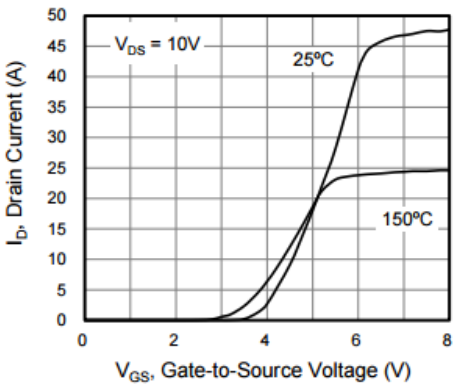
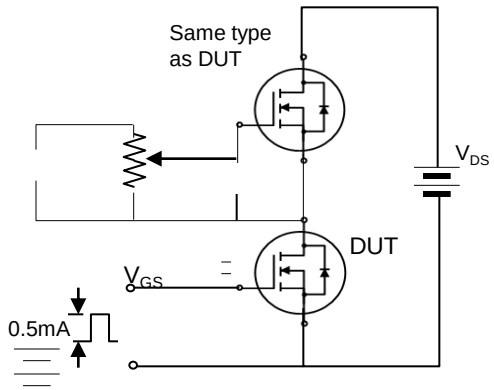


Fig 13. Gate charge test circuit & waveform



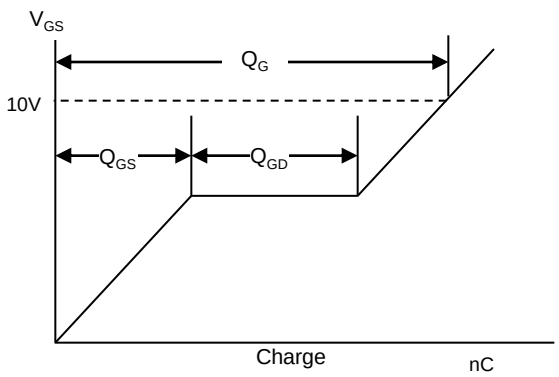


Fig 14. Switching time test circuit & waveform

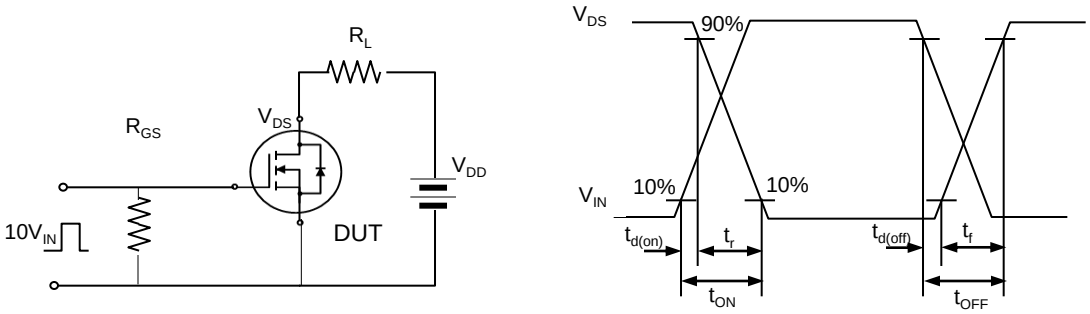


Fig 15. Unclamped Inductive switching test circuit & waveform

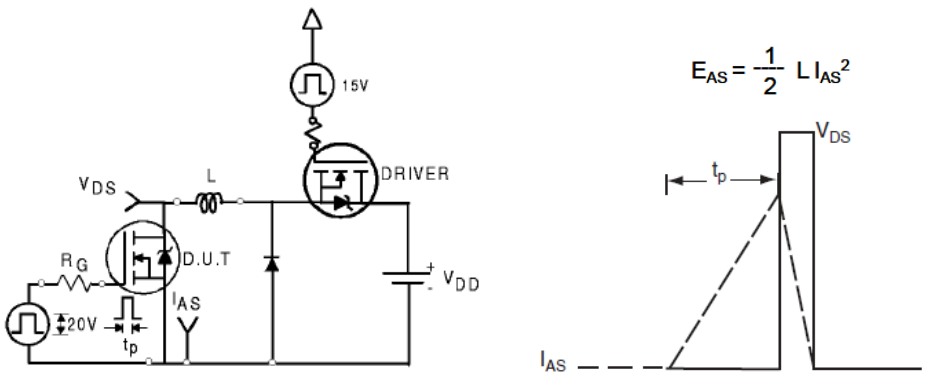
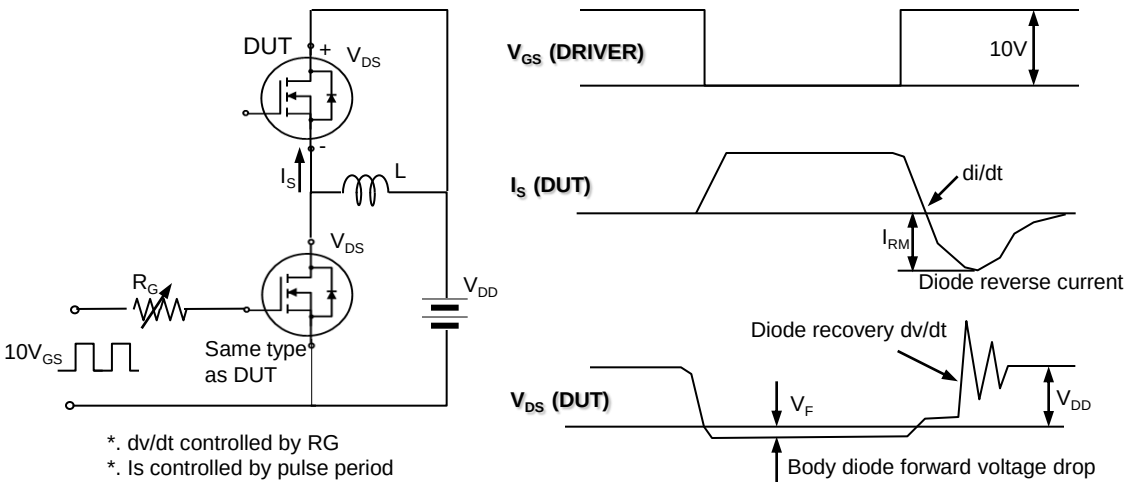


Fig 16. Peak diode recovery dv/dt test circuit & waveform



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