General Description

The WSR28N65F is CoolFET II MOSFET family that is utilizing charge balance technology for extremely low on-resistance and low gate charge performance. P/T is suitable for applications which require superior power density and outstanding efficiency

Product Summery

BV_{DSS}	R_{DSON}	I_D
650V	280mΩ	28A

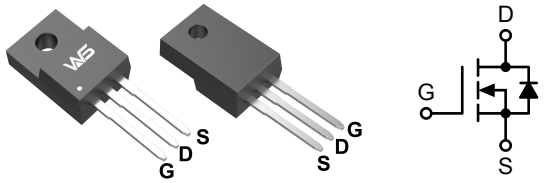
Features

- Low Crss
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- RoHS product

Applications

- Uninterruptible Power Supply(UPS)
- Power Factor Correction (PFC)

TO-220F Pin Configuration



Absolute Maximum Ratings (T_C= 25ÁC, Unless Otherwise Noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	650	V
V_{GS}	Gate-Source Voltage	±30	V
I_D	Continuous Drain Current	28	A
I_{DM}	Pulsed Drain Current [1]	44	A
E_{AS}	Single Pulse Avalanche Energy [2]	250	mJ
P_D	Power Dissipation	25.5	W
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Junction-to-Ambient	---	62	℃/W
$R_{\theta JC}$	Junction-to-Case	---	1.2	℃/W

Electrical Characteristics (T_J= 25ÁC Unless Otherwise Noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	650	---	---	V
△BV_{DSS}/△T_J	BV_{DSS} Temperature Coefficient	ID=250uA,Reference25℃	---	0.7	---	V/℃
$R_{DS(ON)}$	Drain-to-Source On-Resistance	V_{GS}=10V,I_D=3.2A	---	280	340	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	2.5	3.3	4.5	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=650V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=520V , V_{GS}=0V , T_C=125℃	---	---	50	
I_{GSS}	Gate-Source Leakage Current, forward	V_{GS}=30V , V_{DS}=0V	---	---	100	nA
	Gate-Source Leakage Current, reverse	V_{GS}=-30V , V_{DS}=0V	---	---	-100	nA
Q_g	Total Gate Charge	V_{DS}=400V , V_{GS}=10V , I_D=7A	---	2.77	---	nC
Q_{gs}	Gate-Source Charge		---	5.8	---	
Q_{gd}	Gate-Drain Charge		---	20.4	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DS}=400V , I_D=7A V_{GS}=10V , R_G=4.7Ω,	---	6.2	---	ns
T_r	Rise Time		---	21	---	
$T_{d(off)}$	Turn-Off Delay Time		---	28.8	---	
T_f	Fall Time		---	22.4	---	
C_{iss}	Input Capacitance	V_{DS}=100V , V_{GS}=0V , f=1MHz	---	781	---	pF
C_{oss}	Output Capacitance		---	30.3	---	
C_{rss}	Reverse Transfer Capacitance		---	1.47	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current (Body Diode)	V_G=V_D=0V , Force Current	---	---	14	A
I_{SM}	Maximum Pulsed Current (Body Diode)		---	---	44	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S=7A , T_J=25℃	---	0.7	1.5	V
t_{rr}	Reverse Recovery Time	IF=7A,dI/dt=100A/μs,T_J=25℃	---	218	---	nS
Q_{rr}	Reverse Recovery Charge		---	1.1	---	nC

Note :

1、The data tested by surface mounted on a 1 inch2 FR-4 board with 2OZ copper.
2、The EAS data shows Max. rating . L=0.5mH, IAS =7A, VDD =50V, RG=25Ω
3、The test condition is Pulse Test: ISD ≤ ID, di/dt = 100A/us, VDD≤ BVDSS, Starting at TJ =25℃
4、The power dissipation is limited by 150℃ junction temperature
5、The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

Typical Characteristics

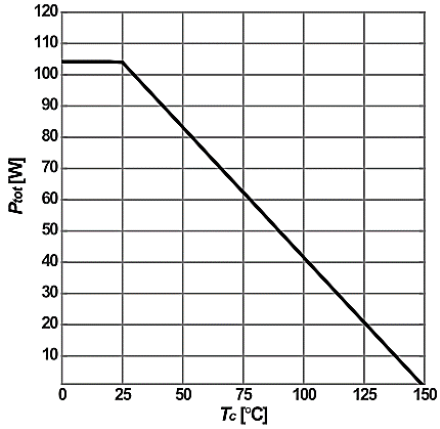


Figure1: Power dissipation (Non FullPAK)

