



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
- $ID=20A(V_{GS}=10V)$
- 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	SPC65R180G	SPB65R180G
Device Package	TO-220F	TO-220
Marking	65R180G	

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

Parameter	Symbol	Limit		Unit
		SPC65R180G	SPB65R180G	
Drain to Source Voltage	V_{DSS}	650	650	V
Continuous Drain Current (@ $T_C=25^\circ\text{C}$)	I_D	20 ⁽¹⁾	20 ⁽¹⁾	A
Continuous Drain Current (@ $T_C=100^\circ\text{C}$)		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 (@ $V_{DS}=0\sim 400V$)	dv/dt	25	25	V/ns
Peak diode Recovery dv/dt ⁽⁴⁾	dv/dt	15	15	V/ns
Total power dissipation (@ $T_C=25^\circ\text{C}$)	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. $L = 50\text{mH}$, $I_{AS} = 4A$, $V_{DD} = 50V$, $R_G=25\Omega$, Starting at $T_J = 25^\circ\text{C}$
4. $I_{SD} \leq I_D$, $di/dt = 100A/\mu\text{s}$, $V_{DD} \leq 480V$, Starting at $T_J = 25^\circ\text{C}$
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 ($T_C = 25^\circ\text{C}$ unless otherwise specified)						
Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain to source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	650			V
Breakdown voltage temperature coefficient	$\Delta BV_{DSS} / \Delta T_J$	$I_D=250\mu A$, referenced to 25°C		0.7		V/°C
Drain to source leakage current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$			1	μA
		$V_{DS}=650V, T_C=125^\circ\text{C}$			10	μA
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	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	3	4	V
Drain to source on state resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=10A$		160	180	m Ω
Forward Transconductance	G_{fs}	$V_{DS}=20V, I_D=10A$		14		S
Dynamic Characteristics						
Input capacitance	C_{iss}	$V_{GS}=0V, V_{DS}=200V, f=1\text{MHz}$		2100		pF
Output capacitance	C_{oss}			69		
Reverse transfer capacitance	C_{rss}			8		
Turn on delay time	$t_{d(on)}$	$V_{DS}=380V, I_D=20A, R_G=18\Omega, V_{GS}=10V$		27		ns
Rising time	t_r			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}	$I_S=20A, V_{GS}=0V, dl_f/dt=100A/\mu s$		360		ns
Reverse recovery Charge	Q_{rr}				6.9	



