

PFP65R380 / PFF65R380

N-Channel Super Junction MOSFET

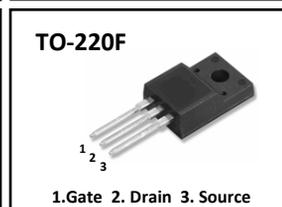
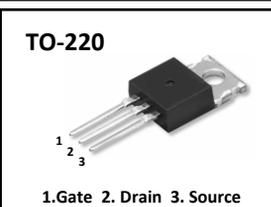
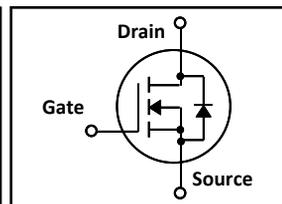
FEATURES

- New technology for high voltage device
- Low $R_{DS(ON)}$ and low conduction losses
- Small package
- Ultra low gate charge cause lower driving requirement
- 100% avalanche tested
- RoHS

APPLICATION

- PFC(Power Factor Correction)
- SMPS(Switched Mode Power Supplies)
- UPS(Uninterruptible Power Supplies)

$BV_{DSS} = 650\text{ V}$
 $R_{DS(on)} = 0.35\ \Omega$
 $I_D = 11\text{ A}$



Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	PFP65R380	PFF65R380	Units
V_{DSS}	Drain-Source Voltage	650		V
I_D	Drain Current – Continuous ($T_C = 25^\circ\text{C}$)	11	11*	A
	Drain Current – Continuous ($T_C = 100^\circ\text{C}$)	7	7*	A
I_{DM}	Drain Current – Pulsed (Note 1)	33	33*	A
V_{GS}	Gate-Source Voltage	+/-30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	210		mJ
I_{AR}	Avalanche Current (Note 3)	1.8		A
E_{AR}	Repetitive Avalanche Energy (Note 3)	0.32		mJ
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	83	31	W
	- Derate above 25°C	0.67	0.25	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300		$^\circ\text{C}$

* Drain current limited by maximum junction temperature.

Thermal Resistance Characteristics

Symbol	Parameter	PFP65R380	PFF65R380	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.5	4.0	$^\circ\text{C}/\text{W}$
$R_{\theta JS}$	Thermal Resistance, Junction-to-Sink	0.5	--	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	

Electrical Characteristics $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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On Characteristics

V_{GS}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	2.5	--	3.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10 \text{ V}, I_D = 5.5 \text{ A}$	--	0.35	0.38	Ω

Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	650	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	--	0.6	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650 \text{ V}, V_{GS} = 0 \text{ V}$	--	--	1	μA
		$V_{DS} = 520 \text{ V}, T_C = 125^\circ\text{C}$	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30 \text{ V}, V_{DS} = 0 \text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30 \text{ V}, V_{DS} = 0 \text{ V}$	--	--	-100	nA

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}, f = 1.0 \text{ MHz}$	--	760	990	pF
C_{oss}	Output Capacitance		--	54	70	pF
C_{rss}	Reverse Transfer Capacitance		--	12	16	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Time	$V_{DS} = 400 \text{ V}, I_D = 4.8 \text{ A}, R_{GS} = 3.4 \Omega, V_{GS} = 13 \text{ V}$	--	11	--	ns
t_r	Turn-On Rise Time		--	9	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	56	--	ns
t_f	Turn-Off Fall Time		--	8	--	ns
Q_g	Total Gate Charge	$V_{DS} = 480 \text{ V}, I_D = 4.8 \text{ A}, V_{GS} = 10 \text{ V}$	--	34	50	nC
Q_{gs}	Gate-Source Charge		--	4	--	nC
Q_{gd}	Gate-Drain Charge		--	18	--	nC

Source-Drain Diode Maximum Ratings and Characteristics

I_S	Continuous Source-Drain Diode Forward Current	--	--	11	A	
I_{SM}	Pulsed Source-Drain Diode Forward Current	--	--	30		
V_{SD}	Source-Drain Diode Forward Voltage	$I_S = 5.5 \text{ A}, V_{GS} = 0 \text{ V}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$I_S = 4.8 \text{ A}, V_{GS} = 0 \text{ V}$	--	275	--	ns
Q_{rr}	Reverse Recovery Charge	$di_f/dt = 100 \text{ A}/\mu\text{s}$	--	3.2	--	μC

Notes ;

- Limited by maximum junction temperature, maximum duty cycle is 0.75
- $I_{AS} = 1.8 \text{ A}, V_{DD} = 50 \text{ V}$, Starting $T_J = 25^\circ\text{C}$
- Repetitive rating : Pulse width limited by maximum junction temperature.

