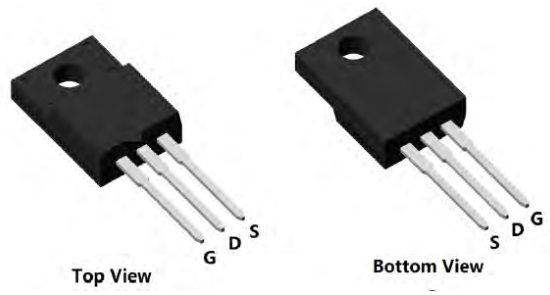
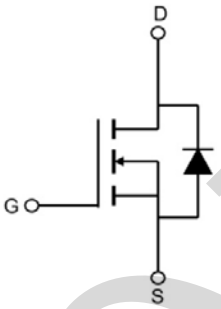
N-Channel Multilayer Epitaxial Super Junction Power MOSFET

MCR65B180CTF.
TO-220F





V_{DS}	650	V
$R_{DS(on),TYP}$@ V_{GS}=10 V	150	mΩ
I_D	19	A

Features

- New technology for high voltage device
- Low on-resistance and low conduction losses
- small package
- Ultra Low Gate Charge cause lower driving requirements
- 100% Avalanche Tested
- ROHS compliant

Application

- Power factor correction（PFC）
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply（UPS）

Maximum ratings, at T_A =25°C, unless otherwise specified

Symbol	Parameter		Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage		650	V
V_{GS}	Gate-Source voltage		±30	V
I_{AS}	Avalanche Current ②	T_C =25°C	4	A
I_D	Continuous drain current @VGS=10V	T_C =25°C	19	A
		T_C =100°C	12	A
I_{DM}	Pulse drain current tested ①	T_C =25°C	53	A
E_{AS}	Avalanche energy, single pulsed②		103	mJ
E_{AR}	Repetitive Avalanche Energy ①		1.62	mJ
P_D	Maximum power dissipation	T_C =25°C	36	W
		Derate Above 25°C	0.29	W
T_{STG},T_J	Storage and Junction Temperature Range		-55 to＋150	°C

Thermal Characteristics

Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	°C/W

Electrical Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Static Electrical Characteristics @ T_j=25°C (unless otherwise stated)						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=1mA	650	--	--	V
		V_{GS}=0V, I_D=1mA, T_J = 150℃	700	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=650V,V_{GS}=0V	--	--	1	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±30V,V_{DS}=0V	--	--	±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=1.7mA	2.5	--	4.5	V
$R_{DS(on)}$	Drain-Source On-State Resistance	V_{GS}=10V, I_D=8.5A	--	150	180	mΩ
Dynamic Electrical Characteristics @ T_j = 25°C (unless otherwise stated)						
C_{iss}	Input Capacitance	V_{DS}=400V,V_{GS}=0V, f=250KHz	--	1233	--	pF
C_{oss}	Output Capacitance		--	35	--	pF
$C_{o(tr)}$	Time Related Output Capacitance	V_{DS}=0V to 400V, V_{GS}=0V	--	402	--	pF
$C_{o(er)}$	Energy Related Output Capacitance		--	54	--	pF
Q_g (10V)	Total Gate Charge	V_{DS}=400V,I_D=8.5A , V_{GS}=10V	--	32.1	--	nC
Q_{gs}	Gate-Source Charge		--	6.8	--	nC
Q_{gd}	Gate-Drain Charge		--	16	--	nC
R_G	Gate Resistance	f=1MHz	--	6.9	--	Ω

Switching Characteristics

Td(on)	Turn-on Delay Time	V_{DS}=400V, I_D=8.5A, V_{GS}=10V, R_G=10Ω	--	15	--	ns
Tr	Turn-on Rise Time		--	11	--	ns
Td(off)	Turn-Off Delay Time		--	71	--	ns
Tf	Turn-Off Fall Time		--	11	--	ns

Source- Drain Diode Characteristics@ T_j = 25°C (unless otherwise stated)

V_{SD}	Forward on voltage	I_{SD}=8.5A,V_{GS}=0V	--	--	1.2	V
I_S	Maximum Continuous Diode Forward Current		--	--	19	A
I_{SM}	Maximum Pulsed Diode Forward Current		--	--	57	A
Trr	Reverse Recovery Time	V_{DD}=400V , I_{SD}=8.5A di/dt=100A/μs	--	284	--	ns
Qrr	Reverse Recovery Charge		--	3.46	--	uC

NOTE:

①Repetitive rating: pulse-width limited by maximum junction temperature.

