

HC032N120B4X

1200V N-Channel Silicon Carbide Power MOSFET

V_{DS}	=	1200 V
$R_{DS(on)}$	=	32 mΩ
I_D	=	91 A

Features

- High blocking voltage with low on-resistance
- High-speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{rr})
- RoHS Compliant

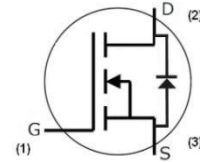
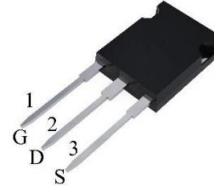
Benefits

- Higher System Efficiency
- Reduce cooling requirements
- Increased power density
- Enabling higher frequency
- Minimize gate ringing
- Reduction of system complexity and cost

Applications

- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Electric Vehicle Charging Stations
- Motor Drives
- Solar Inverters

Package



Part Number	Package	Marking
HC032N120B4X	TO-247-3	HC032N120B4X

Maximum Ratings, at $T_j = 25^\circ\text{C}$, unless otherwise specified

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Breakdown Voltage	1200	V	$V_{GS} = 0\text{ V}$, $I_D = 100\text{ }\mu\text{A}$	
I_D	Continuous Drain Current	91	A	$V_{GS} = 18\text{ V}$, $T_C = 25^\circ\text{C}$	Fig.19
		65	A	$V_{GS} = 18\text{ V}$, $T_C = 100^\circ\text{C}$	
$I_{D(pulse)}$	Pulsed Drain Current, Pulsed width t_p limited by T_{jmax}	211	A	$V_{GS} = 18\text{ V}$, $T_C = 25^\circ\text{C}$	Fig.22
P_D	Power Dissipation	454	W	$T_C = 25^\circ\text{C}$	Fig.20
		227	W	$T_C = 100^\circ\text{C}$	
$V_{GS,op}$	Recommend Gate Source Voltage	-4/+18	V		
V_{GSmax}	Maximum Gate Source Voltage	-10/+22	V	AC ($f > 1\text{ Hz}$)	
T_j, T_{stg}	Operating Junction and Storage Temperature Range	-55 to +175	$^\circ\text{C}$		
T_L	Soldering Temperature	260	$^\circ\text{C}$		

Electrical Characteristics, at $T_J = 25^\circ\text{C}$, unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
Static							
BV_{DS}	Drain-Source Breakdown Voltage	1200	--	--	V	$V_{GS}=0\text{ V}, I_D=100\text{ }\mu\text{A}$	
I_{DSS}	Zero Gate Voltage Drain Current	--	0.1	10	μA	$V_{DS}=1200\text{ V}, V_{GS}=0\text{ V}$	
I_{GSS}	Gate-Source Leakage Current	--	10	50	nA	$V_{GS}=18\text{ V}$	
$V_{GS(th)}$	Gate-Source Threshold Voltage	1.8	2.5	3.8	V	$I_D=10\text{ mA}, V_{GS}=V_{DS}$	Fig. 11
		--	1.8	--		$I_D=10\text{ mA}, V_{GS}=V_{DS}, T_j=175^{\circ}\text{C}$	
g_{fs}	Transconductance	--	25	--	S	$V_{DS}=20\text{ V}, I_{DS}=40\text{ A}$	Fig. 7
		--	27	--		$V_{DS}=20\text{ V}, I_{DS}=40\text{ A}, T_j=175^{\circ}\text{C}$	
$R_{DS(on)}$	Drain-Source On-Resistance	--	32		$\text{m}\Omega$	$V_{GS}=18\text{ V}, I_D=40\text{ A}$	Fig.4,5 ,6
		--	57	--		$V_{GS}=18\text{ V}, I_D=40\text{ A}, T_j=175^{\circ}\text{C}$	
		--	40	--		$V_{GS}=15\text{ V}, I_D=40\text{ A}$	
		--	60	--		$V_{GS}=15\text{ V}, I_D=40\text{ A}, T_j=175^{\circ}\text{C}$	
Dynamic							
C_{iss}	Input Capacitance	--	1855	--	pF	$V_{GS}=0\text{ V}, V_{DS}=1000\text{ V}$ $f=100\text{ KHz}, V_{AC}=25\text{ mV}$	Fig. 17, 18
C_{oss}	Output Capacitance	--	91	--			
C_{rss}	Reverse Transfer Capacitance	--	6.6	--			
E_{oss}	C_{oss} Stored Energy		36		μJ	$V_{GS}=0\text{ V}, V_{DS}=800\text{ V}$ $f=100\text{ KHz}, V_{AC}=25\text{ mV}$	Fig. 16
Q_g	Total Gate Charge	--	88	--	nC	$V_{DS}=800\text{ V}$ $I_D=40\text{ A}$ $V_{GS}=-4/+18\text{ V}$	Fig. 12
Q_{gs}	Gate-Source Charge	--	22	--			
Q_{gd}	Gate-Drain Charge	--	35	--			
$R_{G(int)}$	Internal Gate Resistance	--	0.76	--	Ω	$f=1\text{ MHz}, V_{AC}=25\text{ mV}$	

Body Diode Characteristics, at $T_J = 25^{\circ}\text{C}$, unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
I_S	Continuous Diode Forward Current	--	91	--	A	$V_{GS} = -4\text{ V}$	
$I_{S(\text{pulse})}$	Diode pulse Current	--	--	211	A	$V_{GS} = -4\text{ V}$, Pulsed width t_p limited by $T_{j\text{max}}$	
V_{SD}	Diode Forward Voltage	--	4.0	--	V	$V_{GS} = 0\text{ V}$, $I_S = 20\text{ A}$	Fig. 8, 9, 10

Thermal Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	/	0.33	/	$^{\circ}\text{C/W}$	Fig. 21

Typical Performance

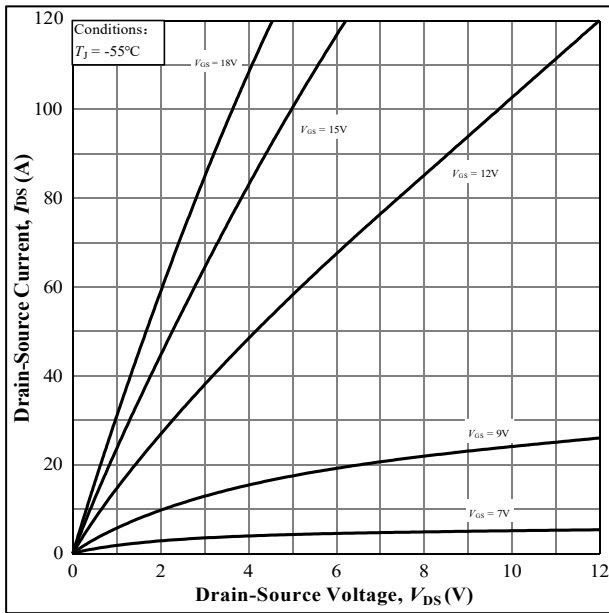


Figure 1: Typical Output Characteristics at $T_j = -55^\circ\text{C}$

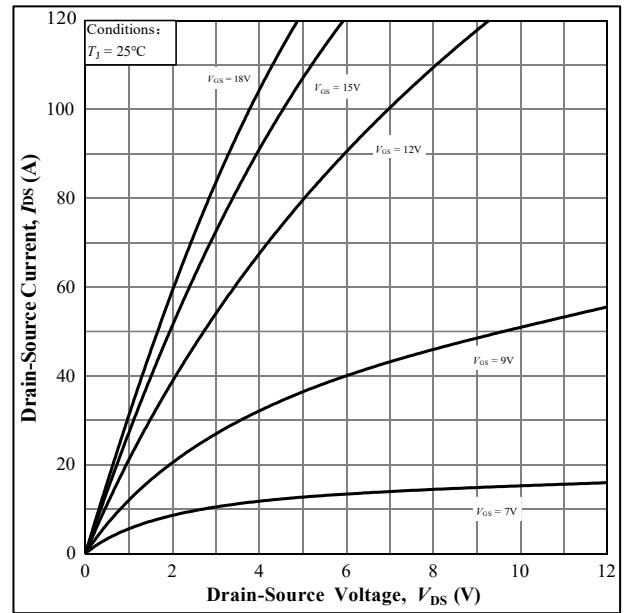


Figure 2: Typical Output Characteristics at $T_j = 25^\circ\text{C}$

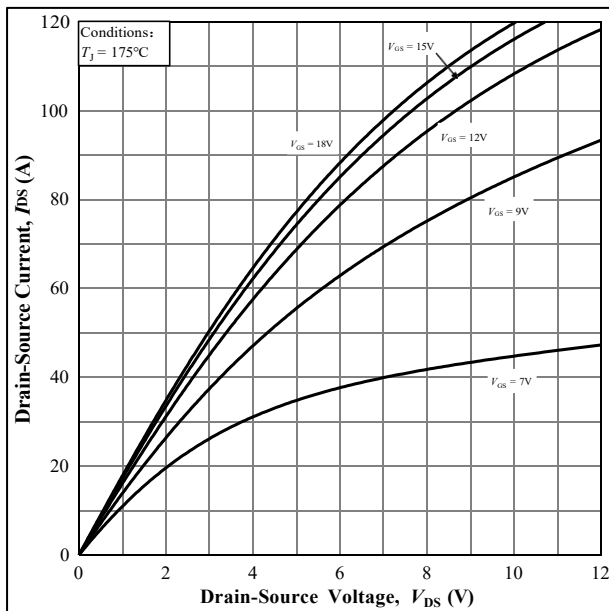


Figure 3: Typical Output Characteristics at $T_j = 175^\circ\text{C}$

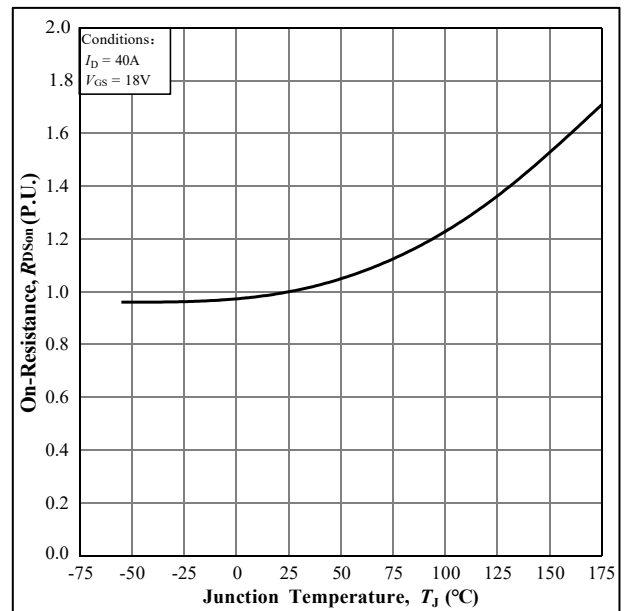


Figure 4: Normalized On-Resistance vs. Temperature

Typical Performance

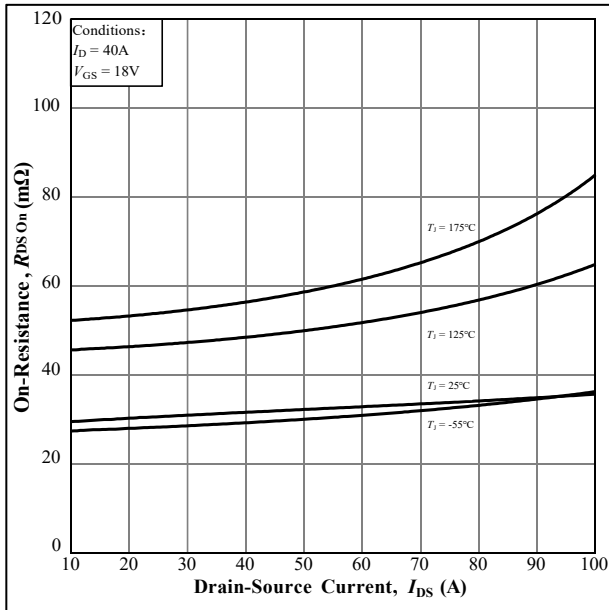


Figure 5: On-Resistance vs. Drain Current For Various Temperature

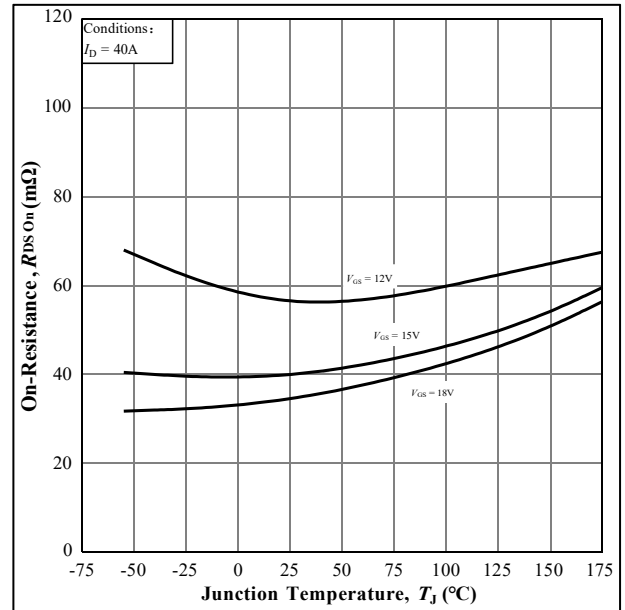


Figure 6: On-Resistance vs. Drain Current For Various Gate Voltage

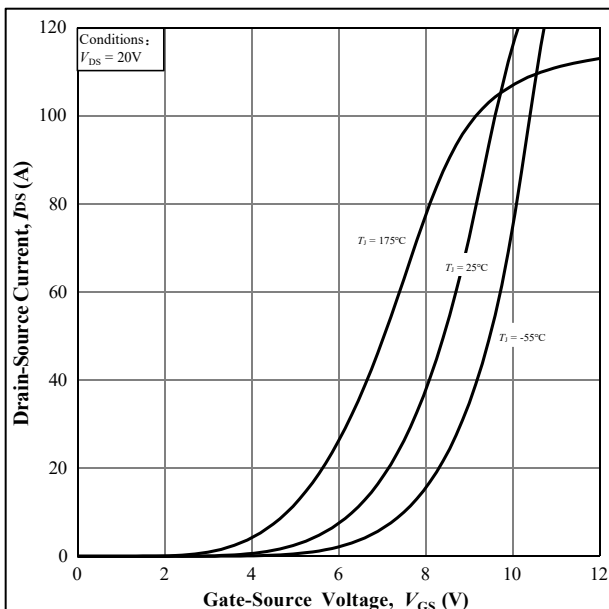


Figure 7: Transfer Characteristic for Various Temperatures

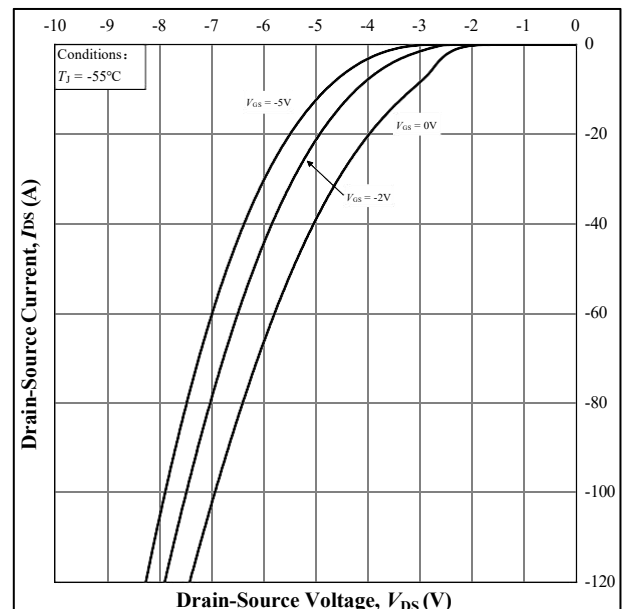


Figure 8: Body Diode Characteristic at -55°C

Typical Performance

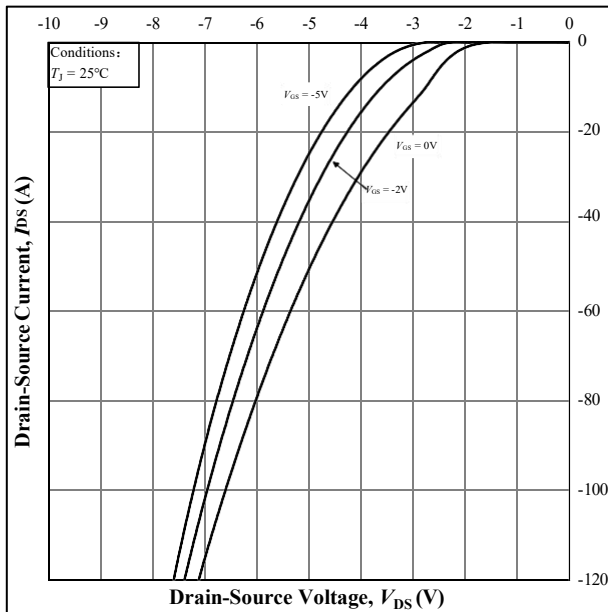


Figure 9: Body Diode Characteristic at 25°C

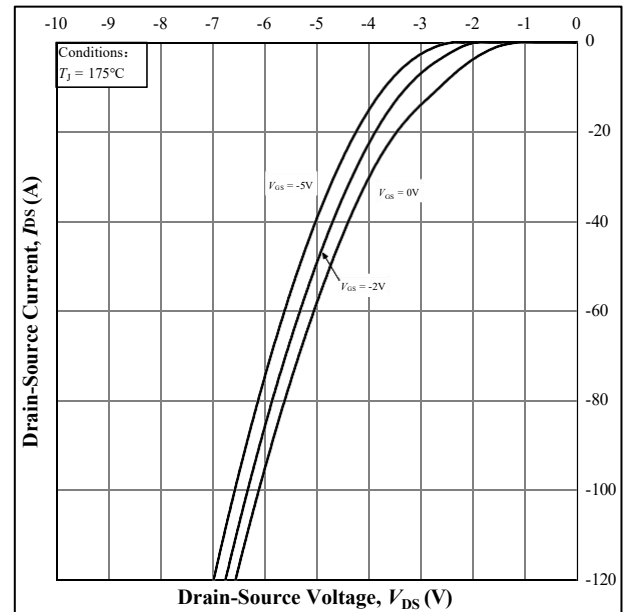


Figure 10: Body Diode Characteristic at 175°C

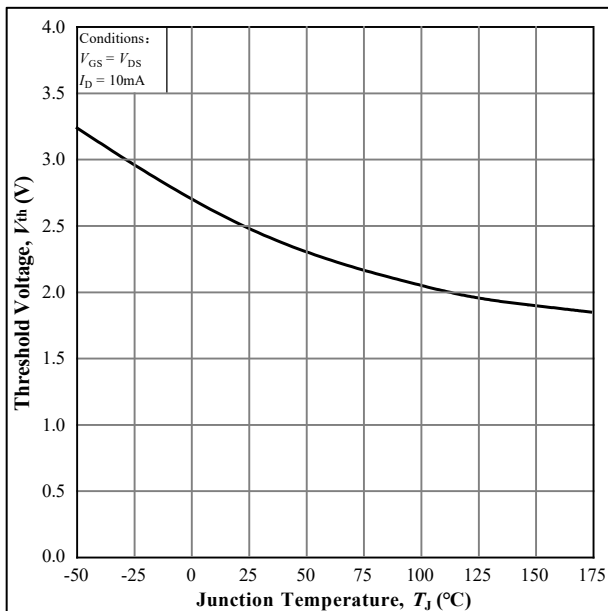


Figure 11: Threshold Voltage vs. Temperature

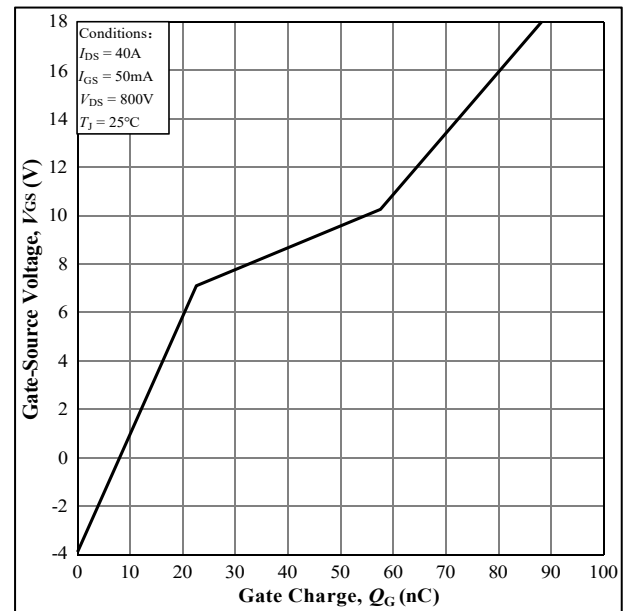


Figure 12: Gate Charge Characteristics

Typical Performance

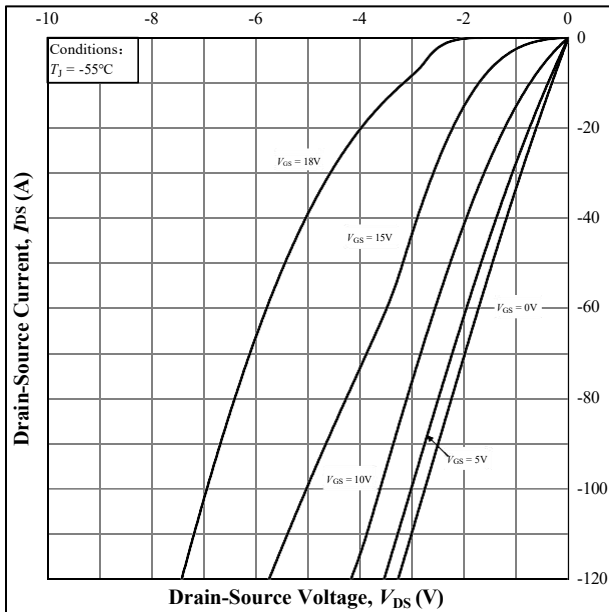


Figure 13: Typical 3rd Quadrant Characteristics
 $T_j = -55\text{ }^{\circ}\text{C}$

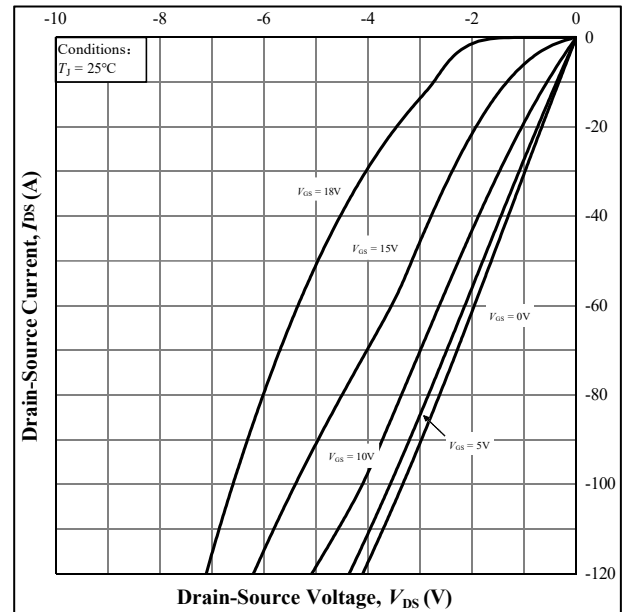


Figure 14: Typical 3rd Quadrant Characteristics at
 $T_j = 25\text{ }^{\circ}\text{C}$

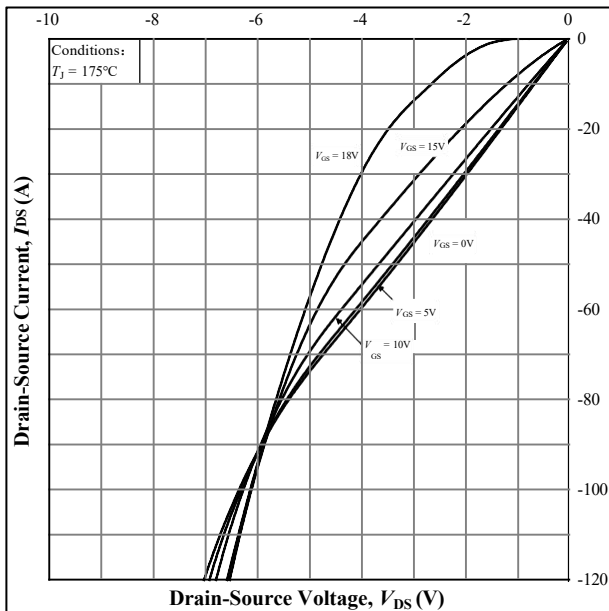


Figure 15: Typical 3rd Quadrant Characteristics
 $T_j = 175\text{ }^{\circ}\text{C}$

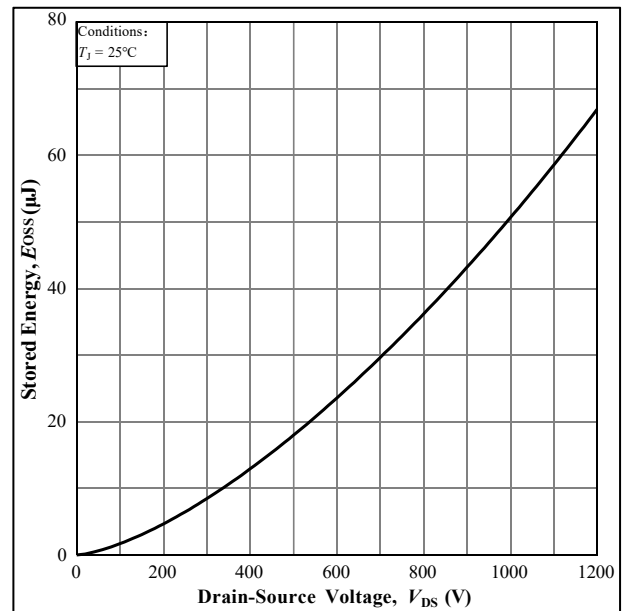


Figure 16: Output Capacitor Stored Energy

Typical Performance

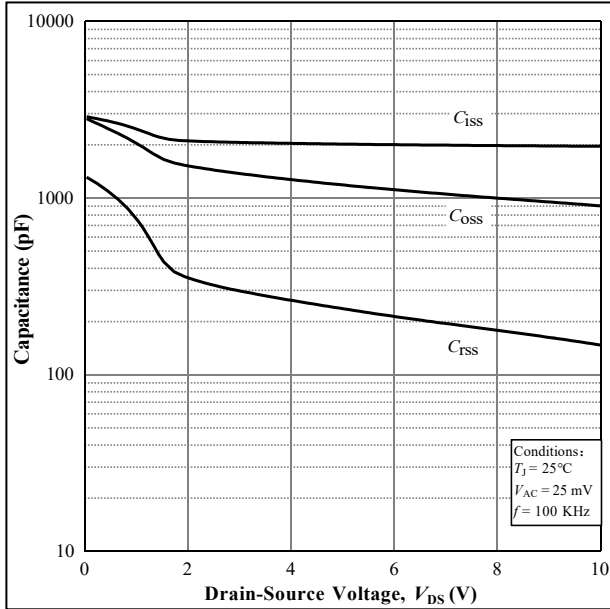


Figure 17: Typical Capacitances vs. Drain-Source Voltage (0 – 10V)

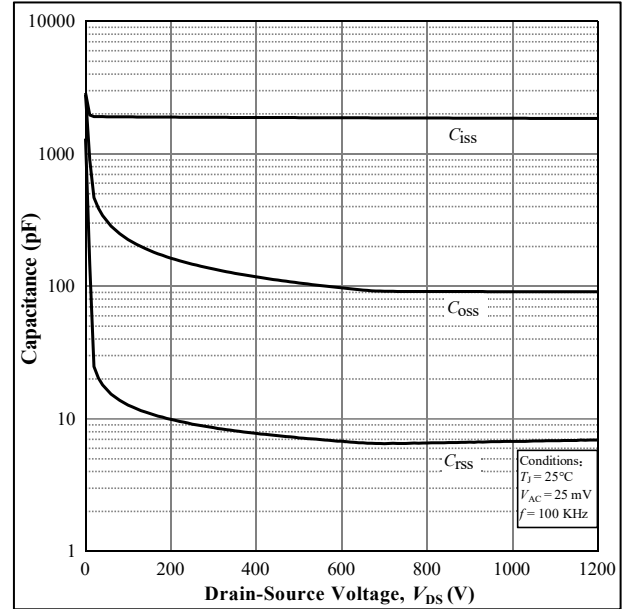


Figure 18: Typical Capacitances vs. Drain-Source Voltage (0 – 1200V)

