

N-Channel 1500V (D-S) SiC MOSFET

Features

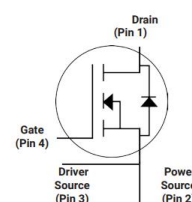
- Wide bandgap SiC MOSFET technology
- Low On-Resistance with High Blocking Voltage
- Low Capacitances with High-Speed switching
- Low reverse recovery(Qrr)
- Halogen free, RoHs compliant



TO-247-4L

Applications

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



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

Parameter		Symbol	Ratings	Unit
Drain Source Voltage		V _{DS}	1500	V
Gate Source Voltage		V _{GS}	-8/+22	V
Recommend Gate Source Voltage		V _{GSop}	-4/+18	V
Drain Current Continuous V _{GS} =18V	T _C =25°C	I _D	97	A
	T _C =125°C		56	
Power Dissipation	T _C =25°C	P _D	556	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}	0.27	$^{\circ}\text{C/W}$
Thermal Resistance Junction to Ambient	R_{thJA}	40	$^{\circ}\text{C/W}$

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	1500	--	--	V
Gate Leakage Current	I _{GSS}	V _{GS} =18V, V _{DS} =0V	--	--	100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =1500V, V _{GS} =0V	--	1	5	μA
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =15mA	2	2.8	4	V
		V _{DS} =V _{GS} , I _D =15mA, T _J =175°C	--	1.9	--	
Drain-Source On-state Resistance	R _{DS(on)}	V _{GS} =18V, I _D =50A	--	20	27	mΩ
		V _{GS} =18V, I _D =50A, T _J =175°C	--	40	--	
Drain-Source On-state Resistance	R _{DS(on)}	V _{GS} =15V, I _D =50A	--	24	35	mΩ
		V _{GS} =15V, I _D =50A, T _J =175°C	--	43	--	
Total Gate Charge	Q _g	V _{GS(off)} =-4V, V _{GS(on)} =18V V _{DD} =1000V, I _D =50A	--	175	--	nC
Gate Source Charge	Q _{gs}		--	39.2	--	
Gate Drain Charge	Q _{gd}		--	23.2	--	
Turn-On Switching Energy	E _{ON}	V _{GS} =-4/+18V, V _{DD} =1000V · I _D =50A, R _G =5Ω, L=100uH	--	0.76	--	mJ
Turn-Off Switching Energy	E _{OFF}		--	0.35	--	
Turn-on Delay Time	t _{d(on)}		--	20.2	--	ns
Turn-on Rise Time	t _r		--	12.8	--	
Turn-off Delay Time	t _{d(off)}		--	57.6	--	
Turn-off Fall Time	t _f		--	18.8	--	
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =1200V, V _{AC} =25mV, f=1MHz	--	4983	--	pF
Output Capacitance	C _{oss}		--	140	--	
Reverse Transfer Capacitance	C _{rss}		--	9.3	--	
Gate resistance	R _G	V _{AC} = 25mV, f=1MHz	--	2.3	--	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} =30A, V _{GS} =-4V	--	4.2	--	V
		I _{SD} =30A, V _{GS} =-4V, T _J =175°C	--	3.8	--	
Continuous Diode Forward Current	I _{SD}	V _{GS} =-4V	--	97	--	A
Reverse Recovery Time	t _{rr}	V _R =1000V, I _F =50A, V _{GS} =-4V, di/dt=1000A/μs	--	25.2	--	ns
Reverse Recovery Charge	Q _{rr}		--	170	--	nC
Reverse Recovery Energy	E _{REC}		--	20	--	uJ
Peak Reverse Recovery Current	I _{rrm}		--	11.9	--	A
Charge Time	t _A		--	13.6	--	ns
DisCharge Time	t _B		--	11.6	--	ns
Reverse Recovery Time	t _{rr}	V _R =1000V, I _F =50A, V _{GS} =-4V, di/dt=1000A/μs T _J =175°C	--	81.2	--	ns
Reverse Recovery Charge	Q _{rr}		--	1230	--	nC
Reverse Recovery Energy	E _{REC}		--	38	--	μJ
Peak Reverse Recovery Current	I _{rrm}		--	23.6	--	A
Charge Time	t _A		--	32	--	ns
DisCharge Time	t _B		--	49.2	--	ns

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

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

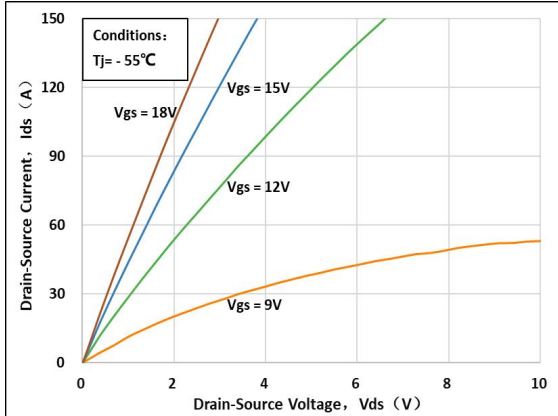


Figure 2. Output Characteristic ($T_J = 25^\circ\text{C}$)

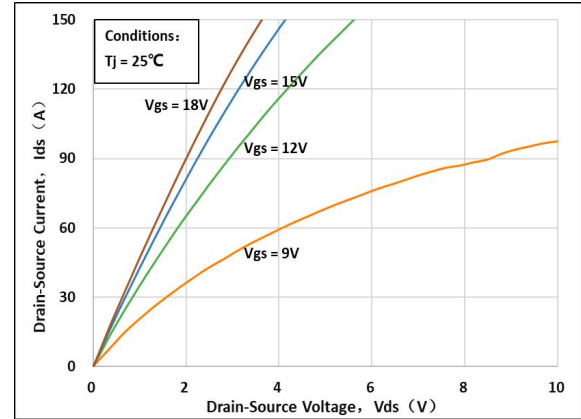


Figure 3. Output Characteristic ($T_J = 175^\circ\text{C}$)

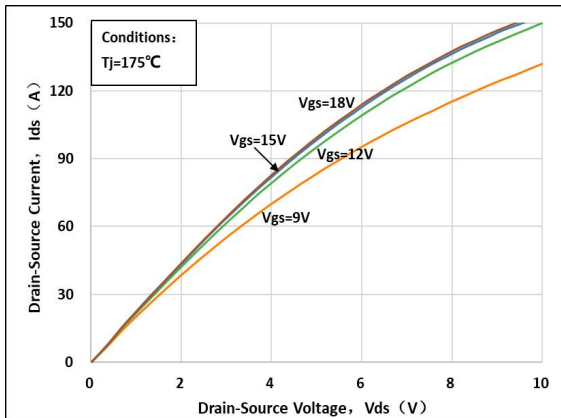


Figure 4. $R_{DS(on)}$ Vs I_{DS} Characteristic

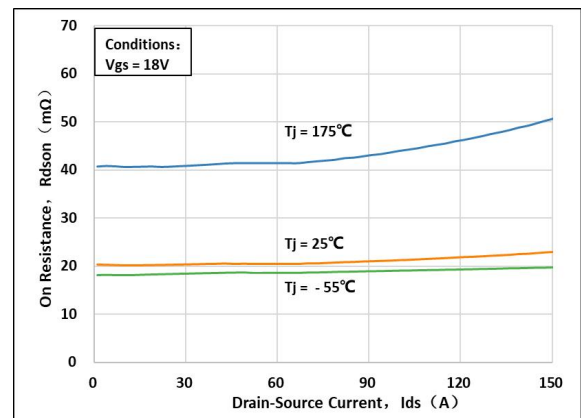


Figure 5. $R_{DS(on)}$ vs. Temperature

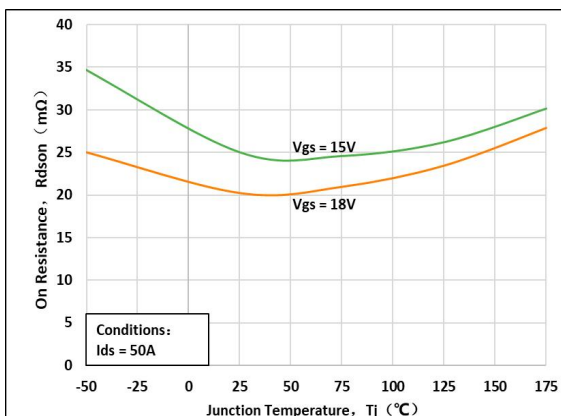
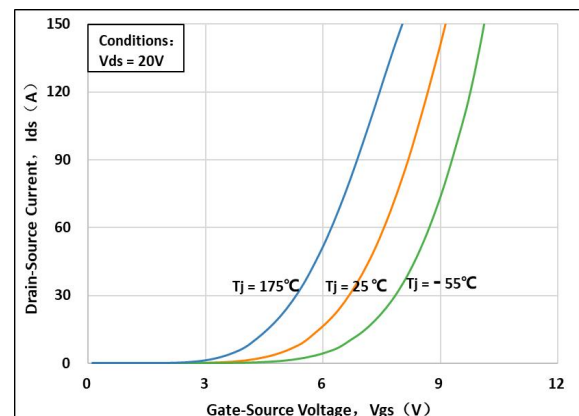


Figure 6. Transfer Characteristic



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

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

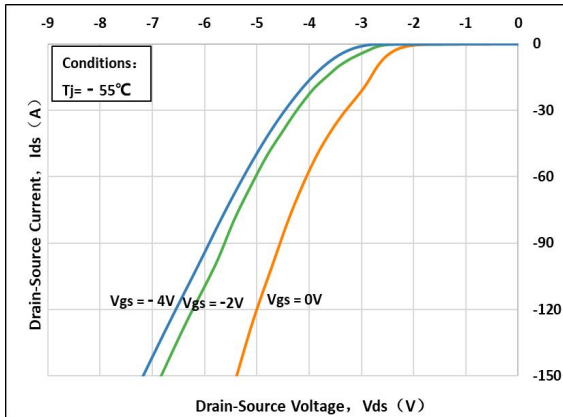


Figure 8: Body-diode Characteristic ($T_J = 25^\circ\text{C}$)

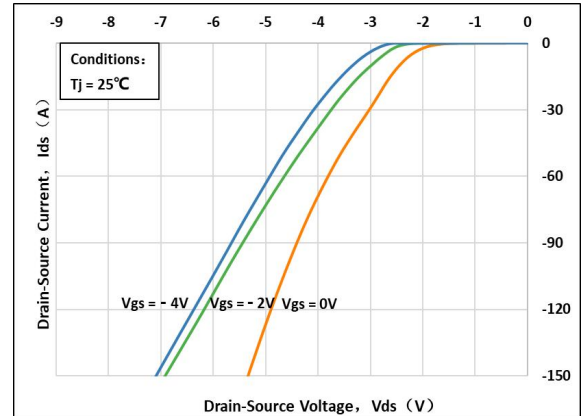


Figure 9: Body-diode Characteristic ($T_J = 175^\circ\text{C}$)

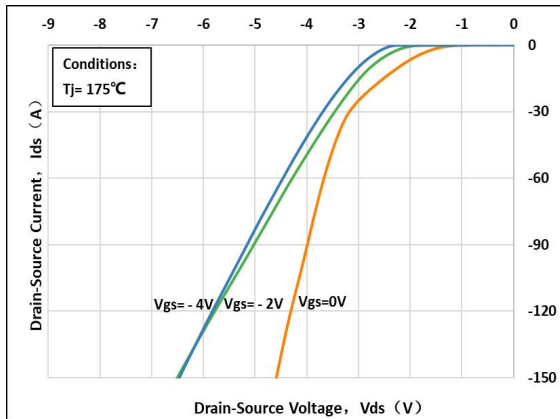


Figure 10: V_{TH} Vs T_J Temperature Characteristic

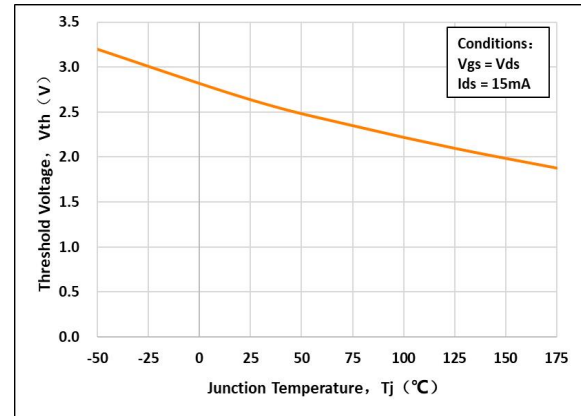


Figure 11: 3rd Quadrant Characteristic ($T_J = -55^\circ\text{C}$)