Typical Characteristics

Fig.1 On Region Characteristics

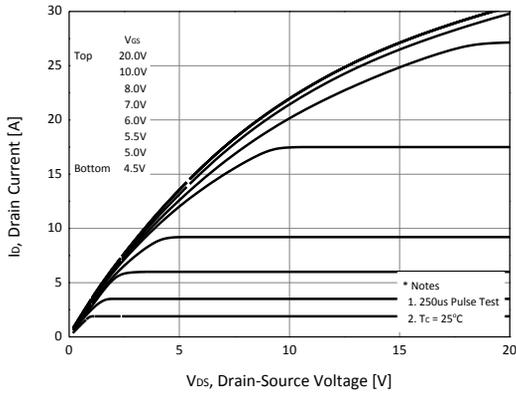


Fig.2 Transfer Characteristics

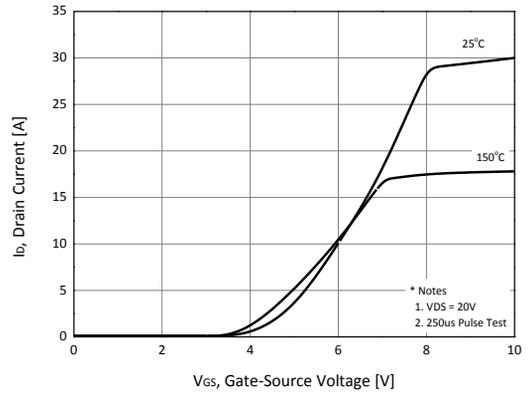


Fig.3 On-Resistance Variation vs. Drain Current

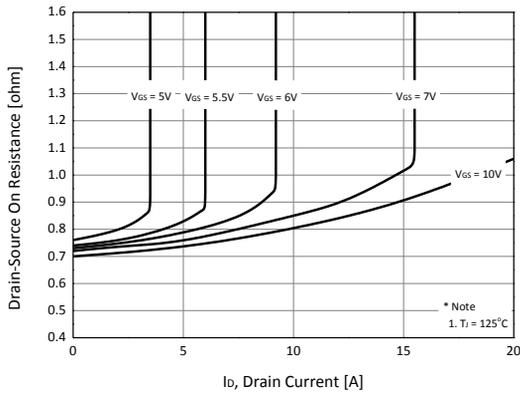


Fig.4 Power Dissipation

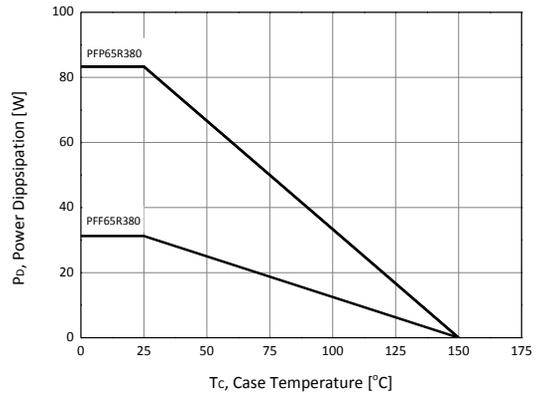


Fig.5 Capacitance Characteristics

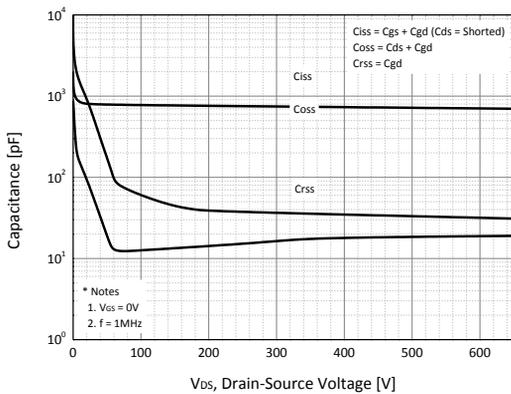
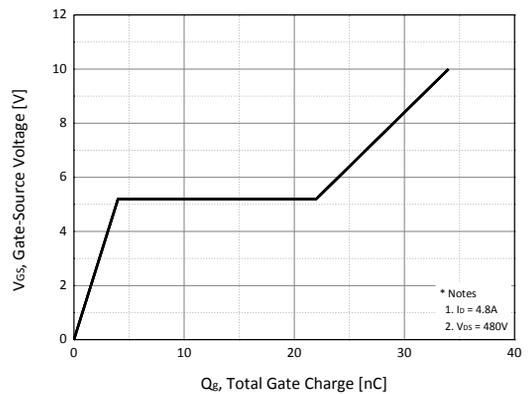


