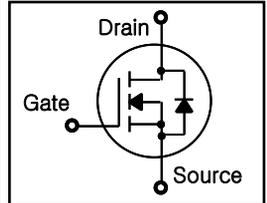WING ON GROUP

POWER ™

PFP65R900 / PFF65R900
## N-Channel Super Junction MOSFET

FEATURES

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

BV$_{DSS}$ = 650 V

R$_{DS(on)}$ = 0.78 Ω

I$_D$ = 5.0 A

Drain
Gate
Source

APPLICATION

- ❏ Power Factor Correction(PFC)
- ❏ Switched mode power supply (SMPS)
- ❏ Uninterruptible Power Supply (UPS)

TO-220

G D S

TO-220F

G D S
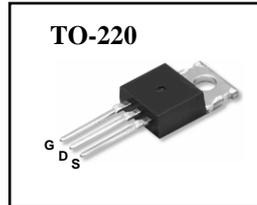
Absolute Maximum Ratings   T$_C$=25℃ unless otherwise specified

Symbol	Parameter		PFP65R900	PFF65R900	Units
V$_{DS}$	Drain-Source Voltage (V$_{GS}$=0V)		650		V
I$_D$	Drain Current – Continuous (T$_C$ = 25℃)		5.0	5.0*	A
	Drain Current – Continuous (T$_C$ = 100℃)		3.0	3.0*	A
I$_{DM(pulse)}$	Drain Current – Pulsed * Note 1		15	15*	A
V$_{GS}$	Gate-Source Voltage (V$_{DS}$=0V)		±30		V
E$_{AS}$	Single Pulsed Avalanche Energy * Note 2		135		mJ
I$_{AR}$	Avalanche Current * Note 1		2.5		A
E$_{AR}$	Repetitive Avalanche Energy * Note 1		0.4		mJ
dv/dt	Drain Source Voltage Slope, V$_{DS}$ ≤ 480V		48		V/ns
	Reverse Diode dv/dt, V$_{DS}$ ≤ 480V		15		V/ns
P$_D$	Maximum Power Dissipation (T$_C$ = 25℃)		49	29	W
	Derate above 25℃		0.39	0.23	W/℃
T$_J$, T$_{STG}$	Operating and Storage Temperature Range		-55 to +150		℃

* Limited by maximum junction temperature

Thermal Resistance Characteristics

Symbol	Parameter	PFP65R900	PFF65R900	Units
R$_{θJC}$	Junction-to-Case (Maximum)	2.55	4.3	℃/W
R$_{θJA}$	Junction-to-Ambient (Maximum)	62	80	℃/W

Electrical Characteristics T_A=25 °C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 uA	2.5	3.0	3.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 3.0 A	--	780	900	m.ohm
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 uA	650	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 650 V, V_{GS} = 0 V	--	--	1	uA
		V_{DS} = 650 V, T_C=125 ℃	--	--	100	uA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	nA
Dynamic Characteristics						
g_{FS}	Forward Transconductance	V_{DS} = 20V, I_D = 3.0A	--	4.8	--	S
R_G	Intrinsic Gate Resistance	f = 1.0 MHz, open drain	--	2.5	--	ohm
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1.0 MHz	--	460	--	pF
C_{oss}	Output Capacitance		--	45	--	pF
C_{rss}	Reverse Transfer Capacitance		--	3.5	--	pF
Q_g	Total Gate Charge	V_{DS} = 480 V, I_D = 5.0 A, V_{GS} = 10 V	--	10.0	20	nC
Q_{gs}	Gate-Source Charge		--	1.6	--	nC
Q_{gd}	Gate-Drain Charge		--	4.0	--	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	V_{DS} = 380 V, I_D = 5.0 A, R_G = 18 Ω, V_{GS} = 10V	--	6.0	--	ns
t_r	Turn-On Rise Time		--	3.0	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	50	60	ns
t_f	Turn-Off Fall Time		--	9.0	15	ns
Source-Drain Diode Maximum Ratings and Characteristics						
I_S	Continuous Source-Drain Diode Forward Current		--	--	5.0	A
I_{SM}	Pulsed Source-Drain Diode Forward Current		--	--	15.0	
V_{SD}	Source-Drain Diode Forward Voltage	I_S = 5.0 A, V_{GS} = 0 V	--	1.0	1.3	V
t_{rr}	Reverse Recovery Time	I_S = 5.0 A di/dt = 100 A/μs	--	250	--	ns
Q_{rr}	Reverse Recovery Charge		--	2.2	--	μC

