

N-Channel 800V (D-S) SiC MOSFET

Features

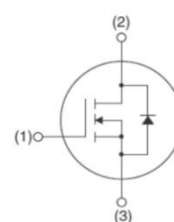
- Wide bandgap SiC MOSFET technology
- Low On-Resistance with High Blocking Voltage
- Low Capacitances with High-Speed switching
- Low reverse recovery(Qrr)
- Halogen free, RoHs compliant



TO-220F

Applications

- Switch mode power supplies
- Renewable energy
- On Board Charger
- High voltage DC/DC converters



Absolute Maximum Ratings (T_J=25°C unless otherwise noted)

Parameter	Symbol	Ratings	Unit
Drain Source Voltage	V _{DS}	800	V
Gate Source Voltage	V _{GS}	-8/+22	V
Recommend Gate Source Voltage	V _{GSop}	-4/+18	V
Drain Current Continuous V _{GS} =18V	I _D	13.3	A
		7.7	
Power Dissipation	P _D	50	W
Operating Temperature and Storage Temperature Range	T _J /T _{STG}	-55 to +175	°C

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance Junction to Case	R _{thJC}	3.0	°C/W
Thermal Resistance Junction to Ambient	R _{thJA}	40	°C/W

Electrical Characteristics (T _J =25°C unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =100μA	800	--	--	V
Gate Leakage Current	I _{GSS}	V _{GS} =18V, V _{DS} =0V	--	--	100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =800V, V _{GS} =0V	--	1	5	μA
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _{DS} =10mA	2	2.8	4	V
		V _{DS} =V _{GS} , I _{DS} =10mA, T _J =175°C	--	2	--	
Drain-Source On-state Resistance	R _{DS(on)}	V _{GS} =18V, I _D =3.6A	--	200	260	mΩ
		V _{GS} =18V, I _D =3.6A, T _J =175°C	--	240	--	
Drain-Source On-state Resistance	R _{DS(on)}	V _{GS} =15V, I _D =3.6A	--	250	320	mΩ
		V _{GS} =15V, I _D =3.6A, T _J =175°C	--	310	--	
Total Gate Charge	Q _g	V _{GS(off)} =-4V, V _{GS(on)} =18V V _{DD} =600V, I _D =3.6A	--	15.6	--	nC
Gate Source Charge	Q _{gs}		--	2.76	--	
Gate Drain Charge	Q _{gd}		--	7.86	--	
Turn-On Switching Energy	E _{ON}	V _{GS} =-4/+18V, V _{DD} =600V · I _D =3.6A, R _G =5Ω, L=1mH	--	52.1	--	mJ
Turn-Off Switching Energy	E _{OFF}		--	12.62	--	
Turn-on Delay Time	t _{d(on)}		--	4.2	--	ns
Turn-on Rise Time	t _r		--	2	--	
Turn-off Delay Time	t _{d(off)}		--	10.2	--	
Turn-off Fall Time	t _f		--	9.8	--	
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =600V, V _{AC} =25mV, f=1MHz	--	338.2	--	pF
Output Capacitance	C _{oss}		--	16.7	--	
Reverse Transfer Capacitance	C _{rss}		--	3.8	--	
Gate resistance	R _G	V _{AC} = 25mV, f=1MHz	--	3.0	--	Ω

Reverse Diode Characteristics (T_J=25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V _{SD}	I _{SD} =1.8A, V _{GS} =-4V	--	4.2	--	V
		I _{SD} =1.8A, V _{GS} =-4V, T _J =175°C	--	3.8	--	
Continuous Diode Forward Current	I _{SD}	V _{GS} =-4V	--	13.3	--	A
Reverse Recovery Time	t _{rr}	V _R =600V, I _F =3.6A, V _{GS} =-4V, di/dt=1000A/μs	--	22.2	--	ns
Reverse Recovery Charge	Q _{rr}		--	36	--	nC
Reverse Recovery Energy	E _{REC}		--	14.74	--	uJ
Peak Reverse Recovery Current	I _{rrm}		--	2.67	--	A
Charge Time	t _A		--	10.8	--	ns
DisCharge Time	t _B		--	11.4	--	ns