Fig.6 Gate Charge Characteristics



Typical Characteristics

Fig.7 BV_{DSS} Variation vs. Temperature

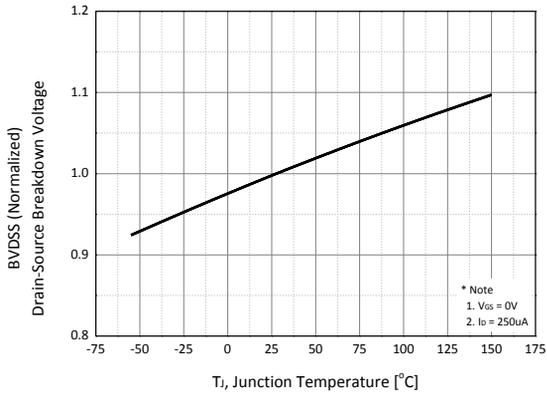


Fig.8 On-Resistance Variation vs. Temperature

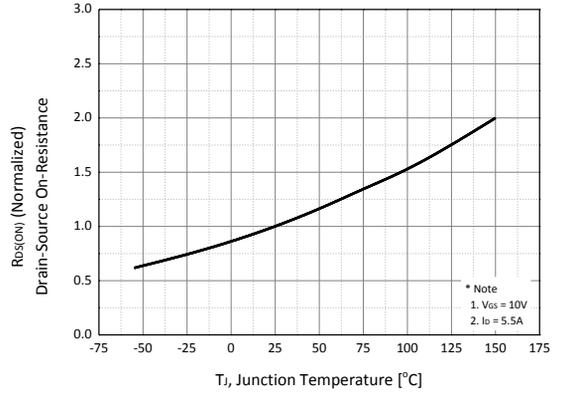


Fig.9-1 Safe Operation Area PFP65R380

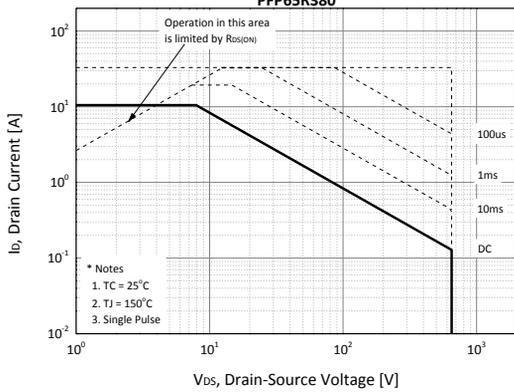


Fig.9-2 Safe Operation Area PFF65R380

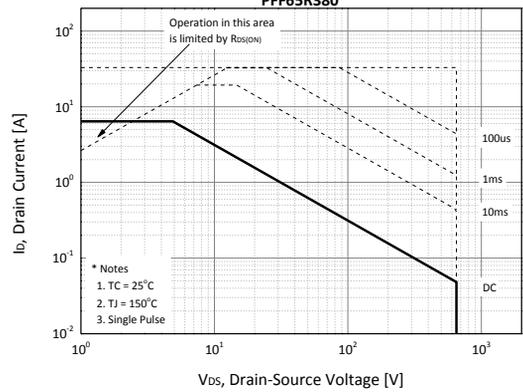
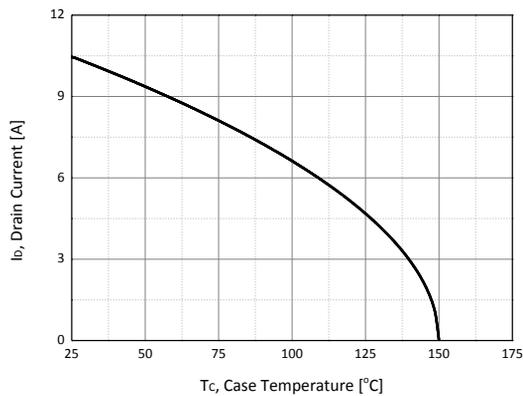