Notes ;

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. V_{DD}=50V, R_G=25Ω, Starting T_J =25°C
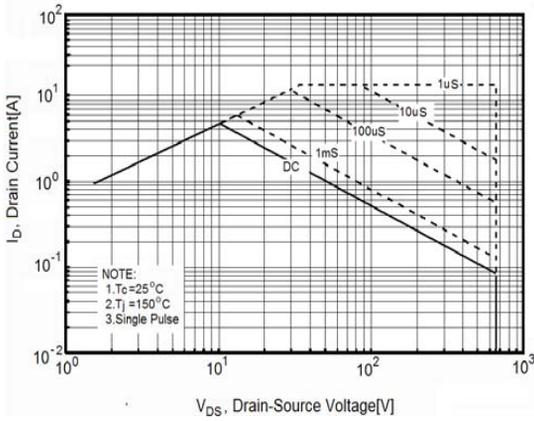
Typical Characteristics

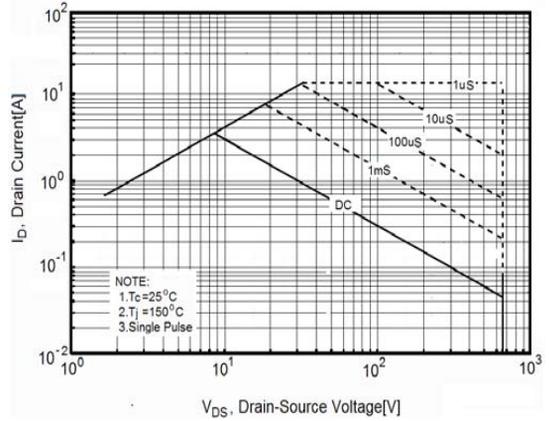**Figure 1. Safe Operating Area(TO-220)**

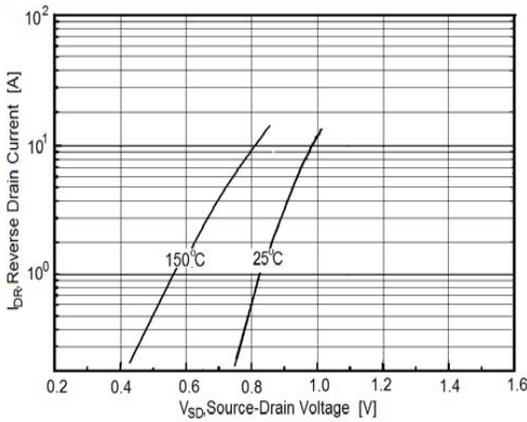

Figure 2. Safe Operating Area(TO-220F)

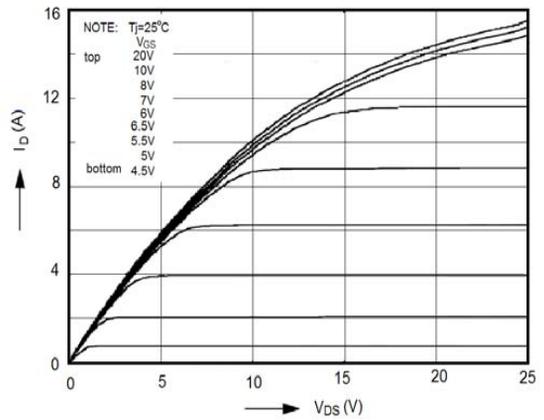**Figure 3. Source-Drain Diode Forward Voltage**