Typical Characteristics Curves ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Figure 1. Output Characteristic ($T_J = -55^\circ\text{C}$)

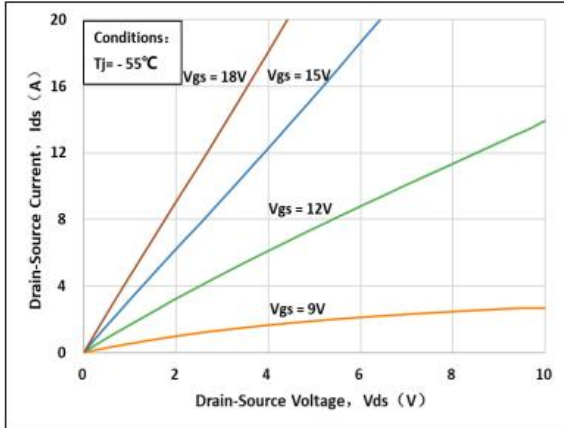


Figure 2. Output Characteristic ($T_J = 25^\circ\text{C}$)

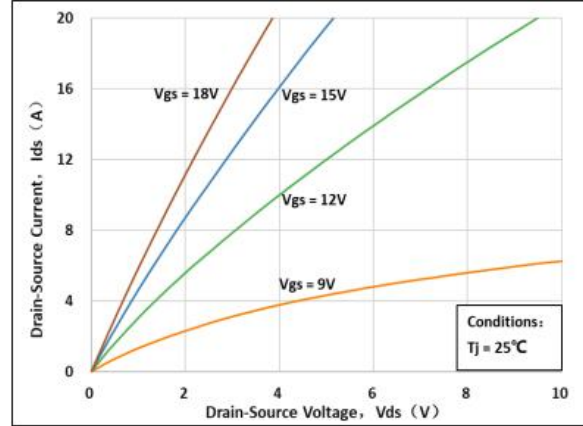


Figure 3. Output Characteristic ($T_J = 175^\circ\text{C}$)