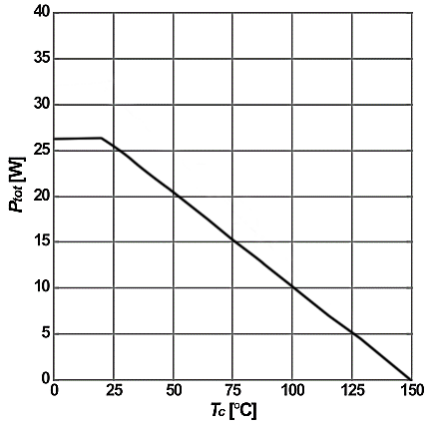


Figure2: Power dissipation (FullPAK)

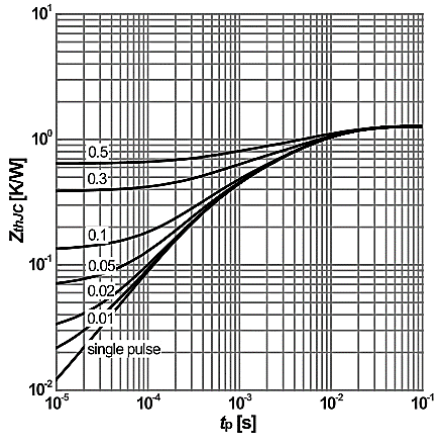


Figure3:Max. transient thermal impedance
Z_{thJC}=f(t_p); parameter: D= t_p/T

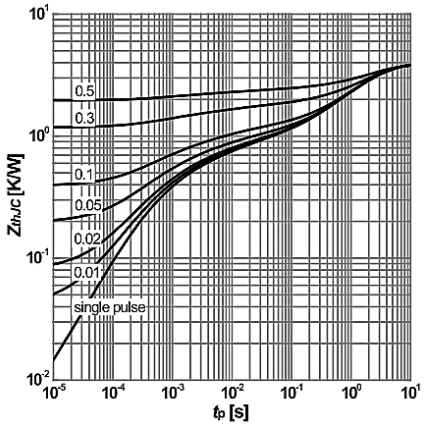


Figure4:Max. transient thermal impedance
Z_{thJC}=f(t_p); parameter: D= t_p/T

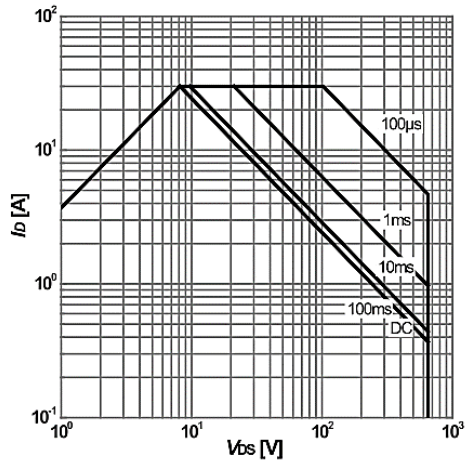


Figure5: Safe operating area (Non FullPAK)
I_D=f(V_{DS}); Tj=25°C; D=0; parameter: t_p

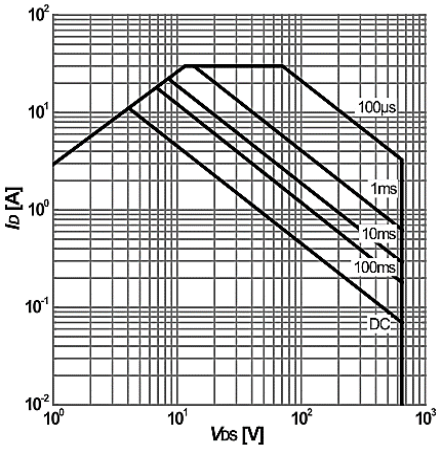


Figure6: Safe operating area (FullPAK)
I_D=f(V_{DS}); Tj=25°C; D=0; parameter: t_p

Typical Characteristics (Cont.)