Figure 4. Output Characteristics
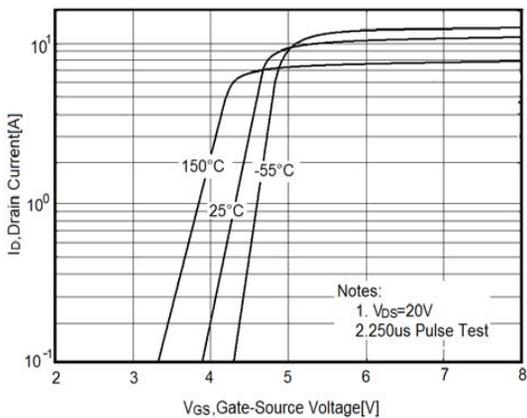

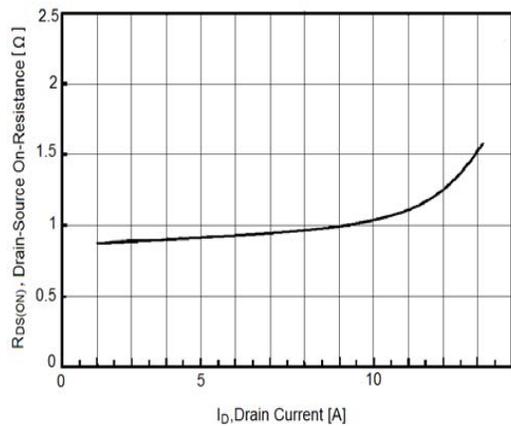**Figure 5. Transfer Characteristics**

Figure 6. Static Drain-Source On Resistance
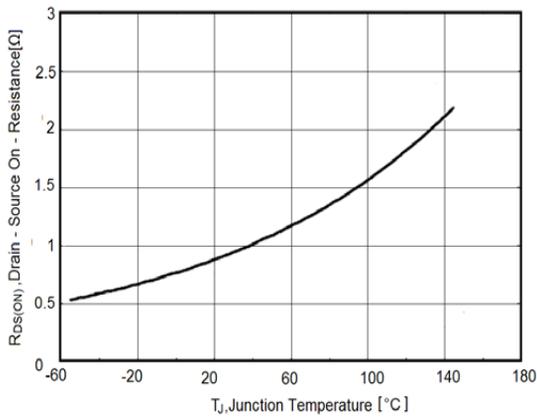
Typical Characteristics   (continued)
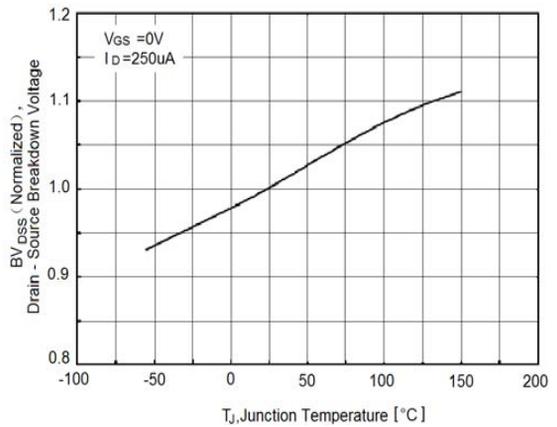

Figure 7. Rds(on) vs. Junction Temperature
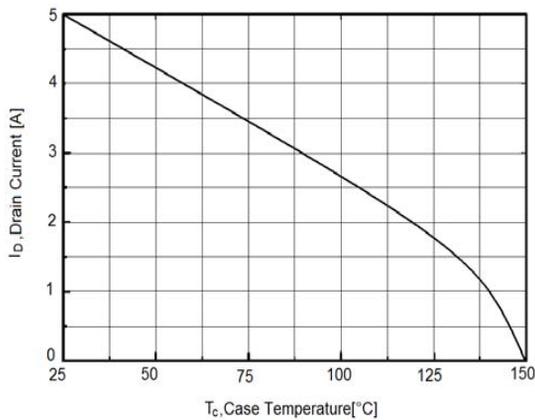