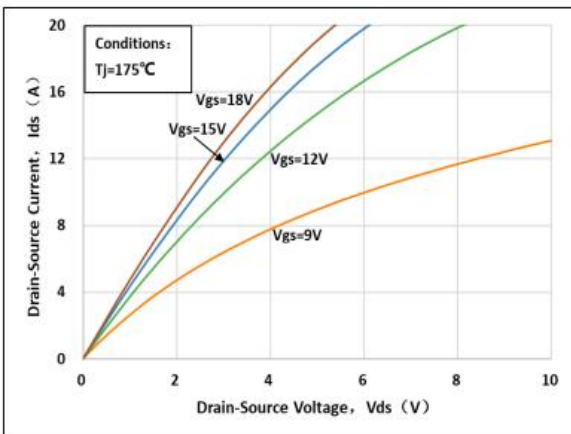


Figure 4. $R_{DS(on)}$ Vs I_{DS} Characteristic

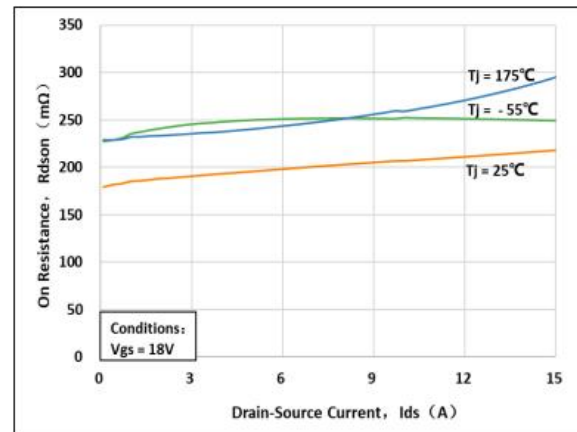


Figure 5. $R_{DS(on)}$ vs. Temperature

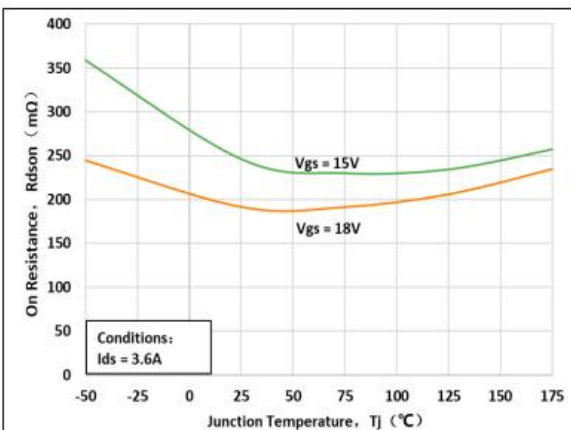
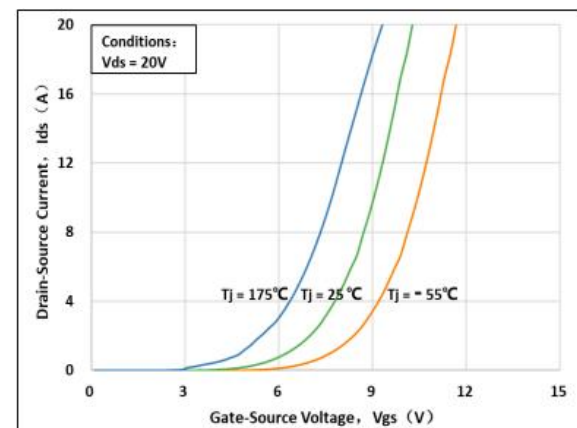


Figure 6. Transfer Characteristic



Typical Characteristics Curves ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Figure 7: Body-diode Characteristic ($T_J = -55^\circ\text{C}$)

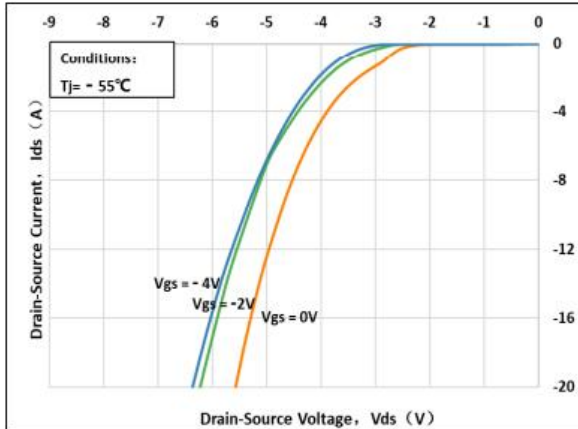


Figure 8: Body-diode Characteristic ($T_J = 25^\circ\text{C}$)

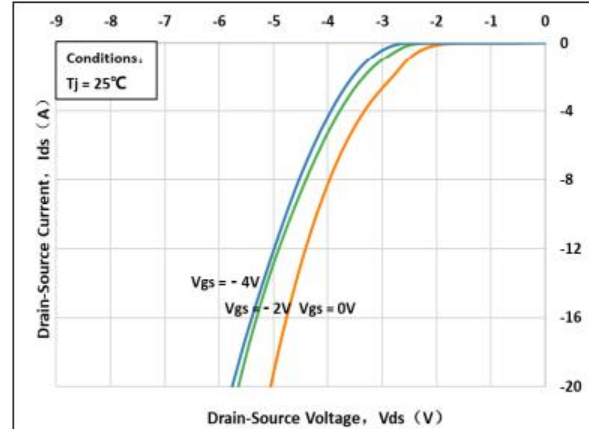


Figure 9: Body-diode Characteristic ($T_J = 175^\circ\text{C}$)

