

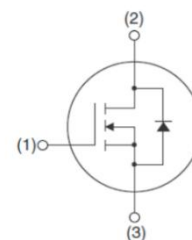
N-Channel 650V (D-S) SiC MOSFET

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-247-3L



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}	650	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	37	A
	T _C =125°C	26	
Power Dissipation	T _C =25°C	183	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}	0.82	°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 =250μA	650	--	--	V
Gate Leakage Current	I _{GSS}	V _{GS} =18V, V _{DS} =0V	--	--	250	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =650V, V _{GS} =0V	--	1	100	μA
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _{DS} =3.6mA	2	2.8	4	V
		V _{DS} =V _{GS} , I _{DS} =3.6mA, T _J =175°C	--	2	--	
Drain-Source On-state Resistance	R _{DS(on)}	V _{GS} =18V, I _D =13.2A	--	60	80	mΩ
		V _{GS} =18V, I _D =13.2A, T _J =175°C	--	73	--	
Drain-Source On-state Resistance	R _{DS(on)}	V _{GS} =15V, I _D =13.2A	--	75	90	mΩ
		V _{GS} =15V, I _D =13.2A, T _J =175°C	--	82	--	
Total Gate Charge	Q _g	V _{GS(off)} =-4V, V _{GS(on)} =18V V _{DD} =400V, I _D =13.2A	--	48.9	--	nC
Gate Source Charge	Q _{gs}		--	11.6	--	
Gate Drain Charge	Q _{gd}		--	20.6	--	
Turn-On Switching Energy	E _{ON}	V _{GS} =-4/+18V, V _{DD} =400V · I _D =13.2A, R _G =5Ω, L=100uH	--	42.4	--	mJ
Turn-Off Switching Energy	E _{OFF}		--	16.5	--	
Turn-on Delay Time	t _{d(on)}		--	9.3	--	ns
Turn-on Rise Time	t _r		--	3.2	--	
Turn-off Delay Time	t _{d(off)}		--	15.7	--	
Turn-off Fall Time	t _f		--	7.4	--	
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =650V, V _{AC} =25mV, f=1MHz	--	1039	--	pF
Output Capacitance	C _{oss}		--	90	--	
Reverse Transfer Capacitance	C _{rss}		--	11	--	
Gate resistance	R _G	V _{AC} = 25mV, f=1MHz	--	0.9	--	Ω

Reverse Diode Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_{SD}	$I_{SD}=6.6\text{A}$, $V_{GS}=-4\text{V}$	--	3.7	--	V
		$I_{SD}=6.6\text{A}$, $V_{GS}=-4\text{V}$, $T_J=175^{\circ}\text{C}$	--	3.5	--	
Continuous Diode Forward Current	I_{SD}	$V_{GS}=-4\text{V}$	--	35	--	A
Reverse Recovery Time	t_{rr}	$V_R=400\text{V}$, $I_F=13.2\text{A}$, $V_{GS}=-4\text{V}$, $di/dt=1000\text{A}/\mu\text{s}$	--	17.6	--	ns
Reverse Recovery Charge	Q_{rr}		--	82	--	nC

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

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

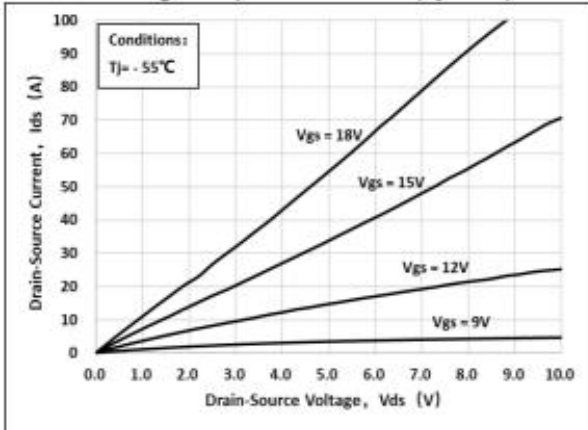


Figure 2. Output Characteristic ($T_J = 25^\circ\text{C}$)