Figure 8. BVdss vs. Junction Temperature

Figure 9. Maximum ID vs. Junction Temperature
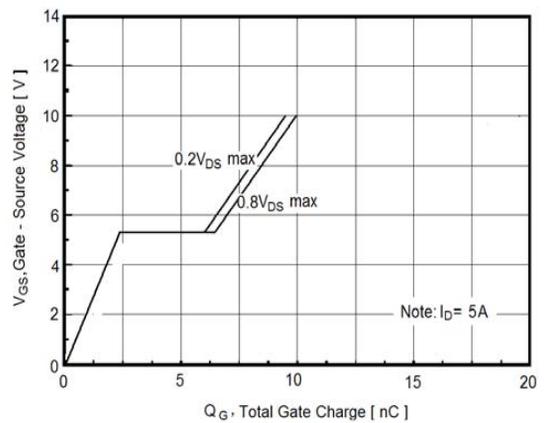
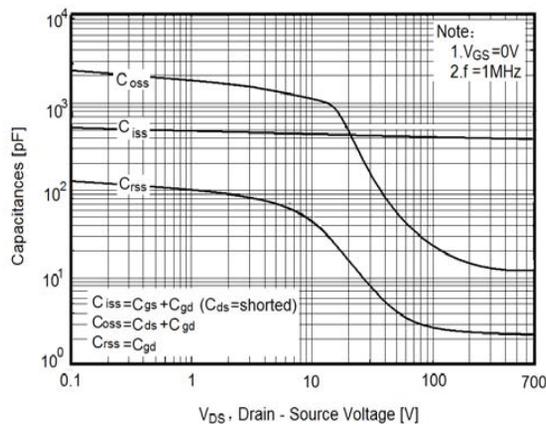**Figure 10. Gate Charge Waveforms**
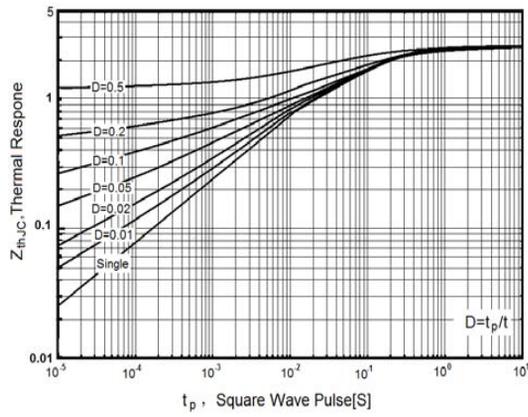

Figure 11. Capacitance

Typical Characteristics (continued)
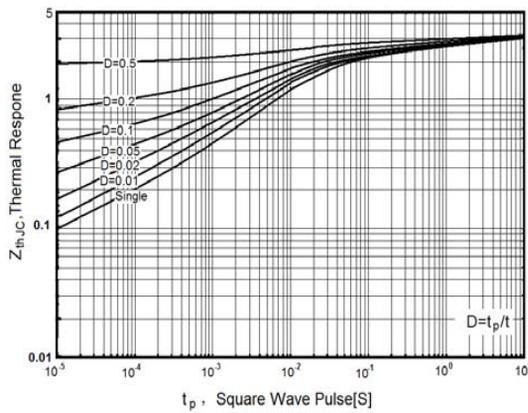

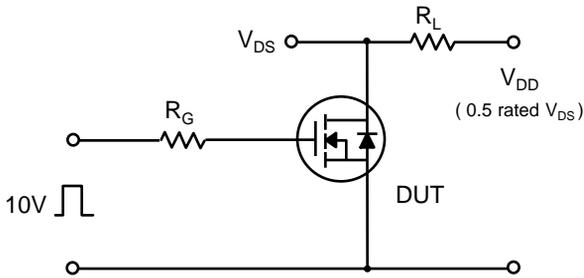**Figure 12. Transient Thermal Response Curve (TO-220)**