Fig1. Output characteristics

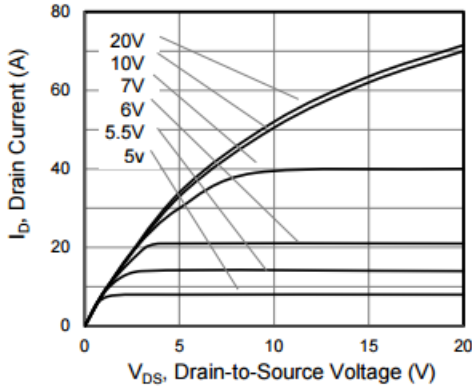


Fig2. On-Resistance vs. Drain Current

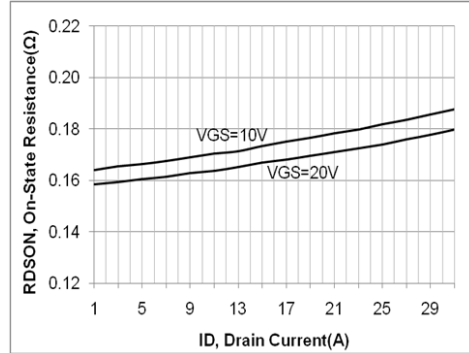


Fig3. Gate charge characteristics

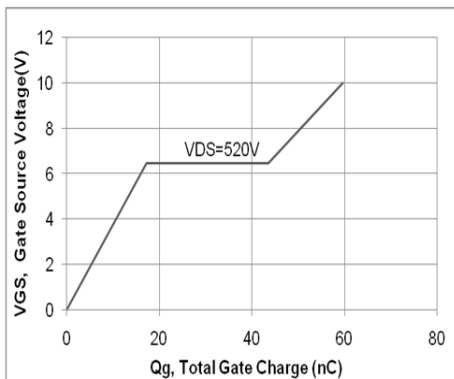


Fig 4. Capacitance Characteristics

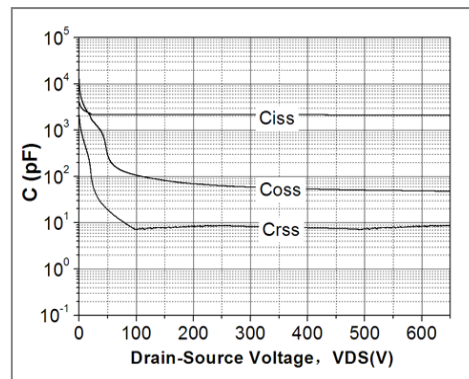


Fig 5. $R_{DS(ON)}$ vs junction temperature

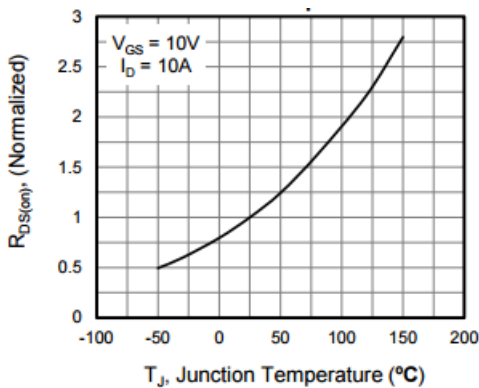


Fig 6. Threshold Voltage vs Junction Temperature

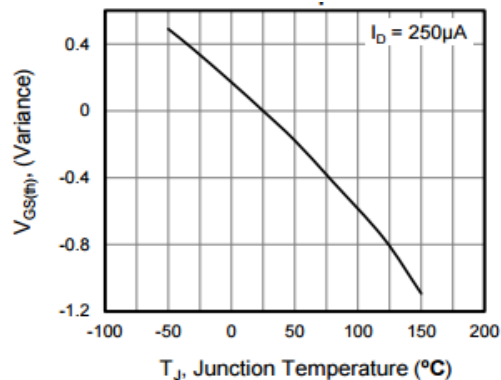




Fig 7 . Safe operating area (TO-220F)

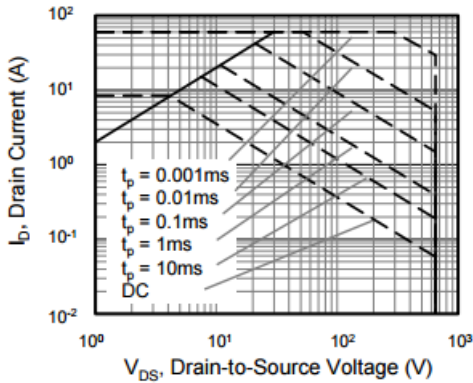


Fig 9 . Safe operating area (TO-220)

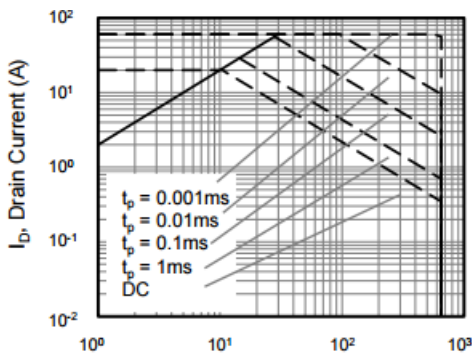


Fig 11. Forward characteristics of reverse diode

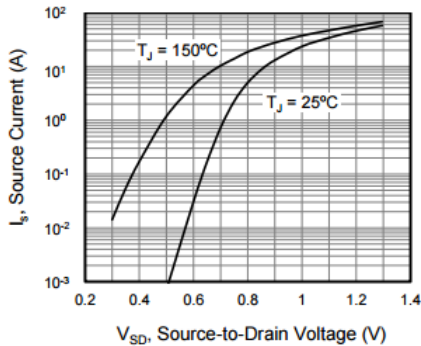


Fig 13. Gate charge test circuit & waveform

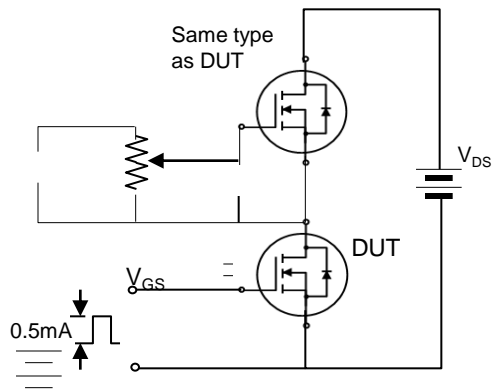


Fig 8 . Transient thermal impedance (TO-220F)

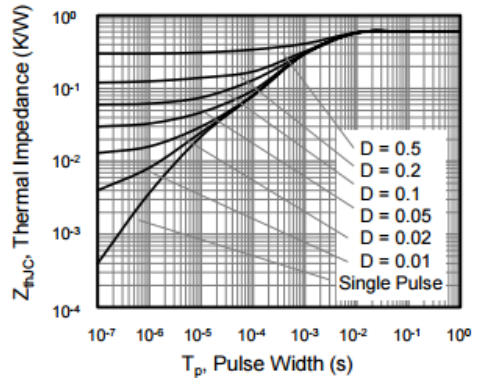


Fig 10 . Transient thermal impedance (TO-220)