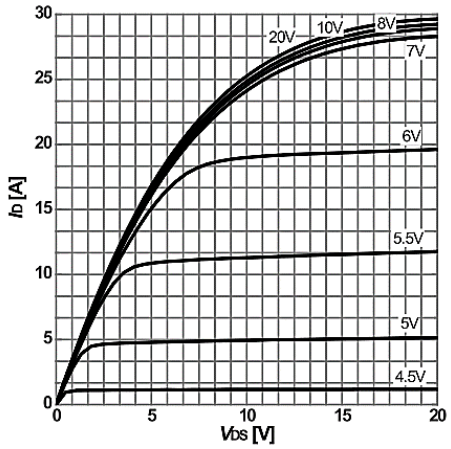


Figure 7: Typ. outp ut characteristics

$I_D=f(V_{DS})$; $T_j=25°C$; parameter: V_{GS}

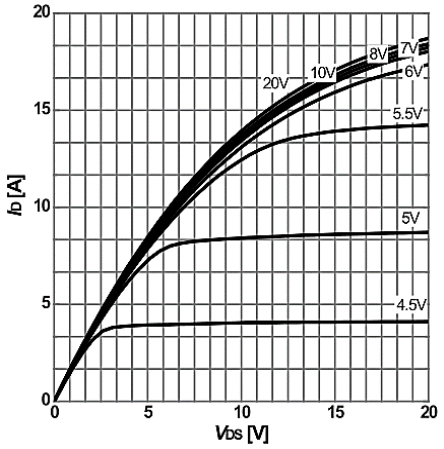


Figure8 : Typ. output characteristics

$I_D=f(V_{DS})$; $T_j=125°C$; parameter: V_{GS}

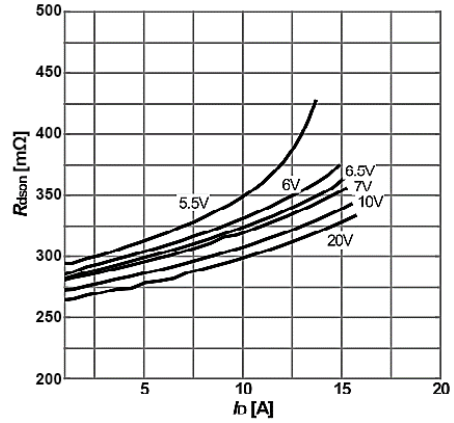


Figure9 : Typ. drain-source on-state resistance

$R_{DS}(on)=f(I_D)$; $T_j=25°C$; parameter: V_{GS}

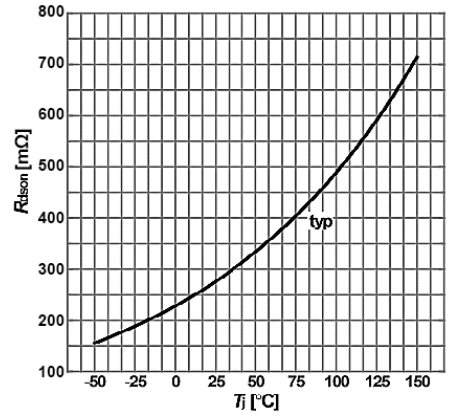


Figure 10: drain -source on-state resistance

$R_{DS}(on)=f(T_j)$; $I_D=3.2A$; $V_{GS}=10V$

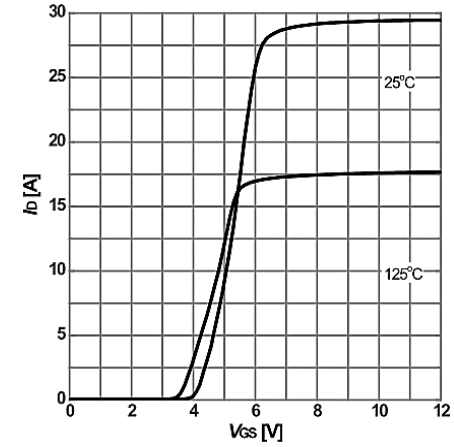


Figure 11: Type. transfer characteristics

$I_D=f(V_{GS})$; $V_{DS}=20V$; parameter: T_j

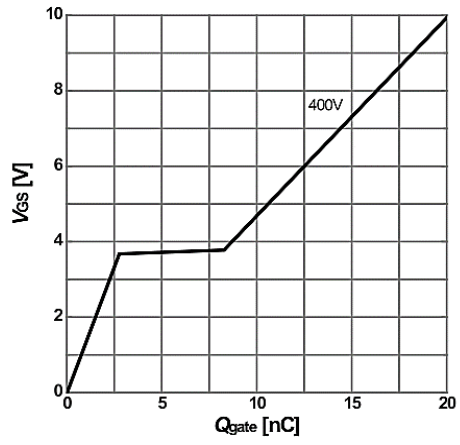