Figure 13. Transient Thermal Response Curve (TO-220F)

Characteristics Test Circuit & Waveform

V_{DS} R_L

V_{DD}
(0.5 rated V_{DS})

R_G

10V

DUT

V_{DS} 90%

V_{in} 10%

$t_{d(on)}$ t_r $t_{d(off)}$ t_f

t_{on} t_{off}

Switching Time Test Circuit & Waveforms

Same Type
as DUT

12V   200nF   50KΩ   300nF

V_{DS}

V_{GS}

DUT

1mA

V_{GS}

10V

Q_g

Q_{gs} Q_{gd}
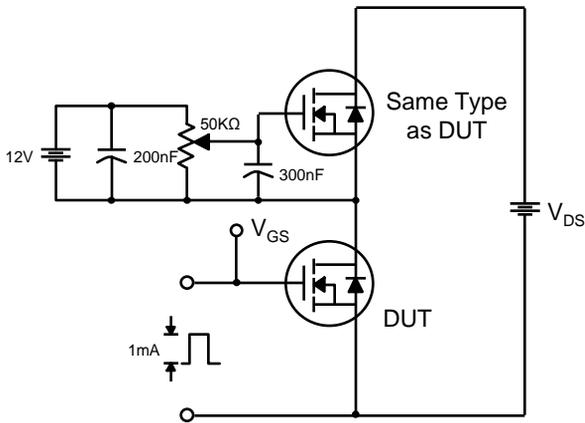
Charge

Gate Charge Test Circuit & Waveform

V_{DS} L

V_{DD}

I_D

R_G

10V

DUT

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

BV_{DSS}

I_{AS}

$I_D (t)$

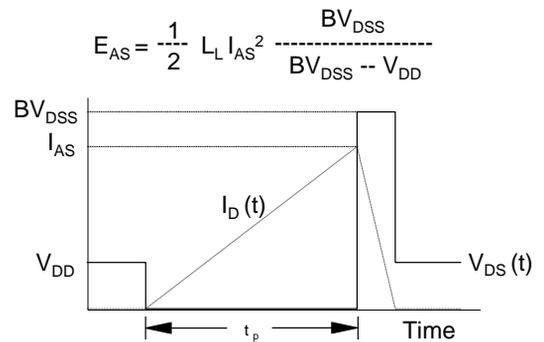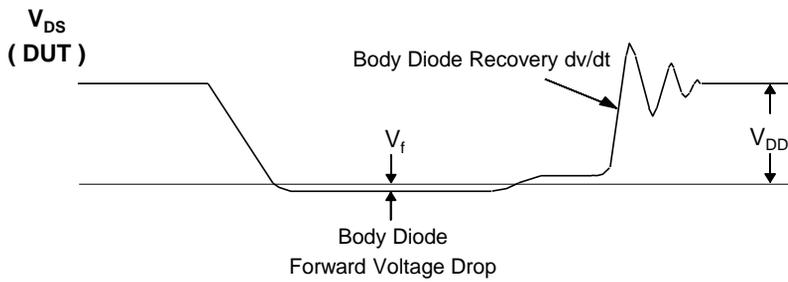V_{DD} $V_{DS} (t)$
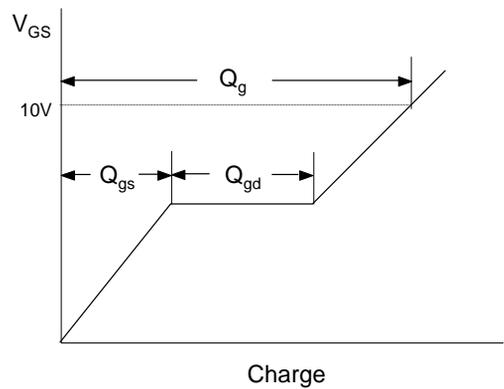
t_p Time
