



SMF12N65-Z

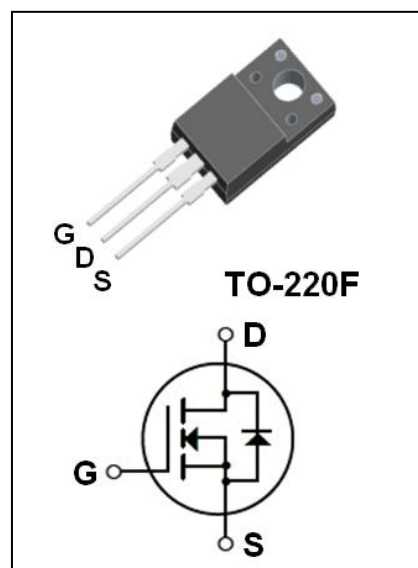
650V N-Channel MOSFET

● Features:

- 12.0A, 650V, $R_{DS(on)(Typ)} = 0.65\Omega @ V_{GS}=10V$
- Low Gate Charge
- Low C_{rss}
- 100% Avalanche Tested
- Fast Switching
- Improved dv/dt Capability

● Application:

- High Frequency Switching Mode Power Supply
- Active Power Factor Correction



Absolute Maximum Ratings ($T_c=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	650	V
I_D	Drain Current - Continuous ($T_c=25^\circ\text{C}$) - Continuous ($T_c=100^\circ\text{C}$)	12.0*	A
		7.6*	A
I_{DM}	Drain Current - Pulsed (Note1)	48*	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Limit Reference Value) (Note2)	732	mJ
I_{AR}	Avalanche Current (Note1)	11.0	A
E_{AR}	Repetitive Avalanche Energy (Note1)	24.2	mJ
dv/dt	Peak Diode Recovery dv/dt (Note3)	4.5	V/ns
P_D	Power Dissipation ($T_c = 25^\circ\text{C}$) - Derate above 25°C	51	W
		0.41	W/ $^\circ\text{C}$
T_j	Operating Junction Temperature	150	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$

* Drain Current Limited by Maximum Junction Temperature.

Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.45	$^\circ\text{C} / \text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	$^\circ\text{C} / \text{W}$

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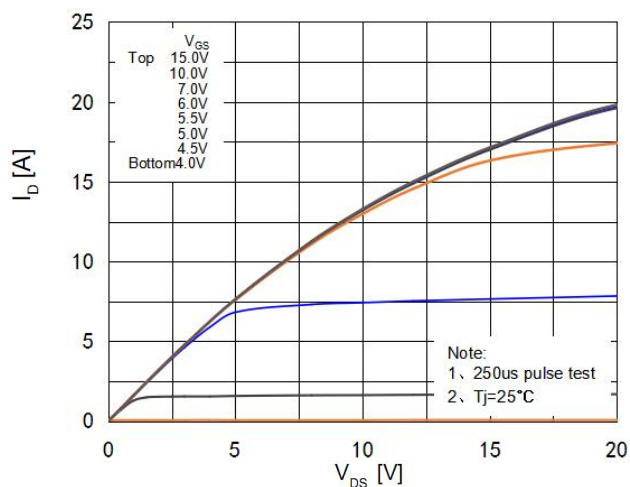
Electrical Characteristics(Tc=25°C unless otherwise noted)