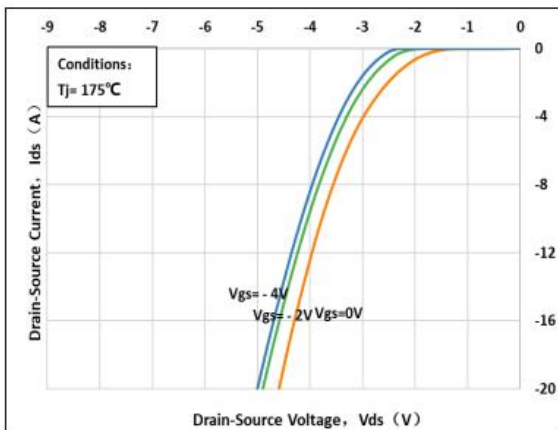


Figure 10: V_{TH} Vs T_J Temperature Characteristic

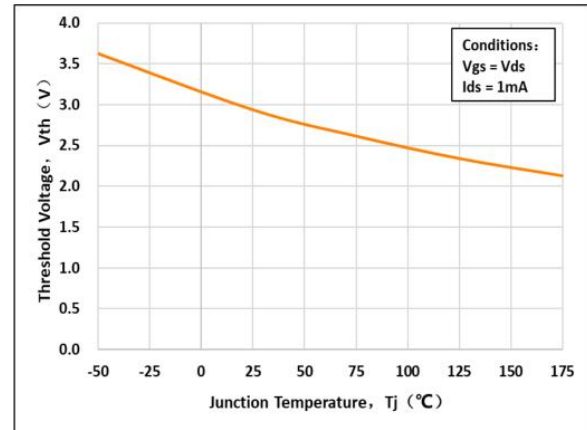


Figure 11: 3rd Quadrant Characteristic ($T_J = -55^\circ\text{C}$)

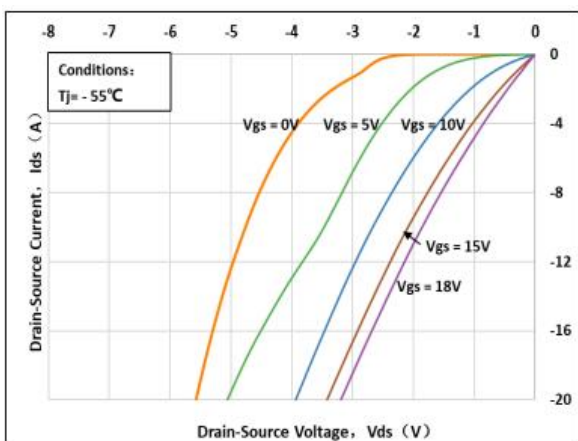
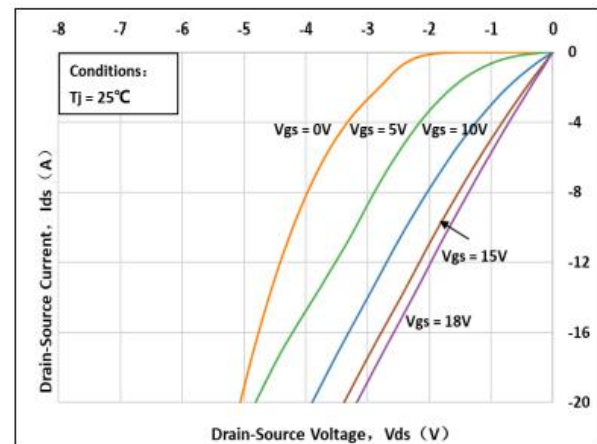


Figure 12: 3rd Quadrant Characteristic ($T_J = 25^\circ\text{C}$)



Typical Characteristics Curves ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Figure 13: 3rd Quadrant Characteristic($T_J=175^\circ\text{C}$)