②I_{AS} = 4 A, R_G = 25 Ω, starting T_J = 25℃.

③I_{SD} ≤ 8.5 A, di/dt ≤ 100 A/μs, V_{DD} ≤ 400 V, starting T_J = 25℃.

Typical Characteristics

Figure 1. On-Region Characteristics

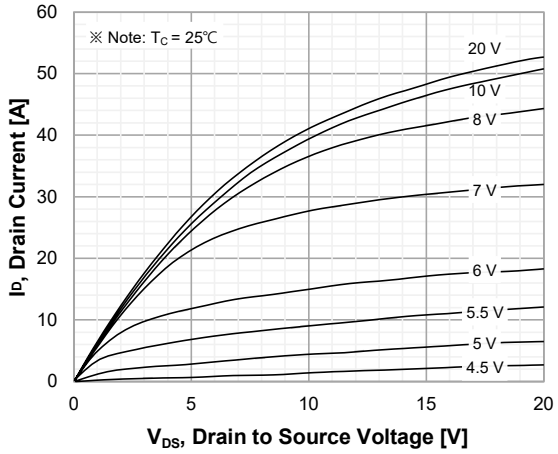


Figure 2. Transfer Characteristics

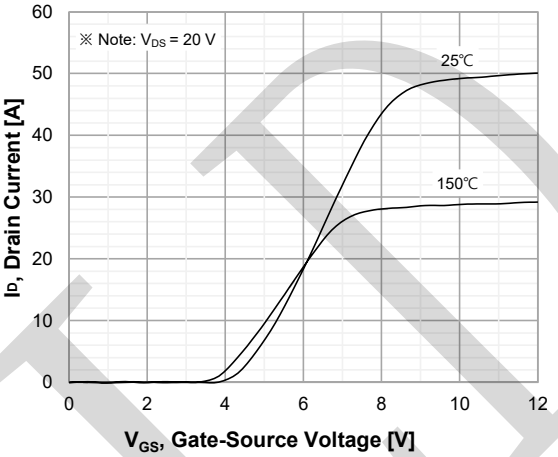


Figure 3. On-Resistance Characteristics vs. Drain Current and Gate Voltage

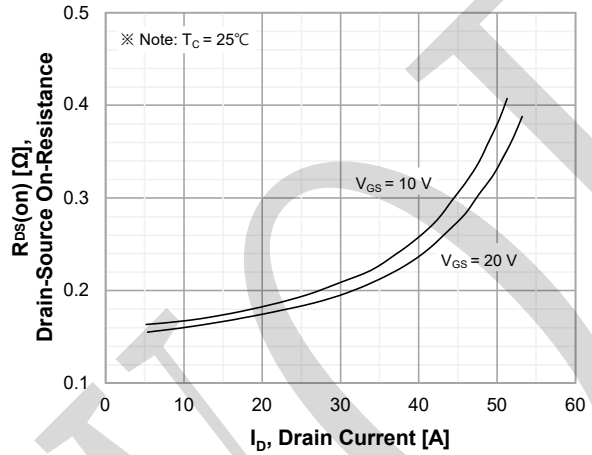


Figure 4. Diode Forward Voltage Characteristics vs. Source-Drain Current and Temperature