Symbol	Parameter	Test Conditons	Min	Typ	Max	Unit
Off Characteristics						
BV _{DSS}	Drain-source Breakdown Voltage	V _{GS} =0V ,I _D =250μA	650	--	--	V
ΔBV _{DSS} /ΔT _J	Breakdown Voltage Temperature Coefficient	I _D =250μA (Referenced to 25°C)	--	0.68	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =650V,V _{GS} =0V	--	--	1	μA
		V _{DS} =520V,T _c =125°C	--	--	10	μA
I _{GSSF}	Gate-Body Leakage Current,Forward	V _{GS} =+30V, V _{DS} =0V	--	--	100	nA
I _{GSSR}	Gate-Body Leakage Current,Reverse	V _{GS} =-30V, V _{DS} =0V	--	--	-100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D =250μA	2.0	--	4.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10 V, I _D =6.0A	--	0.65	0.85	Ω
g _{FS}	Forward Transconductance	V _{DS} =20 V, I _D =6.0A (Note4)	--	13.3	--	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =25V,V _{GS} =0V, f=1.0MHz	--	2210	--	pF
C _{oss}	Output Capacitance		--	152	--	pF
C _{rss}	Reverse Transfer Capacitance		--	5.2	--	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 325 V, I _D = 12 A, R _G = 25 Ω (Note4,5)	--	32.2	--	ns
t _r	Turn-On Rise Time		--	86.8	--	ns
t _{d(off)}	Turn-Off Delay Time		--	144	--	ns
t _f	Turn-Off Fall Time		--	92.7	--	ns
Q _g	Total Gate Charge	V _{DS} = 520 V, I _D =12 A, V _{GS} = 10 V (Note4,5)	--	49.7	--	nC
Q _{gs}	Gate-Source Charge		--	8.8	--	nC
Q _{gd}	Gate-Drain Charge		--	22.6	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	12	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	48	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} =0V,I _S =12.0 A	--	--	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} =0V, I _S =12.0 A, d I _F /dt=100A/μs (Note4)	--	432	--	ns
Q _{rr}	Reverse Recovery Charge		--	4.41	--	μC

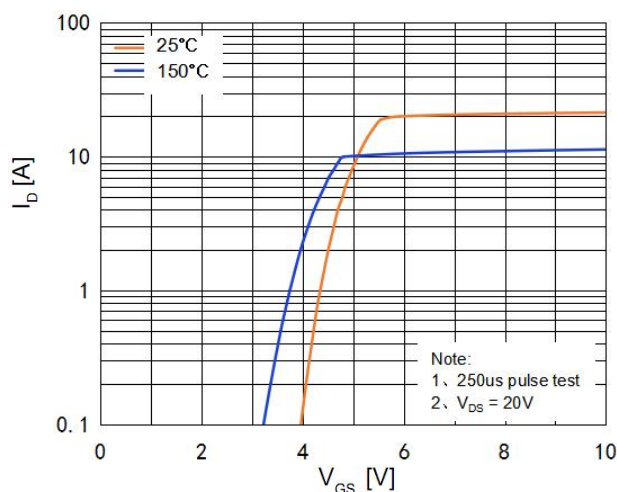
Notes:

- 1、Repetitive Rating:Pulse Width Limited by Maximum Junction Temperature.
- 2、 $L=11mH, I_{AS}=11.0A, V_{DD}=100V, R_G=25\Omega$, Starting $T_J=25^\circ C$.
- 3、 $I_{SD}\leq 12.0A, di/dt\leq 200A/\mu s, V_{DD}\leq BV_{DSS}$, Starting $T_J=25^\circ C$.
- 4、Pulse Test : Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
- 5、Essentially Independent of Operating Temperature.