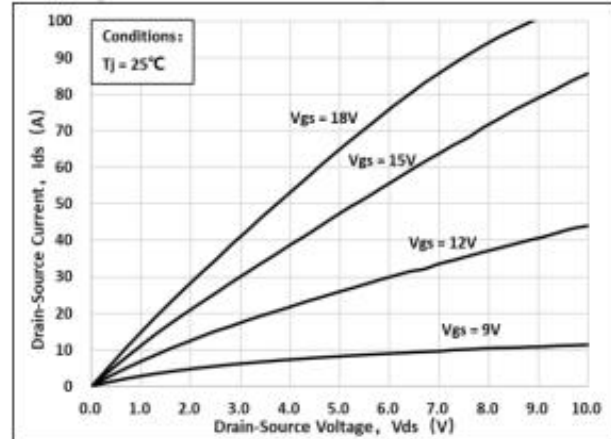


Figure 3. Output Characteristic ($T_J = 175^\circ\text{C}$)

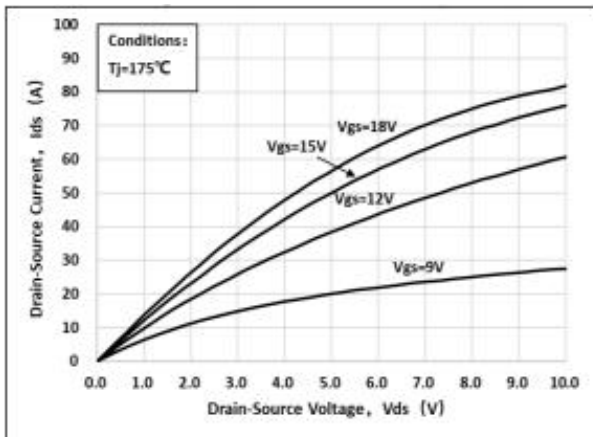


Figure 4. $R_{DS(on)}$ Vs I_{DS} Characteristic

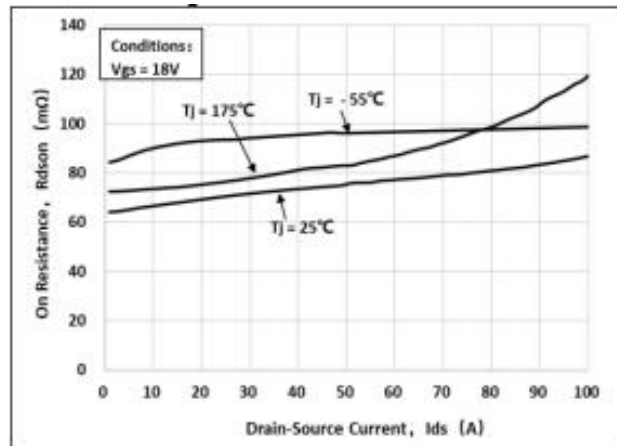


Figure 5. $R_{DS(on)}$ vs. Temperature

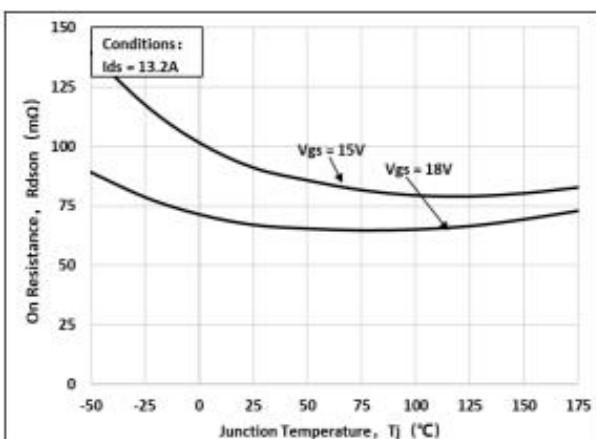
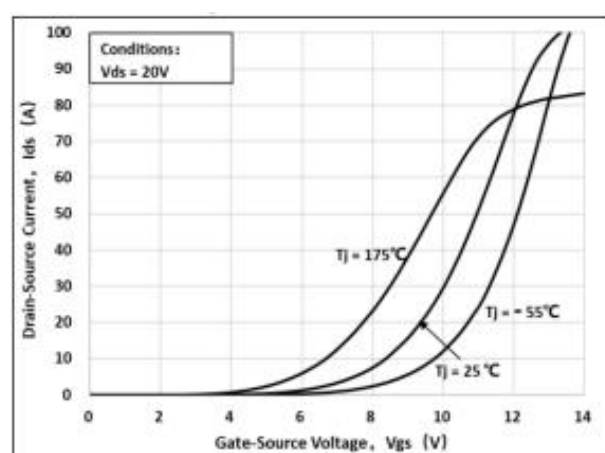


Figure 6. Transfer Characteristic



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

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

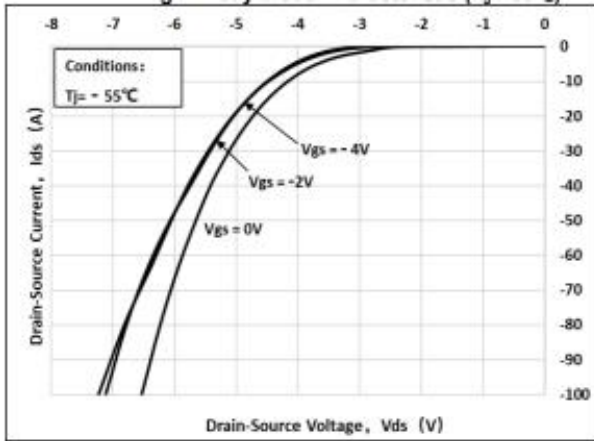


Figure 8: Body-diode Characteristic ($T_J = 25^\circ\text{C}$)

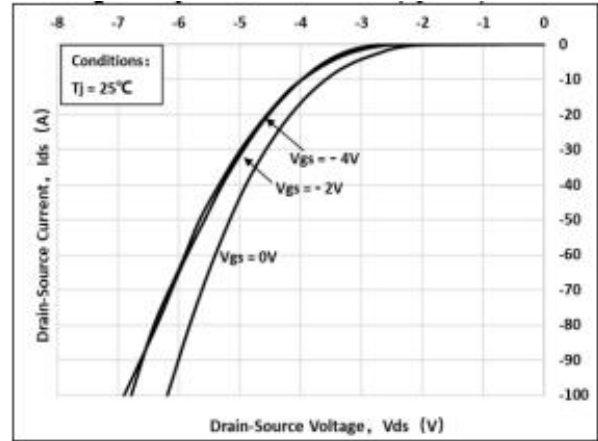


Figure 9: Body-diode Characteristic ($T_J = 175^\circ\text{C}$)

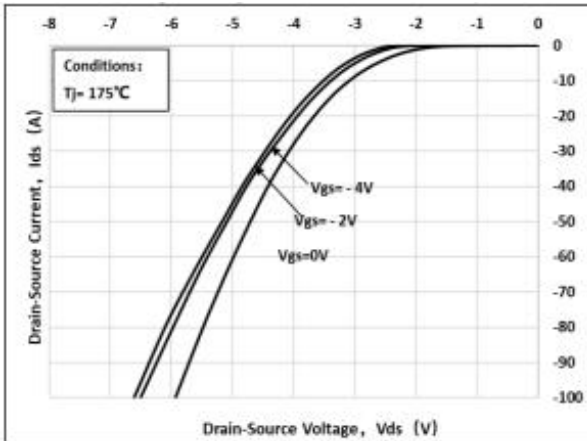


Figure 10: V_{TH} Vs T_J Temperature Characteristic

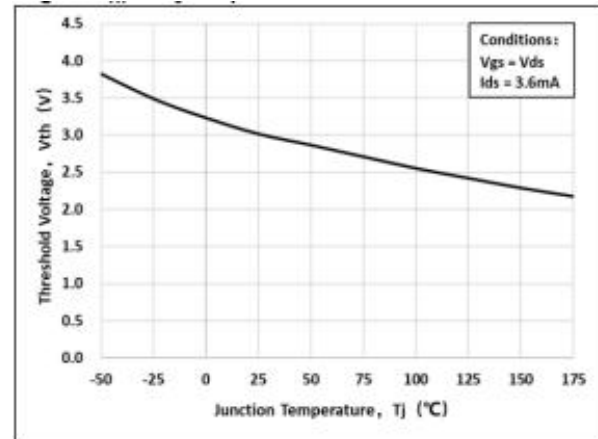


Figure 11: 3rd Quadrant Characteristic ($T_J = -55^\circ\text{C}$)

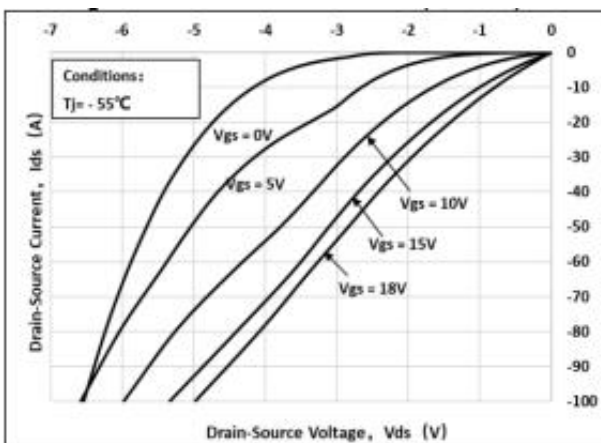
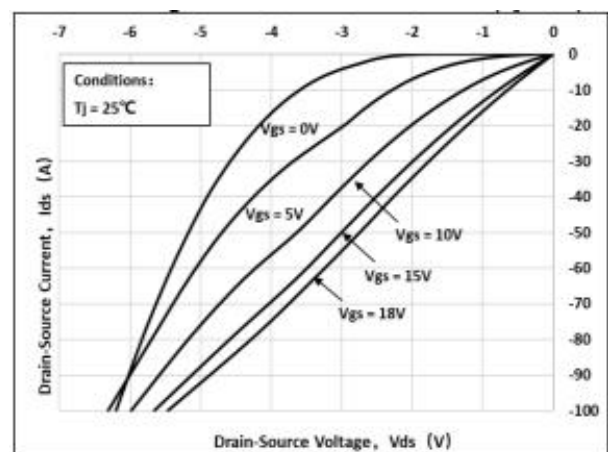


Figure 12: 3rd Quadrant Characteristic ($T_J = 25^\circ\text{C}$)



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

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

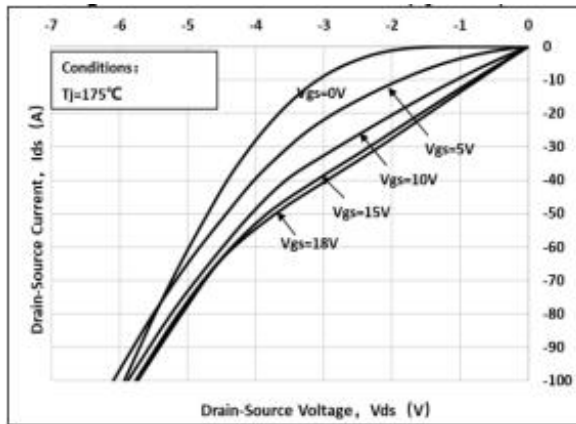


Figure 14: Gate Charge Characteristics

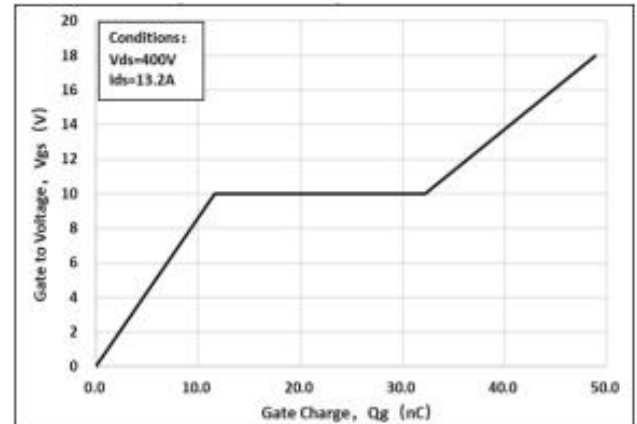


Figure 15: Safe Operating Area

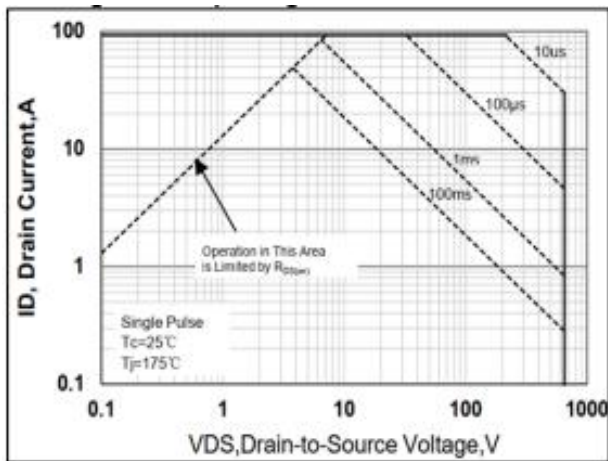


Figure 16: Capacitance Characteristics

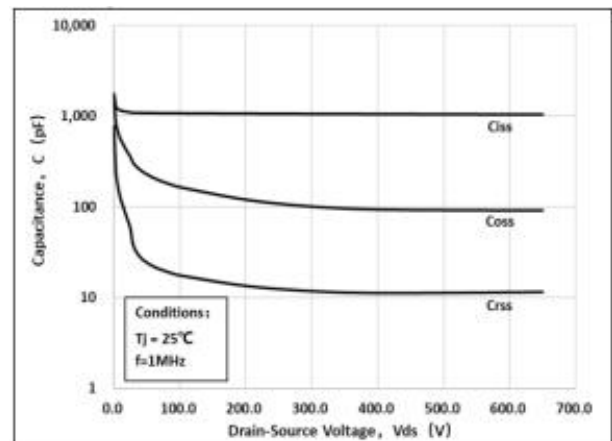
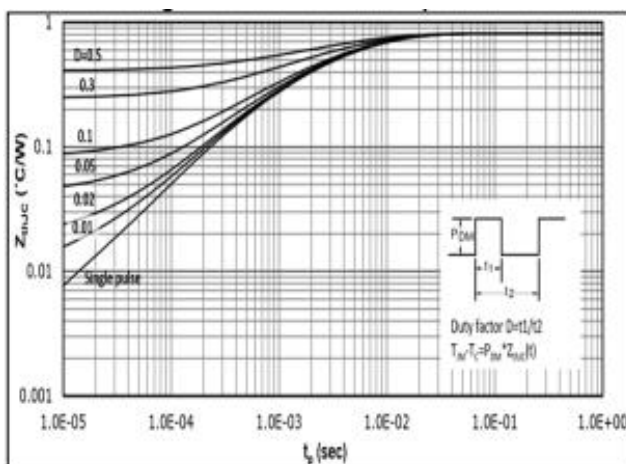
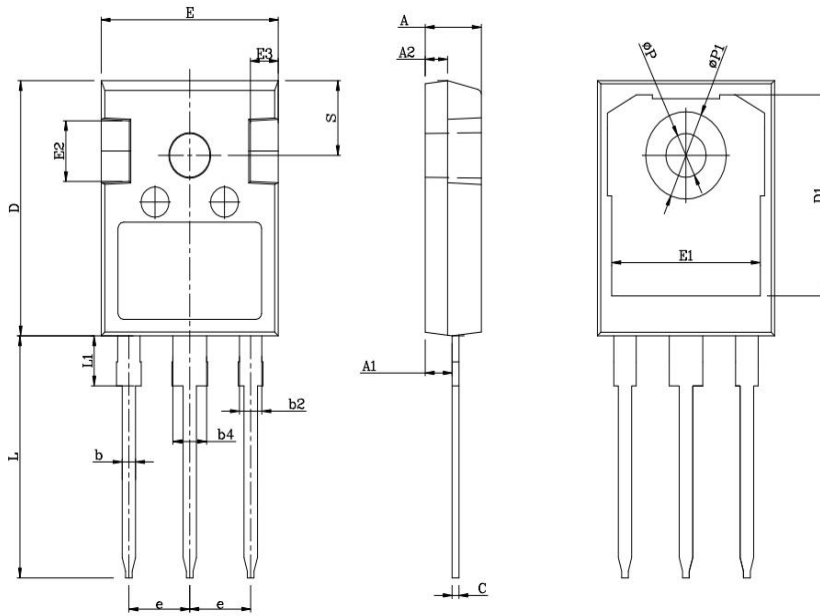


Figure 17: Transient Thermal Impedance



Package Outline Dimensions (Unit: millimeters)

TO-247-3L



COMMON DIMENSIONS

SYMBOL	mm		
	Min	Nom	Max
A	4.80	5.00	5.20
A1	2.23	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.80	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.26	13.56
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.82	19.92	20.22
L1	3.94	4.12	4.30
ØP	3.66	3.68	3.75
ØP1	7.08	7.19	7.30
S	6.15BSC		

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