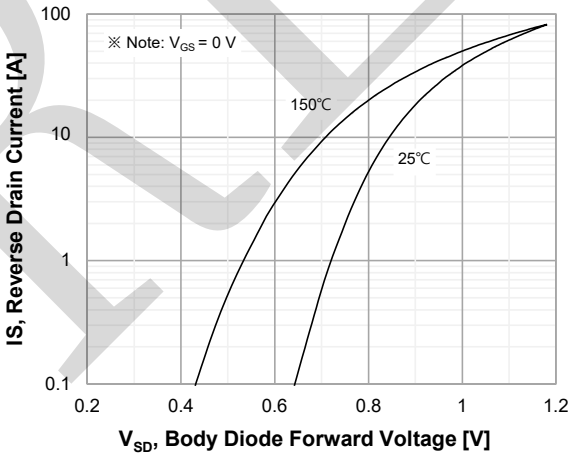


Figure 5. Capacitance Characteristics

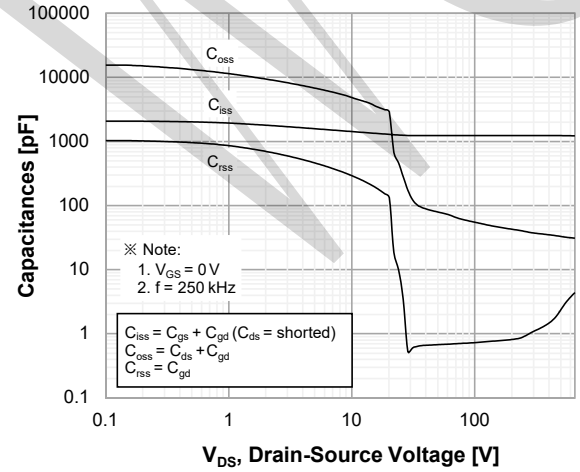
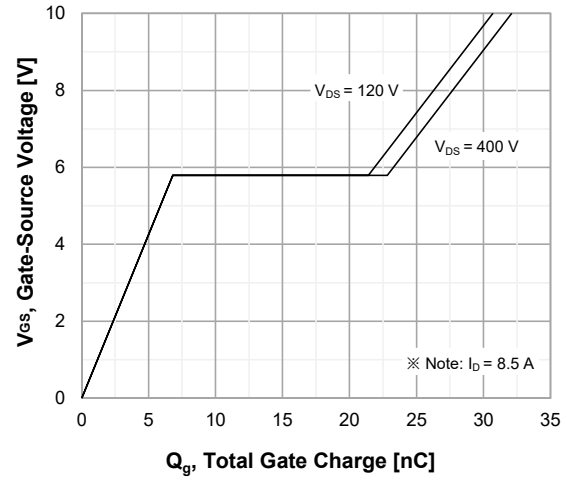