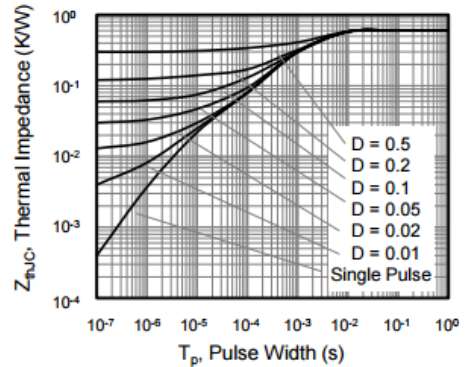


Fig 12 . Transfer characteristics

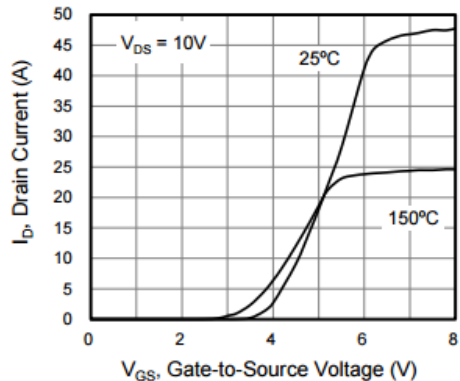


Fig 14. Switching time test circuit & waveform

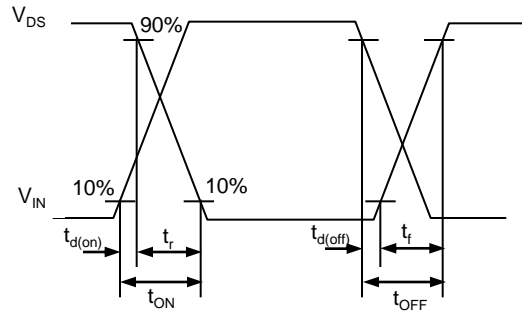
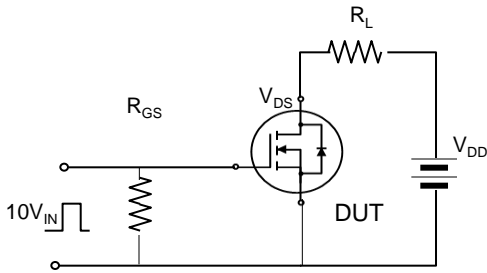


Fig 15. Unclamped Inductive switching test circuit & waveform

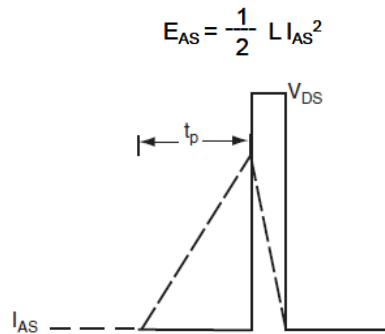
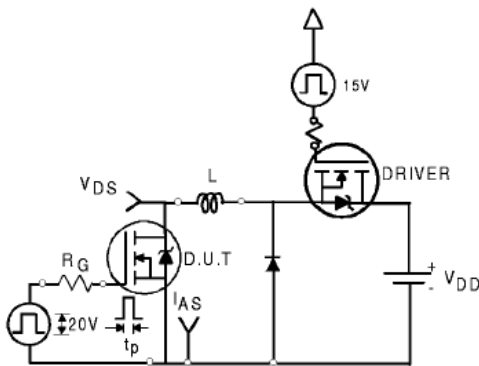
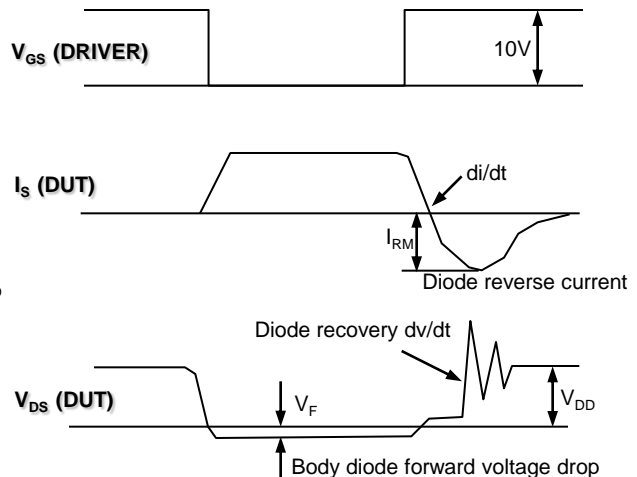
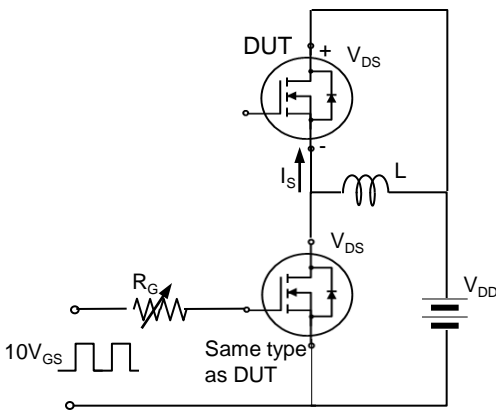


Fig 16. Peak diode recovery dv/dt test circuit & waveform



*. dv/dt controlled by RG
 *. IS controlled by pulse period



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