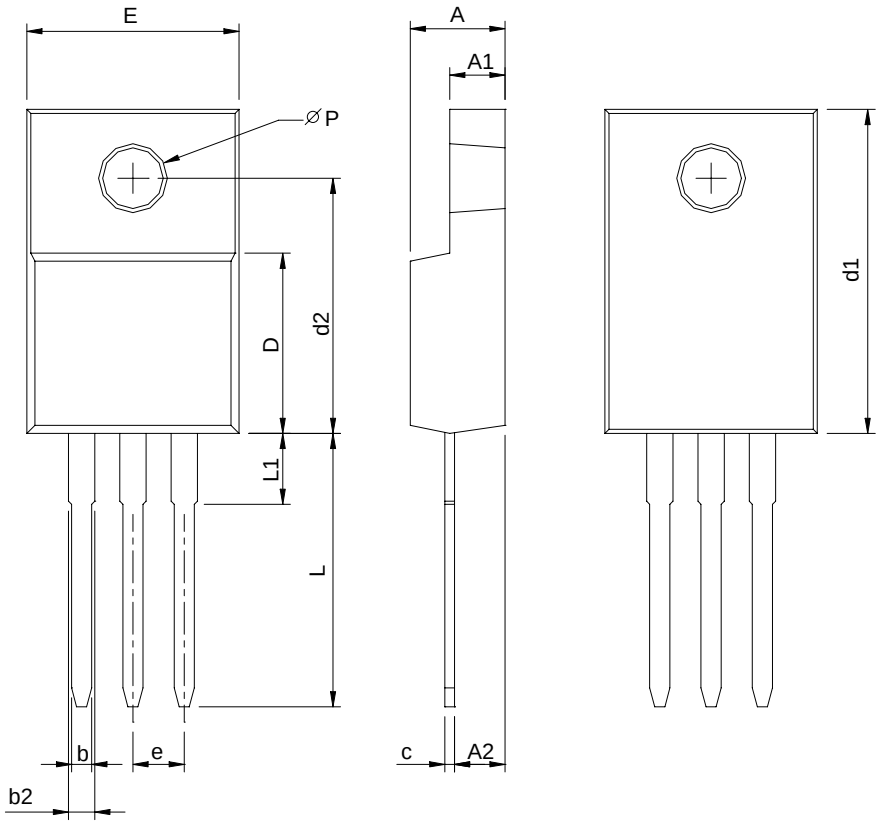


Figure 12: Type. gate charge

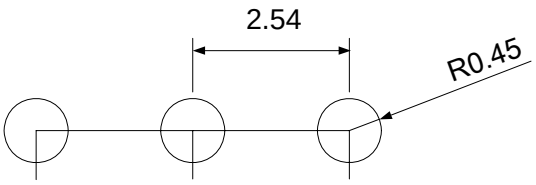
$V_{GS}=f(Q_{gate})$; $I_D=3.2A$ pulsed; $V_{DS}=480V$

Packaging information



SYMBOL	TO-220F			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.20	4.80	0.165	0.189
A1	2.34	3.20	0.092	0.126
A2	2.10	2.90	0.083	0.114
b	0.50	0.90	0.020	0.035
b2	0.91	1.90	0.035	0.075
c	0.30	0.80	0.012	0.031
D	8.10	9.40	0.319	0.370
d1	14.50	16.50	0.571	0.650
d2	12.10	12.90	0.476	0.508
E	9.70	10.70	0.382	0.421
e	2.54 BSC		0.100 BSC	
L	13.00	14.50	0.512	0.570
L1	1.60	4.00	0.063	0.157
P	3.00	3.60	0.118	0.142

RECOMMENDED LAND PATTERN



UNIT: mm

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