Fig.10 Maximum I_D vs. Case Temperature



Typical Characteristics

Fig.11-1 Transient Thermal Response Curve
PFP65R380

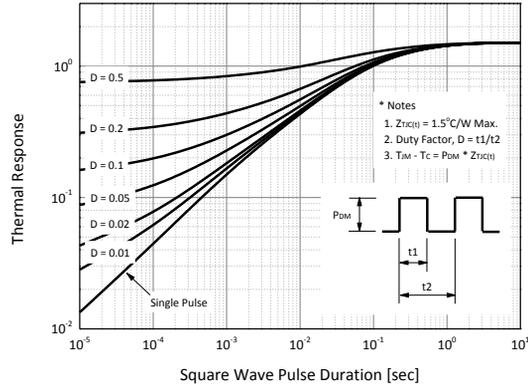
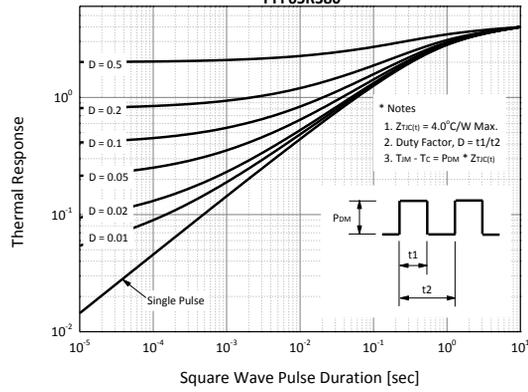