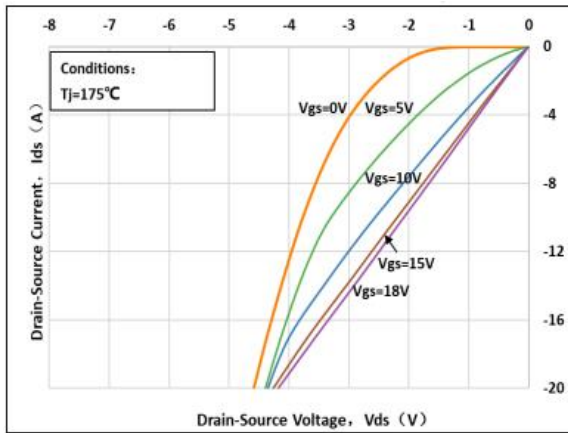


Figure 14: Gate Charge Characteristics

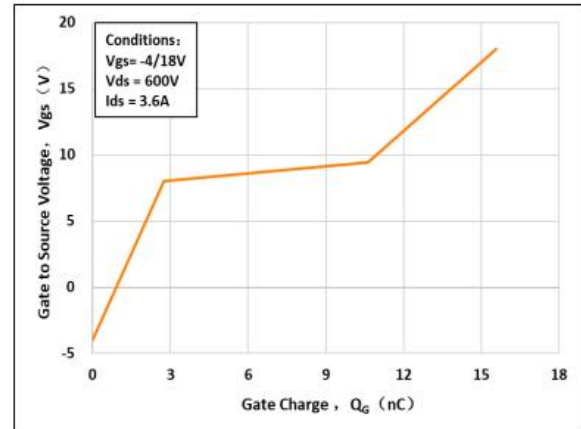


Figure 15: Drain Current vs. Case Temperature

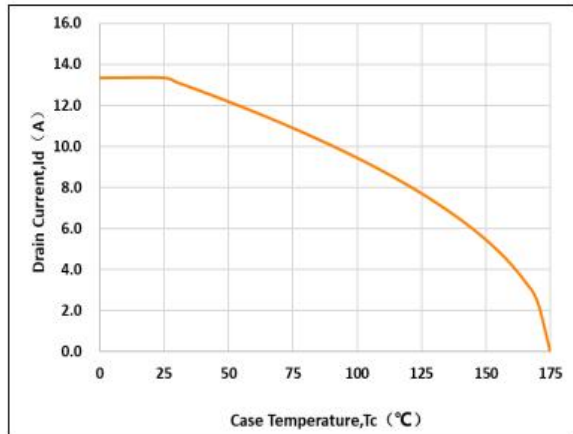


Figure 16: Safe Operating Area

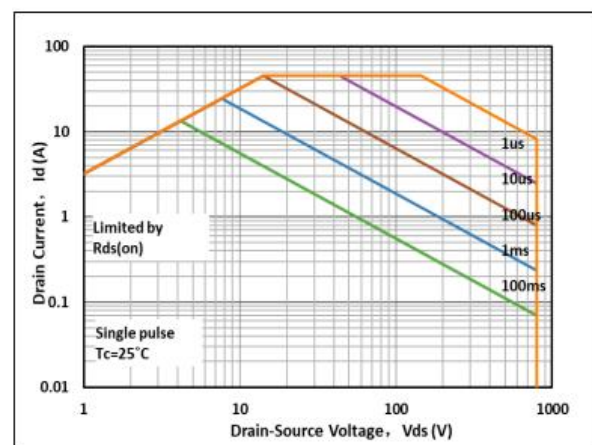


Figure 17: Capacitance Characteristics

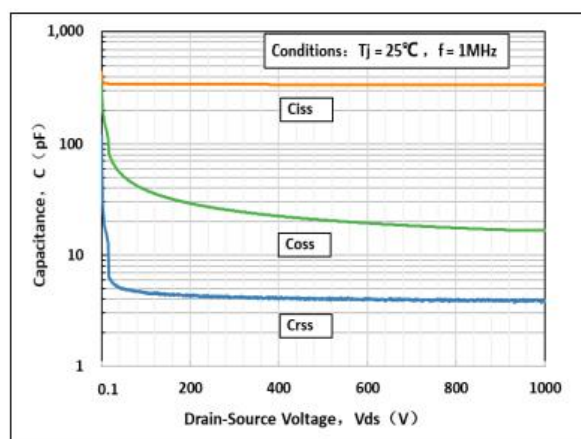
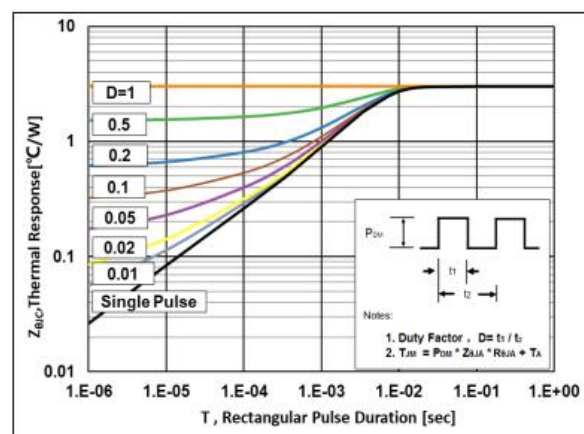
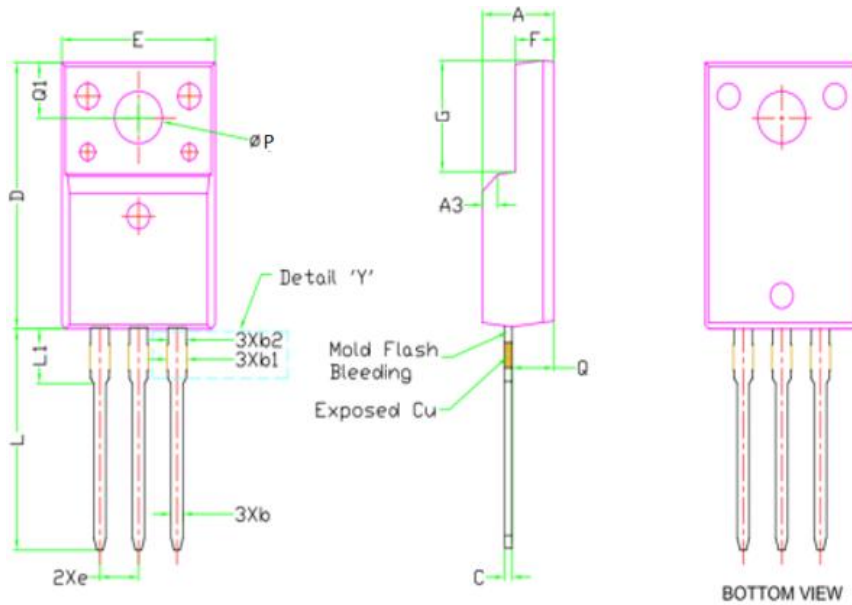


Figure 18: Transient Thermal Impedance



Package Outline Dimensions (Unit: millimeters)

TO-220F



SYMBOL	DIMENSIONS		
	Min.	Nom.	Max.
A	4,60	4,70	4,80
b	0,70	0,80	0,91
b1	1,20	1,30	1,47
b2	1,10	1,20	1,30
C	0,45	0,50	0,63
D	15,80	15,87	15,97
e	2,54		
E	10,00	10,10	10,30
F	2,44	2,54	2,64
G	6,50	6,70	6,90
L	12,90	13,10	13,30
L1	3,13	3,23	3,33
Q	2,65	2,75	2,85
Q1	3,20	3,30	3,40
ϕP	3,08	3,18	3,28

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