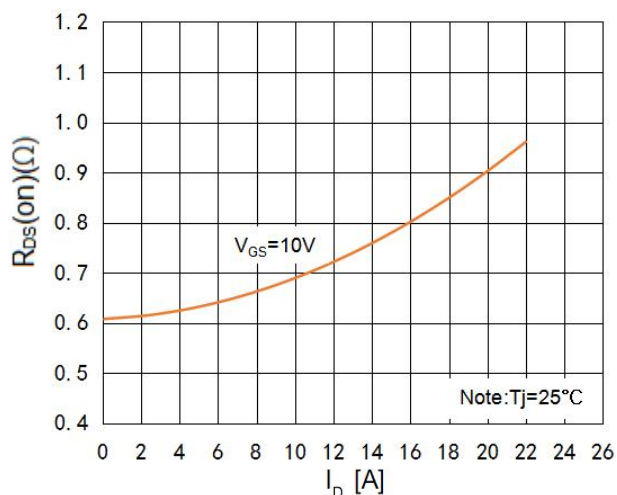
On-Regin Characteristics



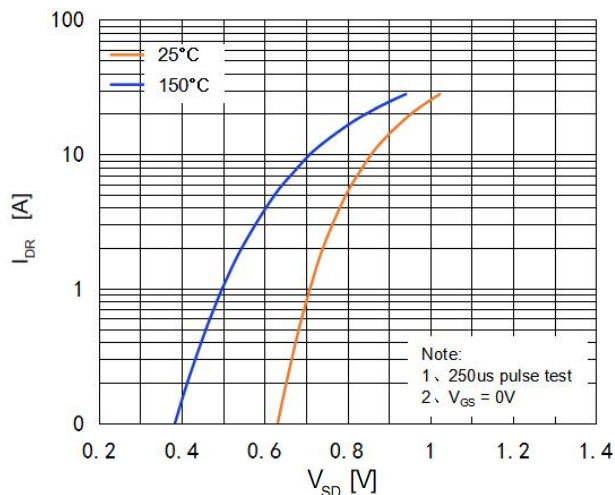
Transfer Characteristics



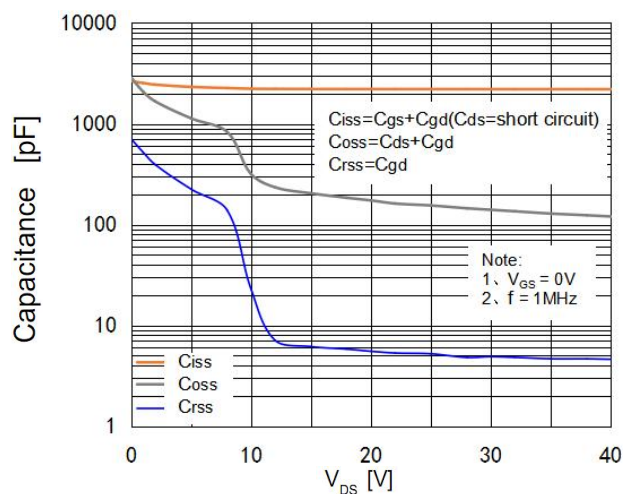
On-Resistance Variation vs. Drain Current and Gate Voltage



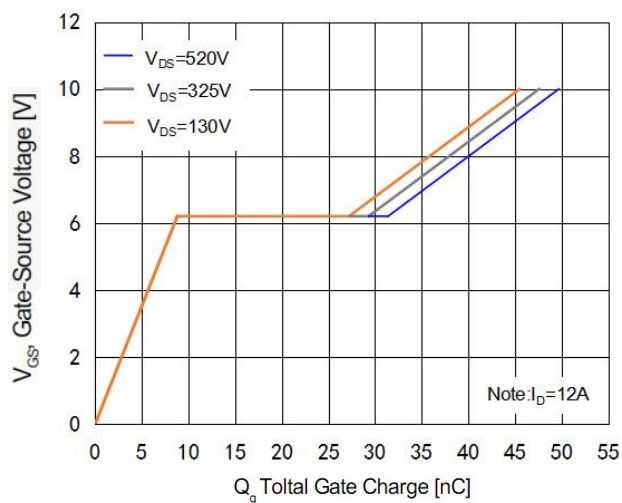
Body Diode Forward Voltage Variation vs. Source Current and Temperature



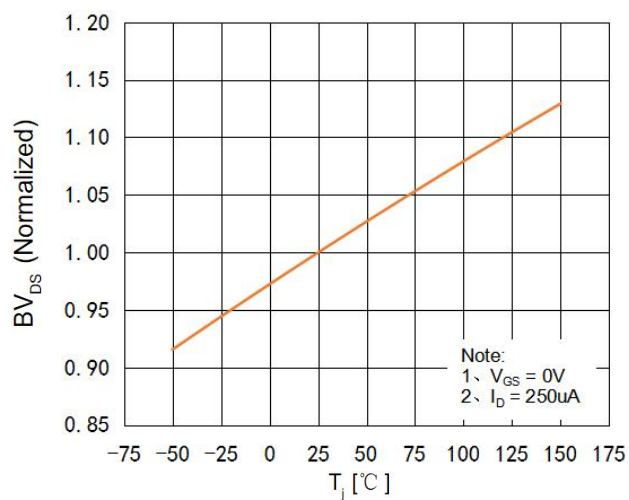
Capacitance Characteristics



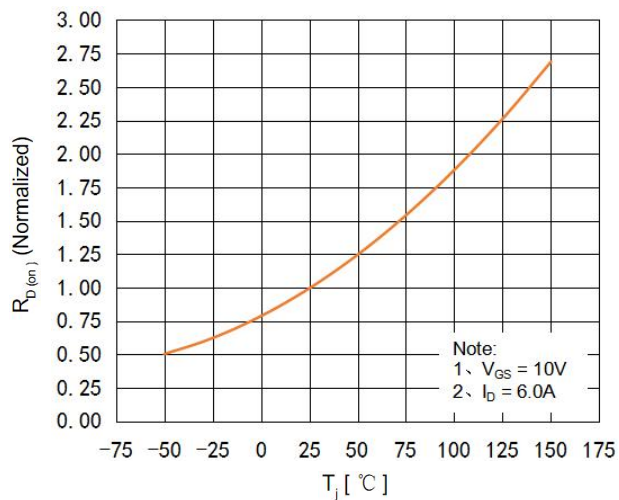
Gate Charge Characteristics



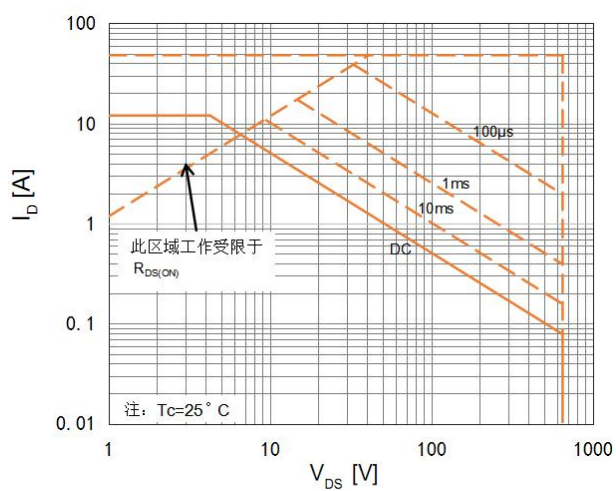
Breakdown Voltage Variation vs. Temperature