Figure 6. Gate Charge Characteristics



Typical Characteristics

Figure 7. Breakdown Voltage Characteristics vs. Temperature

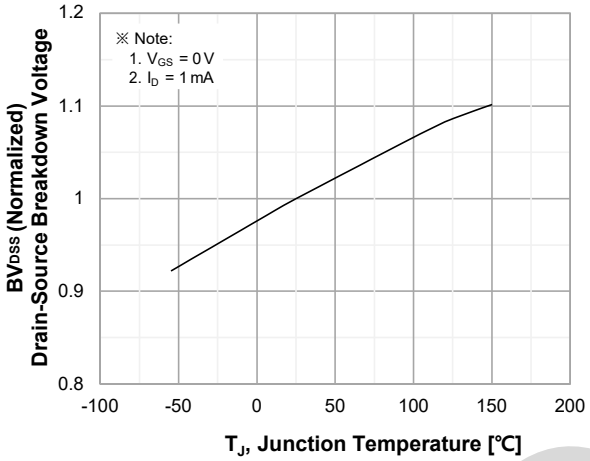


Figure 8. On-Resistance Characteristics vs. Temperature

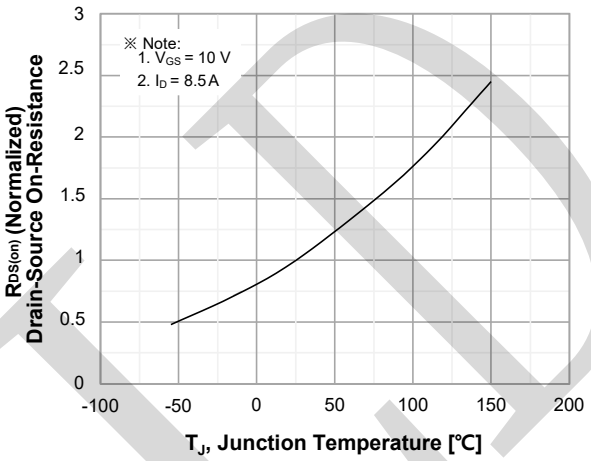


Figure 9. Maximum Safe Operating Area

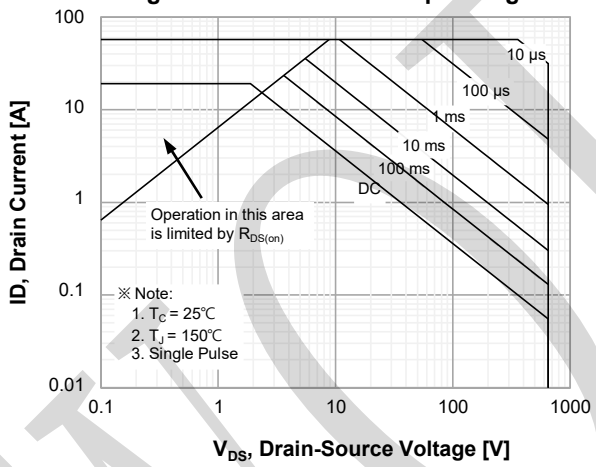


Figure 10. Maximum Drain Current vs. Case Temperature

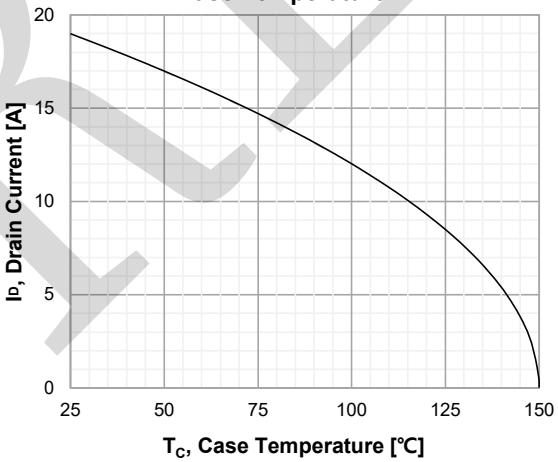


Figure 11. E_{oss} vs. Drain to Source Voltage

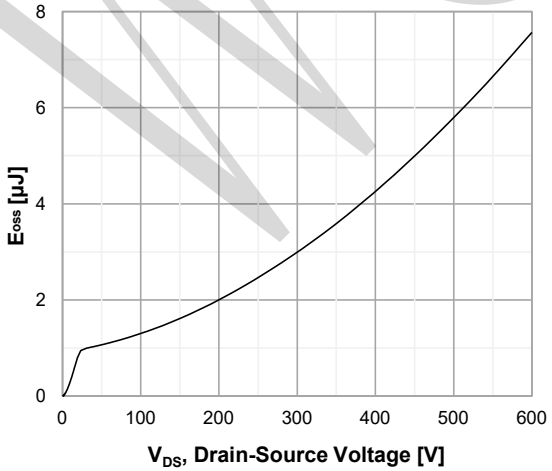
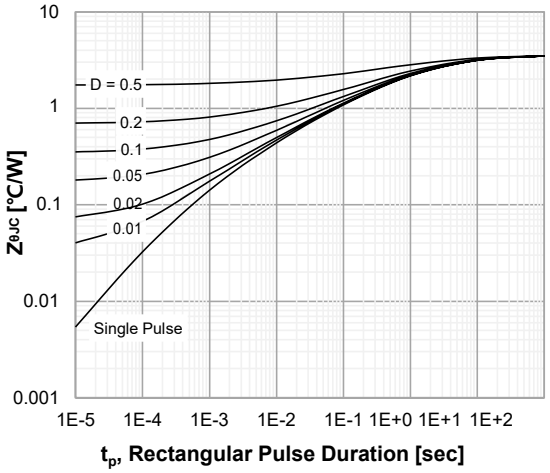