Fig.11-2 Transient Thermal Response Curve
PFF65R380



Characteristics Test Circuit & Waveform

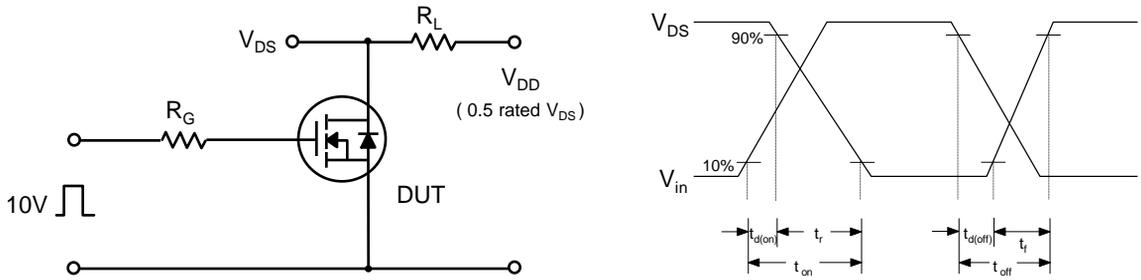


Fig 14. Resistive Switching Test Circuit & Waveforms

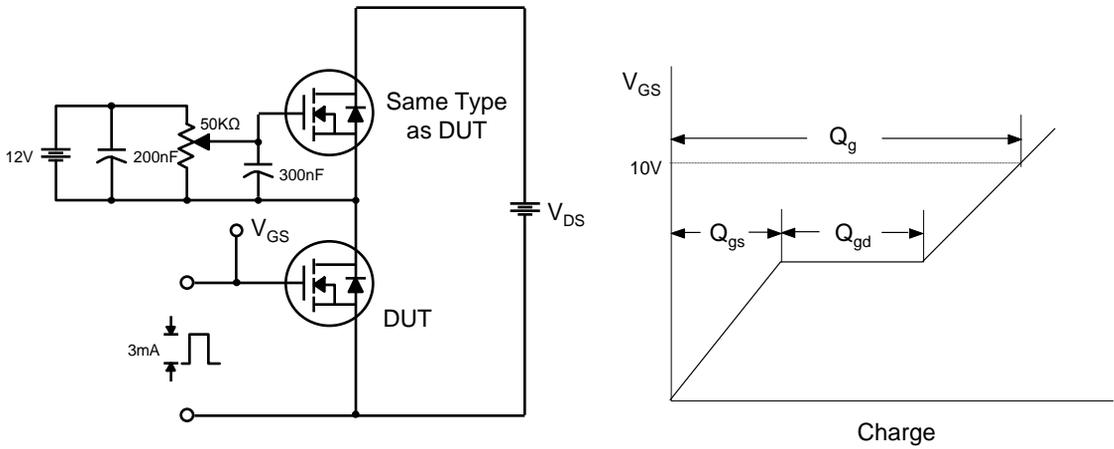


Fig 15. Gate Charge Test Circuit & Waveform

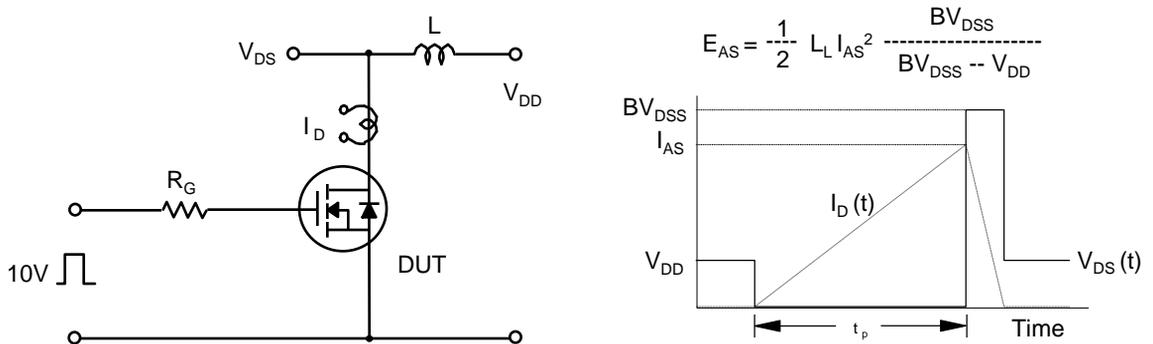


Fig 16. Unclamped Inductive Switching Test Circuit & Waveforms

$$E_{AS} = \frac{1}{2} L_L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

Characteristics Test Circuit & Waveform (continued)

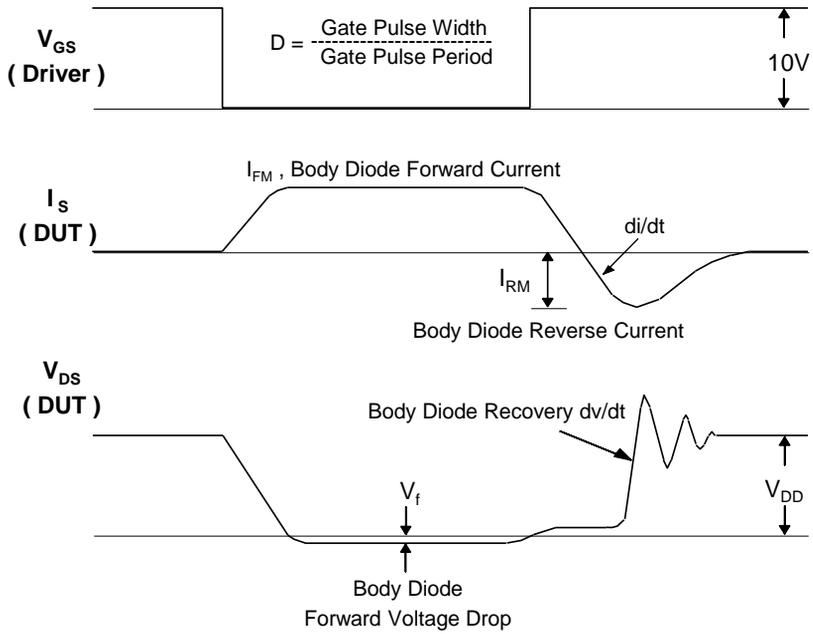
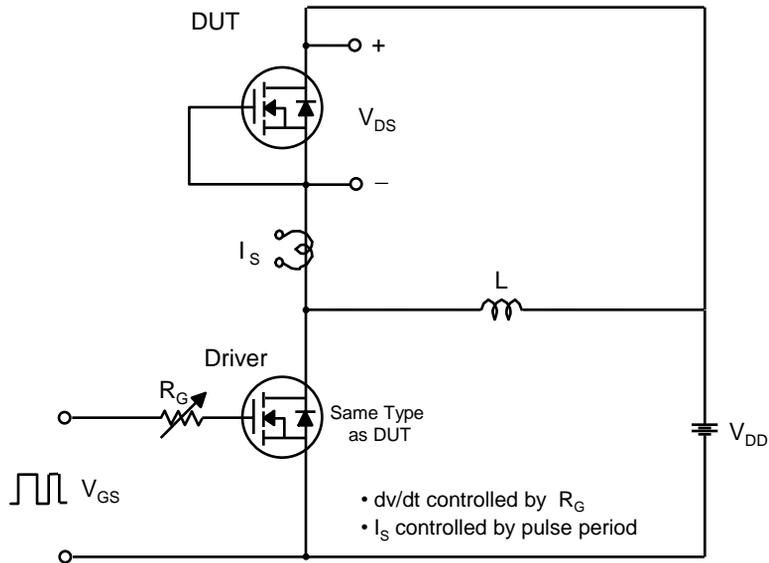


Fig 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms