

# Silicon Carbide MOSFET

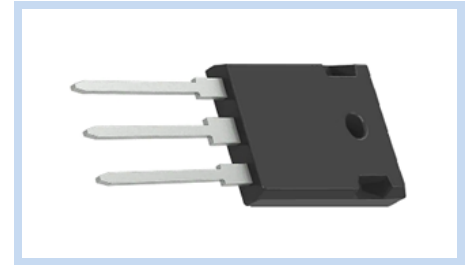
## N-Channel 1200V 90A TO-247

MFTC120N90T247

MERITEK

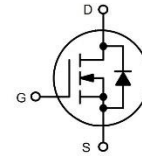
### FEATURE

- $R_{DS(ON)} < 42m\Omega$  at  $V_{GS}=18V, I_D=40A$
- Low On-Resistance with High Blocking Voltage
- Low Capacitances with High-Speed Switching
- Low Reverse Recovery
- Applications: High Voltage DC/DC Converters, Switching Mode Power Supplier, Renewable Energy, Motor Drivers



### MECHANICAL DATA

- Case: TO-247 Package
- Terminals: Solderable per MIL-STD-750, Method 2026



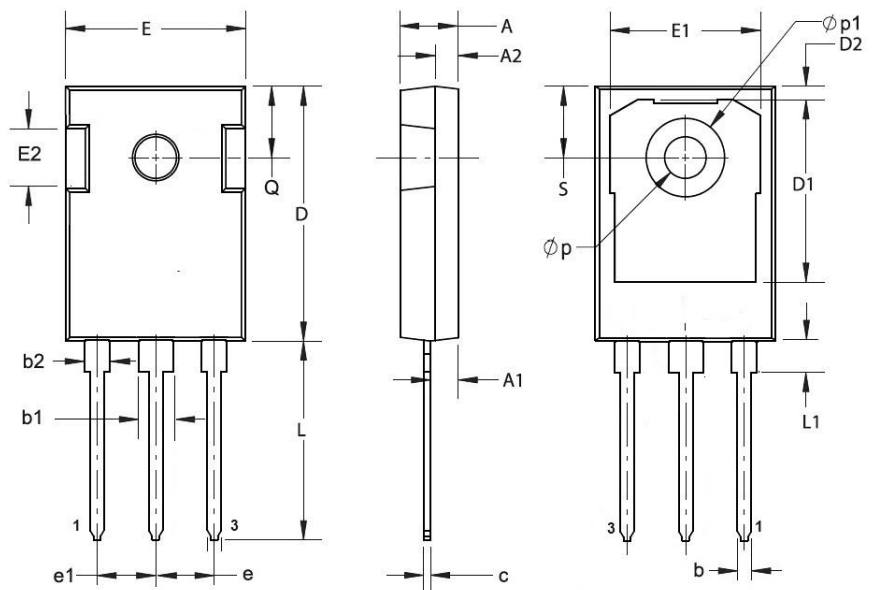
### MAXIMUM RATINGS

Parameter	Symbol	Value	Unit	
Drain-Source Voltage	$V_{GS}=0V, I_D=100\mu A$	$V_{DS}$	1200	V
Gate-Source Voltage	Dynamic (f >1Hz)	$V_{GS}$	-10/+25	V
	Static		-4/+18	
Drain Current – Continuous	$V_{GS}=18V, T_C=25^\circ C$	$I_D$	90	A
	$V_{GS}=18V, T_C=100^\circ C$		63	
Drain Current – Pulse with $t_p$ Limited by $T_{jmax}$	at 1ms	$I_{DM}$	175	A
	at 100 $\mu s$		426	
Power Dissipation	$P_D$	517	W	
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.29	$^\circ C / W$	
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	$^\circ C$	

### DIMENSIONS

DIMENSION	Min	Max
A	4.80	5.20
A1	2.21	2.59
A2	1.85	2.15
b	1.11	1.36
b1	2.91	3.21
b2	1.91	2.21
c	0.51	0.75
D	20.70	21.30
D1	16.25	16.85
e	5.44 BSC	
e1	5.44 BSC	
E	15.50	16.10
L	19.62	20.22
L1	--	4.30
p	3.40	3.80
p1	--	7.30
Q	6.15 BSC	

Note: Pin Layout: 1:Gate(G), 2:Drain(D), 3:Source(S)



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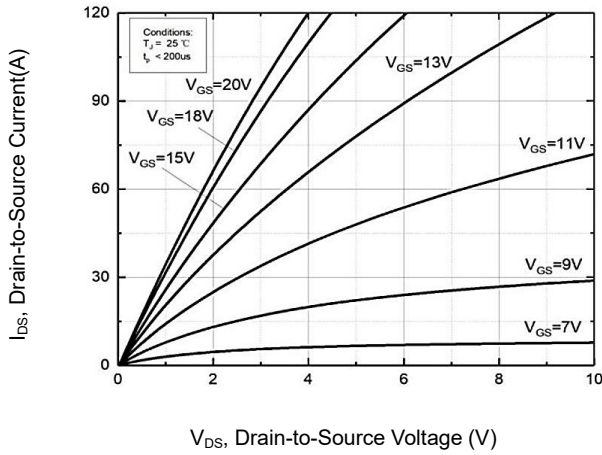
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### ELECTRICAL CHARACTERISTICS

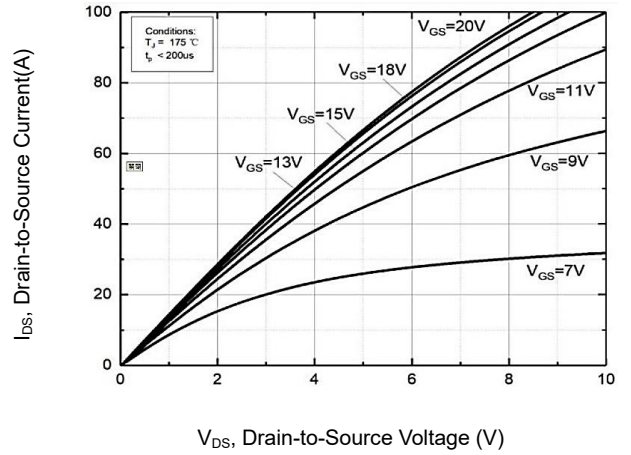
Off Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=100\mu A$	$BV_{DSS}$	1200	--	--	V
Zero Gate Voltage Drain Current	$V_{DS}=1200V, V_{GS}=0V$	$I_{DSS}$	--	1	50	$\mu A$
Gate-Body Leakage Current	$V_{GS}=18V, V_{DS}=0V$	$I_{GSS}$	--	--	250	nA
On Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Static Drain-Source On-Resistance	$V_{GS}=18V, I_D=40A$	$R_{DS(ON)}$	--	28	42	m $\Omega$
	$V_{GS}=20V, I_D=40A$		--	25	--	
	$V_{GS}=18V, I_D=40A, T_J=175^\circ C$		--	50	--	
	$V_{GS}=20V, I_D=40A, T_J=175^\circ C$		--	48	--	
Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=12mA$	$V_{GS(th)}$	--	3	--	V
	$V_{GS}=V_{DS}, I_D=12mA, T_J=175^\circ C$		--	2	--	
Transconductance	$V_{GS}=18V, I_D=40A$	$g_{FS}$	--	38	--	S
	$V_{GS}=18V, I_D=40A, T_J=175^\circ C$		--	24	--	
Dynamic Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Total Gate Charge	$V_{DS}=800V, I_D=40A$ $V_{GS}= -4/+18V$	$Q_g$	--	137	--	nC
Gate-Source Charge		$Q_{gs}$	--	42	--	
Gate-Drain Charge		$Q_{gd}$	--	48	--	
Input Capacitance	$V_{DS}=1000V, V_{GS}=0V$ $V_{AC}=25mV, f=1MHz$	$C_{iss}$	--	3290	--	pF
Output Capacitance		$C_{oss}$	--	124	--	
Reverse Transfer Capacitance		$C_{rss}$	--	7.8	--	
Internal Gate Resistance	$V_{AC}=25mV, f=1MHz$	$R_{G(int)}$	--	1	--	$\Omega$
Drain-Source Body Diode	Conditions	Symbol	Min	Typ.	Max	Unit
Diode Forward Current	$V_{GS}= -4V, T_C=25^\circ C$	$I_S$	--	--	90	A
Diode Forward Current - Pulse with tp Limited by Tjmax	$V_{GS}= -4V$	$I_{S,Pulse}$	--	175	--	A
Drain-Source Diode Forward Voltage	$V_{GS}= -4V, I_{SD}=20A$	$V_{SD}$	--	3.8	--	V
	$V_{GS}= -4V, I_{SD}=20A, T_J=175^\circ C$		--	3.3	--	

### CHARACTERISTIC CURVES

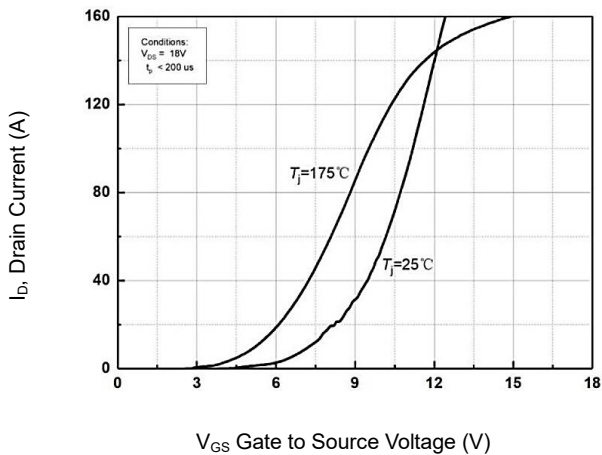
Output Characteristics



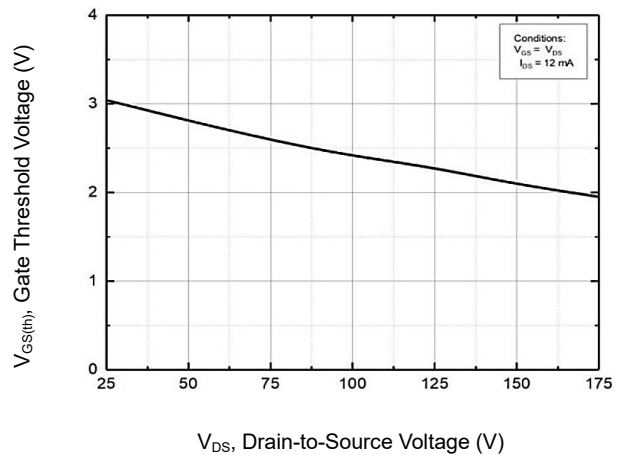
Output Characteristics



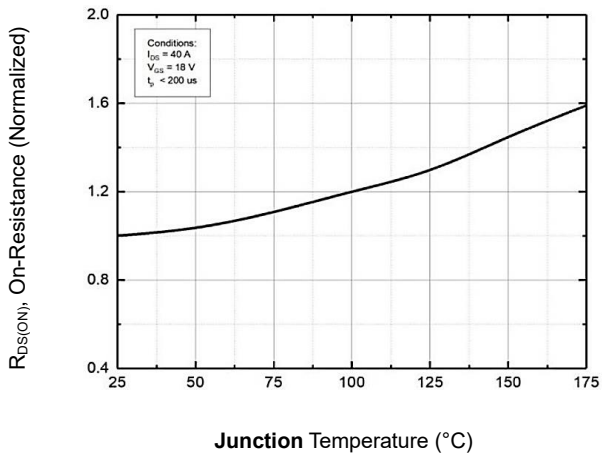
Transfer Characteristic



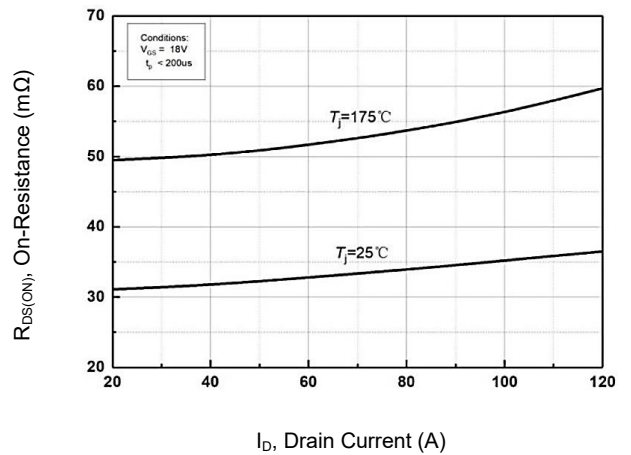
Threshold Voltage vs. Junction temperature



Normalized On-Resistance vs. Junction temperature

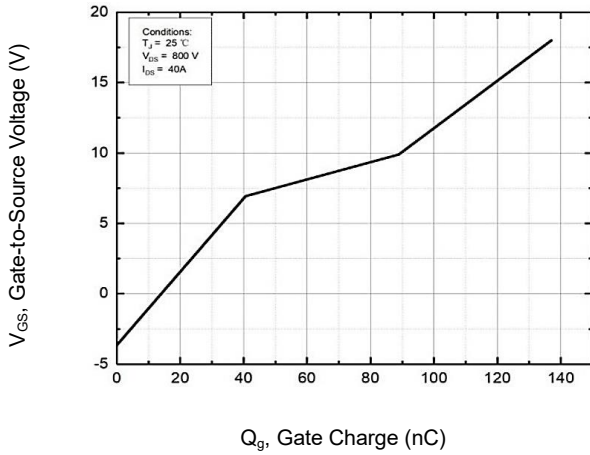


On-Resistance vs. Drain Current

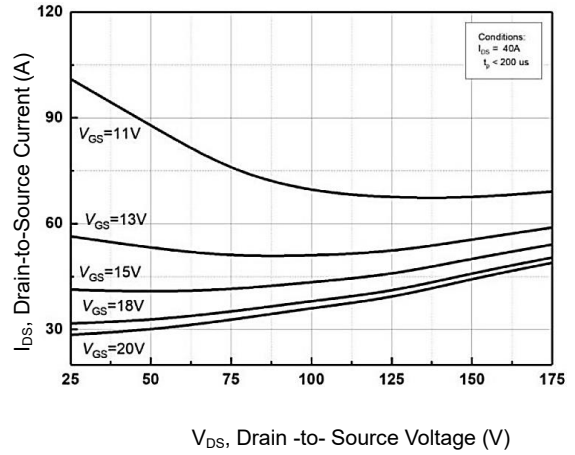


### CHARACTERISTIC CURVES

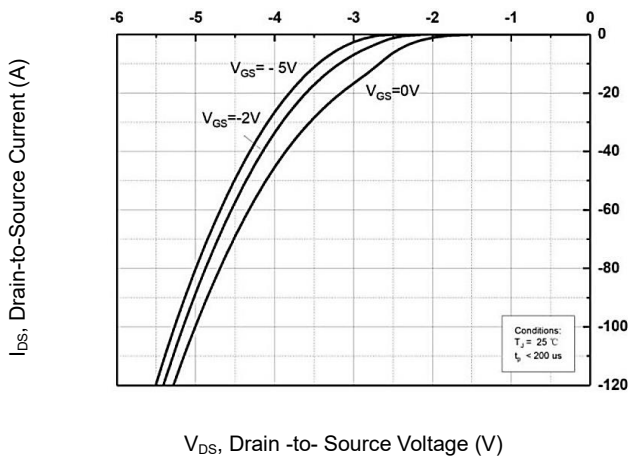
Gate-Charge Characteristics



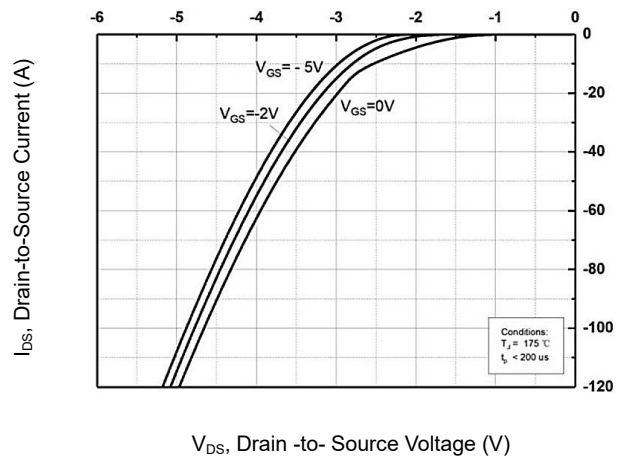
On-Resistance vs. Junction temperature for  $V_{GS}$



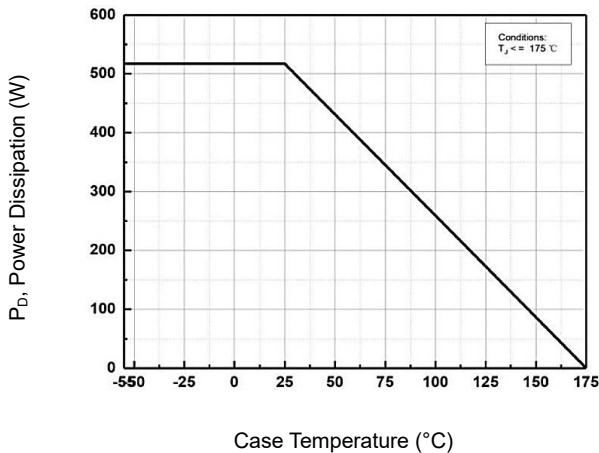
Body Diode Characteristics



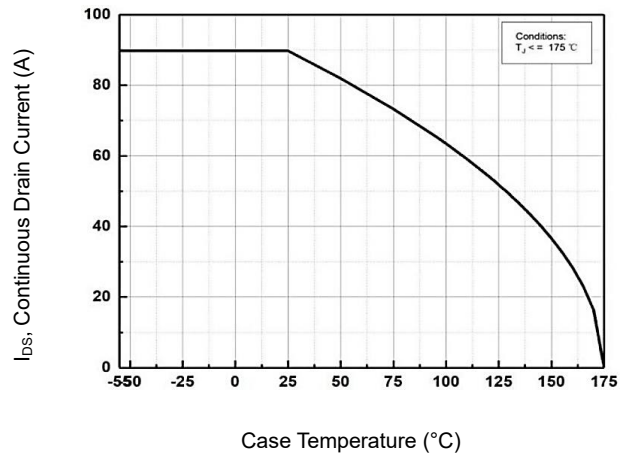
Body Diode Characteristics



Maximum Power Dissipation Derating

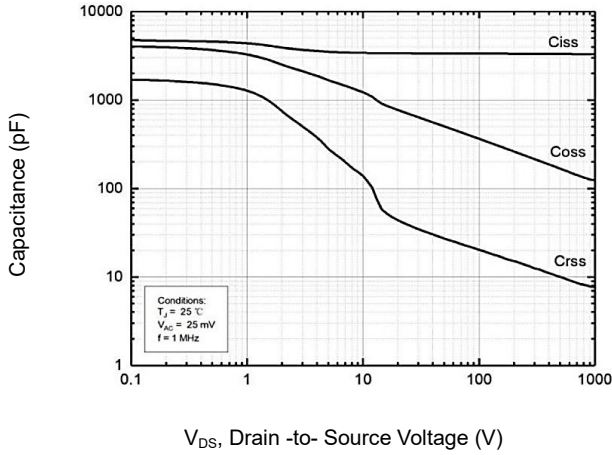


Continuous Drain Current vs. Case Temperature

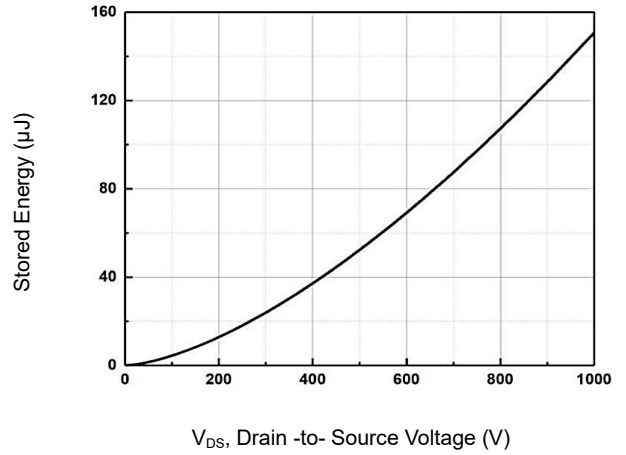


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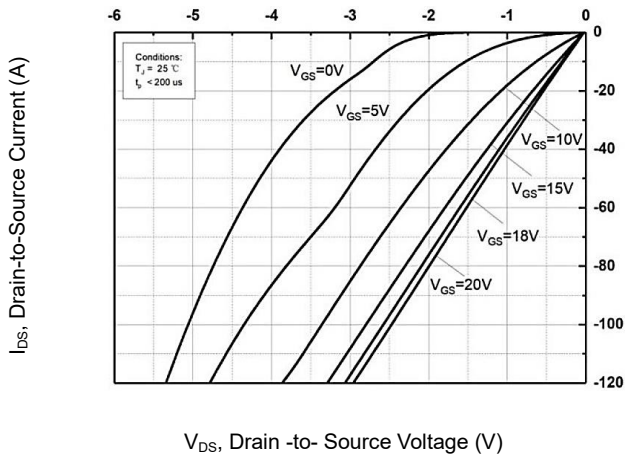
Capacitance vs. Drain-Source Voltage



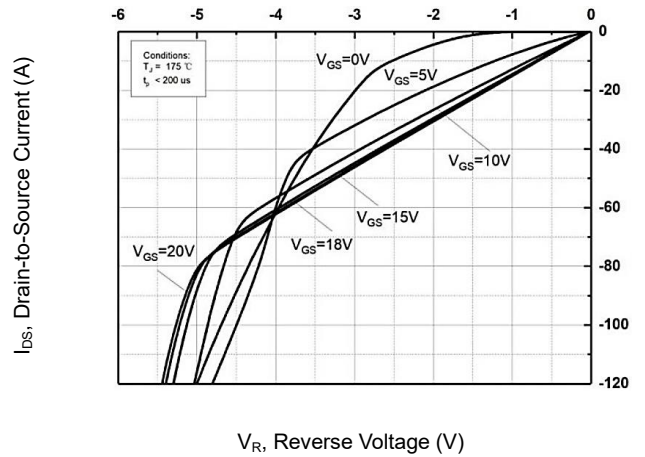
Output Capacitor Stored Energy



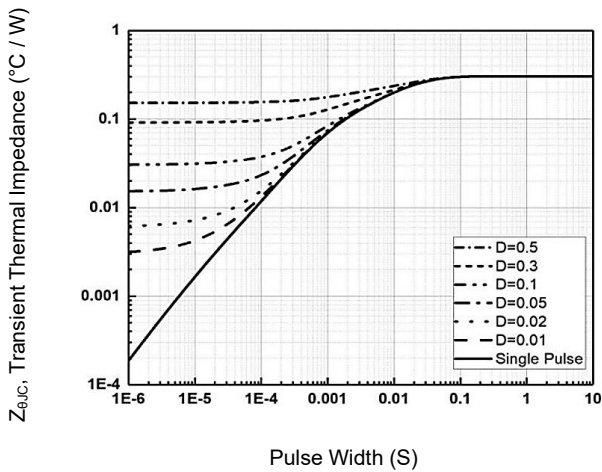
3rd Quadrant Characteristics



3rd Quadrant Characteristics



Transient Thermal Impedance



Safe Operating Area