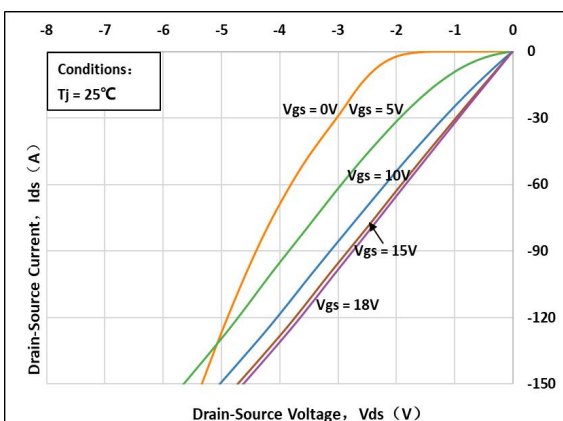
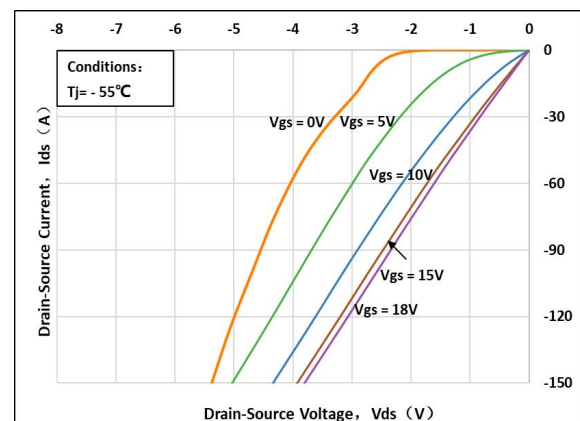


Figure 12: 3rd Quadrant Characteristic ($T_J = 25^\circ\text{C}$)