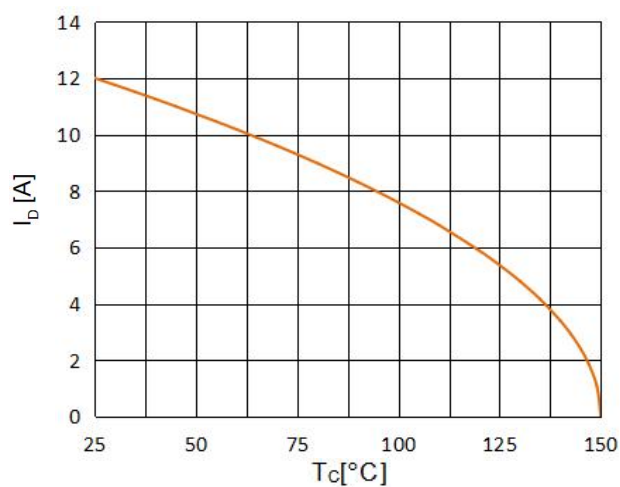
On-Resistance Variation vs. Temperature



Maximum Safe Operating Area



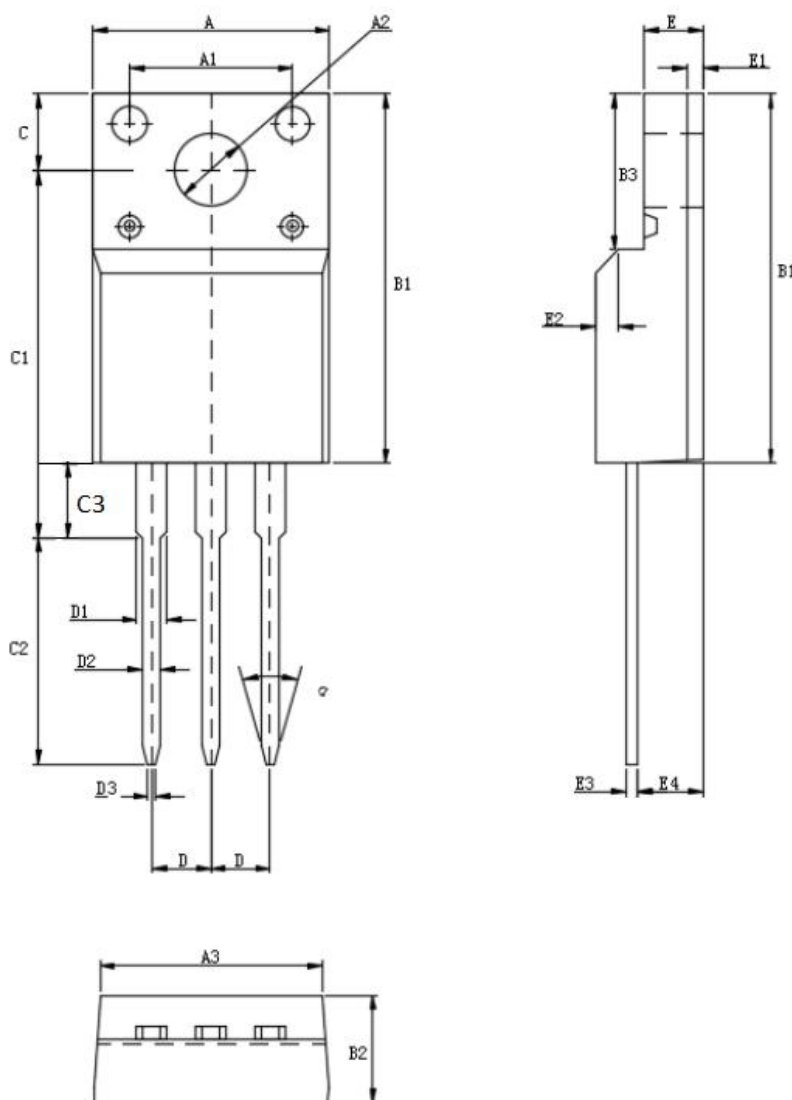
Maximum Drain Current Vs. Case Temperature



TO-220F Package Dimensions

UNIT: mm

SYMBOL	min	nom	max	SYMBOL	min	nom	max
A	9.80		10.60	D		2.54	
A1		7.00		D1	1.15		1.47
A2	2.90		3.40	D2	0.60		0.90
A3	9.10		9.90	D3	0.20		0.50
B1	15.40		16.40	E	2.24		2.84
B2	4.35		4.95	E1		0.70	
B3	6.00		7.40	E2		1.0 × 45°	
C	3.00		3.70	E3	0.35		0.65
C1	15.00		17.00	E4	2.30		3.30
C2	8.80		10.80	α (度)		30°	
C3	2.60		3.60				



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注意事项：

- 1、在电路设计时请不要超过器件的最大额定值，否则会影响整机的可靠性。
- 2、MOSFET产品为静电敏感型器件，使用时应注意采取防静电保护措施，如佩戴防静电手环、设备接地等。
- 3、如需安装散热片，请注意控制扭力大小及散热片的平整度。
- 4、该规格书由华科公司制作，并可能不定期更改，恕不另行通知。
- 5、如有疑问，请及时联系我司销售代表。

版本履历表：

序号	版本号	修改时间	修改记录
1	V1.0	2022-12-20	首次发行