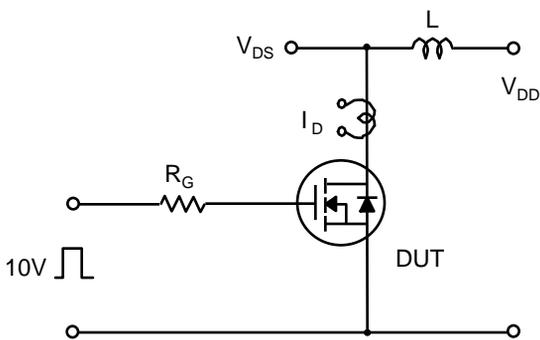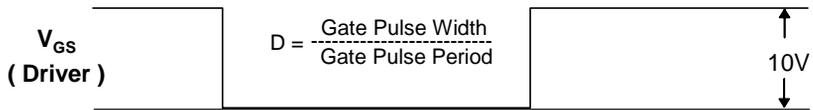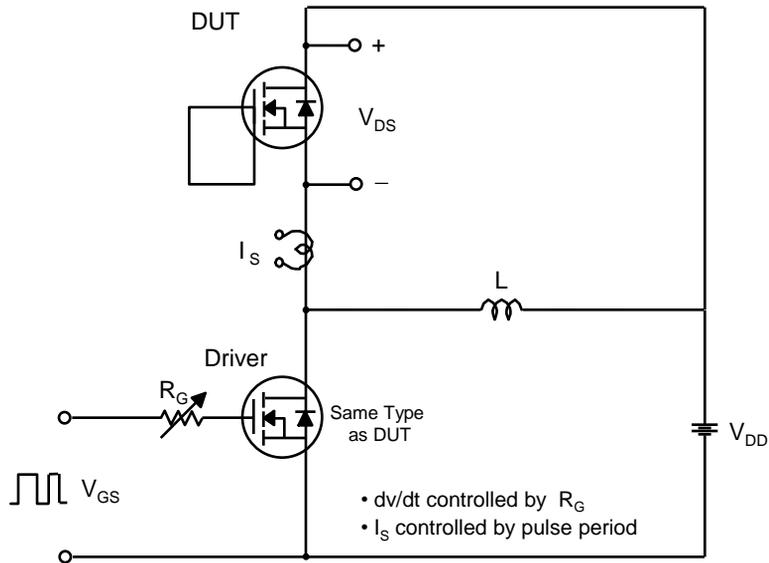
Unclamped Inductive Switching Test Circuit & Waveforms

Characteristics Test Circuit & Waveform (continued)

DUT

+

V_{DS}

−

I_S

L

Driver

R_G

Same Type
as DUT

V_{DD}

V_{GS}

• dv/dt controlled by R_G
• I_S controlled by pulse period

V_{GS}
(Driver)

$D = \dfrac{\text{Gate Pulse Width}}{\text{Gate Pulse Period}}$

10V

I_S
(DUT)

I_{FM} , Body Diode Forward Current

di/dt

I_{RM}

Body Diode Reverse Current

V_{DS}
(DUT)

Body Diode Recovery dv/dt

V_f

V_{DD}

Body Diode
Forward Voltage Drop
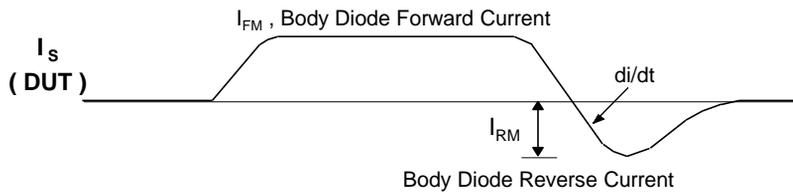
Peak Diode Recovery dv/dt Test Circuit & Waveforms