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

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

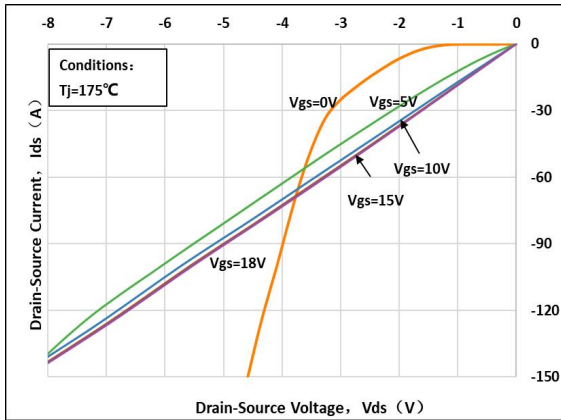


Figure 14: Gate Charge Characteristics

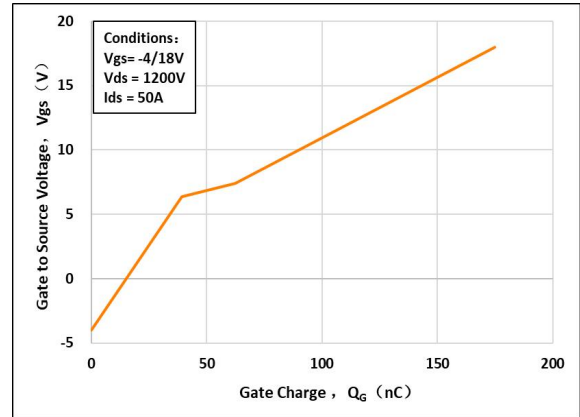


Figure 15: Drain Current vs. Case Temperature

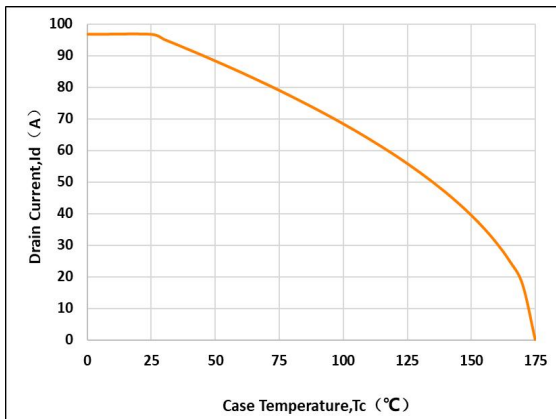


Figure 16: Safe Operating Area

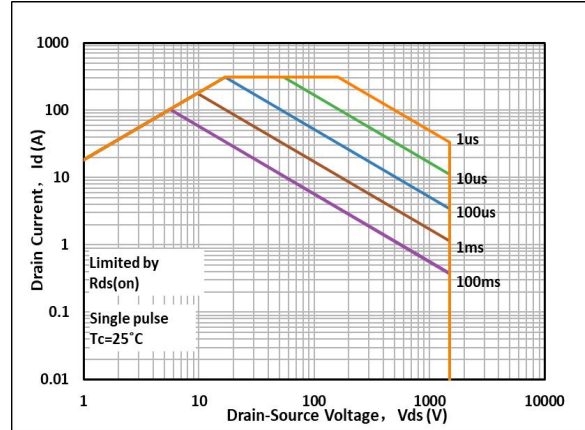


Figure 17: Capacitance Characteristics

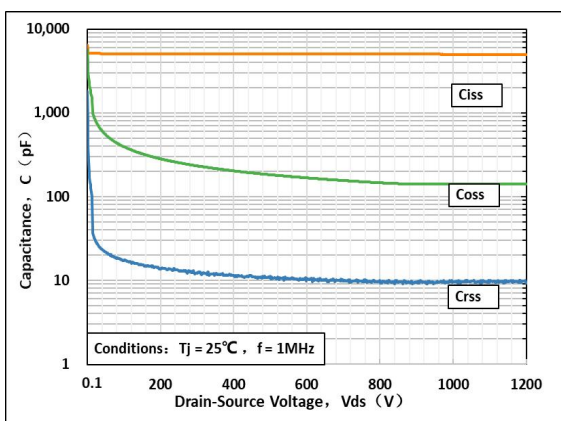
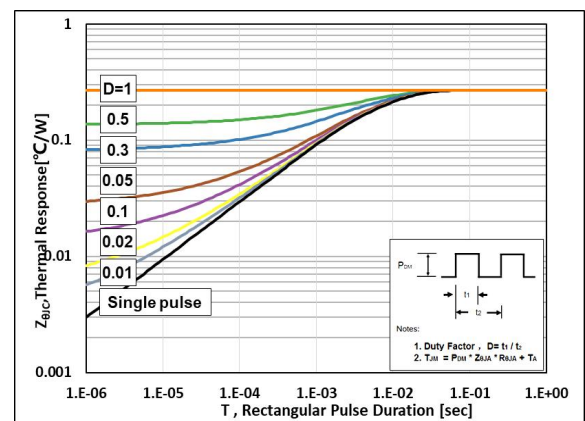
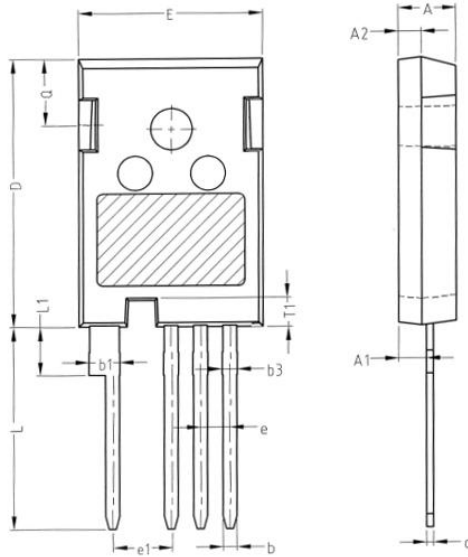


Figure 18: Transient Thermal Impedance



Package Outline Dimensions (Unit: millimeters)

TO-247-4L



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.80	2.00	2.20
b	1.06	1.21	1.36
b1	2.33	2.63	2.93
b3	1.07	1.30	1.60
c	0.51	0.61	0.75
D	23.30	23.45	23.60
D1	16.25	16.55	16.85
E	15.74	15.94	16.14
E1	13.72	14.02	14.32
T1	2.35	2.50	2.65
e	2.54 BSC		
e1	5.08 BSC		
Q	5.49	5.79	6.09
L	17.27	17.57	17.87
L1	3.99	4.19	4.39
ΦP	3.40	3.60	3.80
$\Phi P1$	7.19 REF		

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