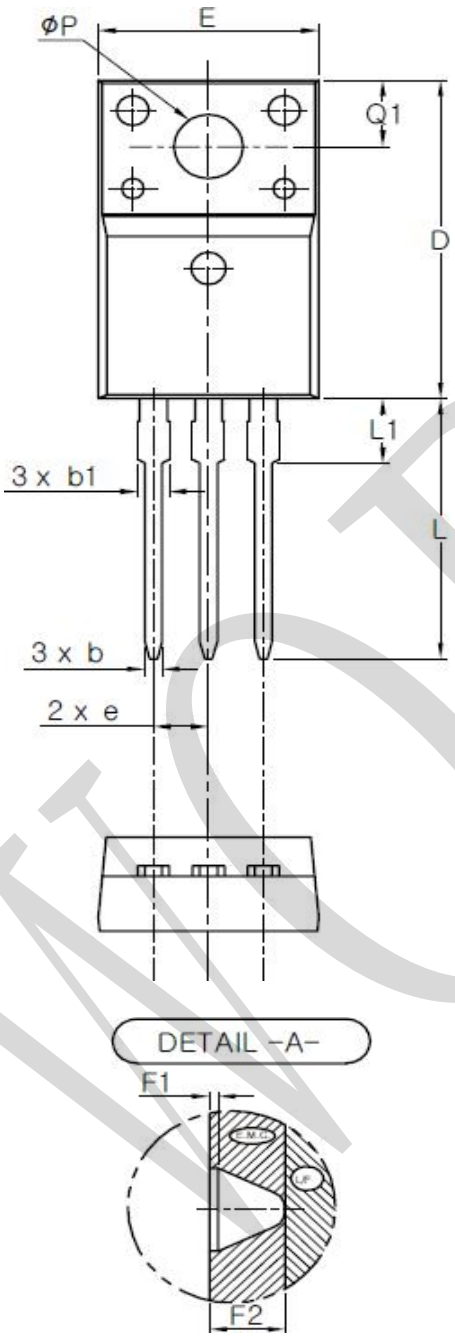
Figure 12. Transient Thermal Response Curve

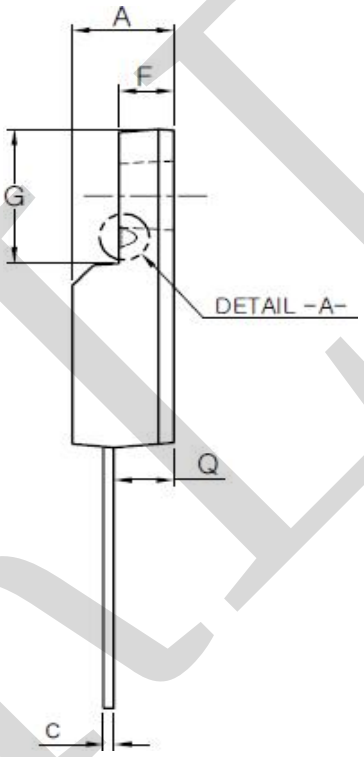


PACKAGE OUTLINE DIMENSIONS

Note:unit mm

TO-220F





SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.90
b	0.70	0.80	0.90
b1	1.33	1.40	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
E	9.96	10.16	10.36
e		2.54 BSC	
F	2.34	2.54	2.74
F1		(0.10)	
F2		(0.84)	
G	6.48	6.68	6.88
L	12.78	12.98	13.18
L1	3.03	3.23	3.43
Q	2.56	2.76	2.96
Q1	3.10	3.30	3.50
ØP	3.08	3.18	3.28

* Dimensions in millimeters