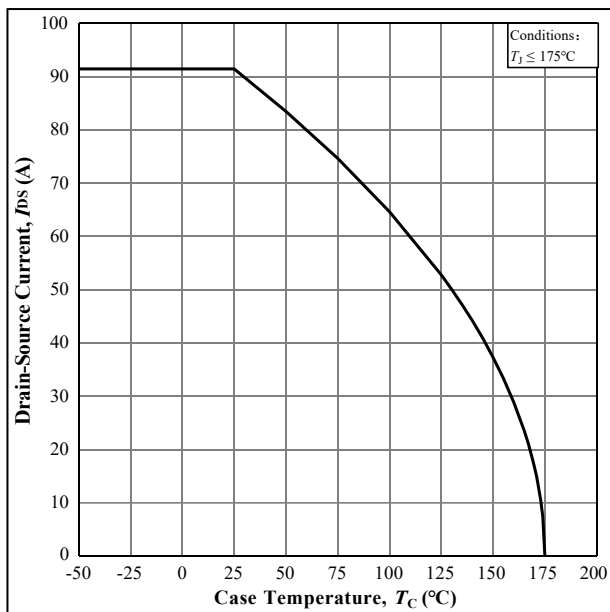


Figure 19: Continuous Drain Current Derating vs. Case Temperature

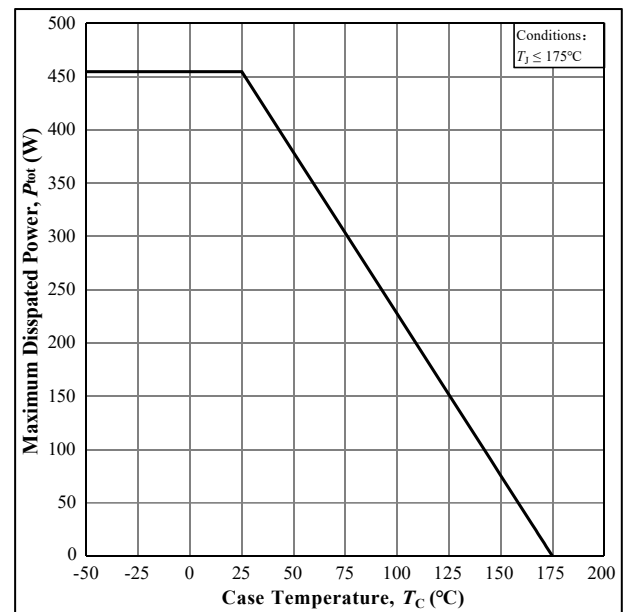


Figure 20: Maximum Power Dissipation Derating vs. Case Temperature

Typical Performance

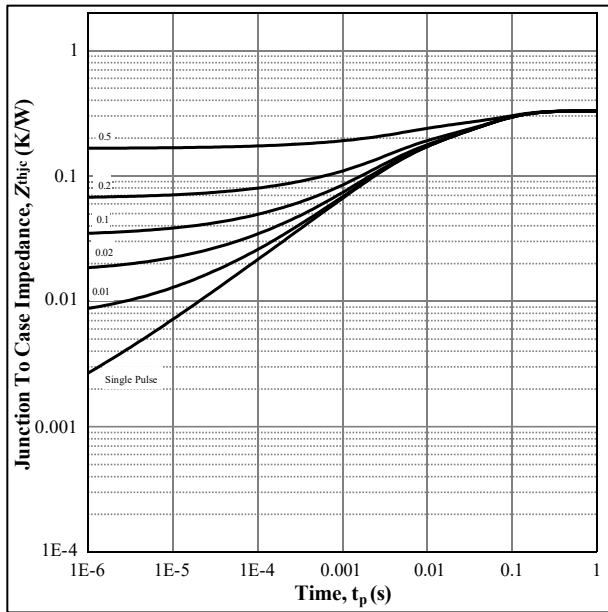


Figure 21: Transient Thermal Impedance
(Junction-Case)

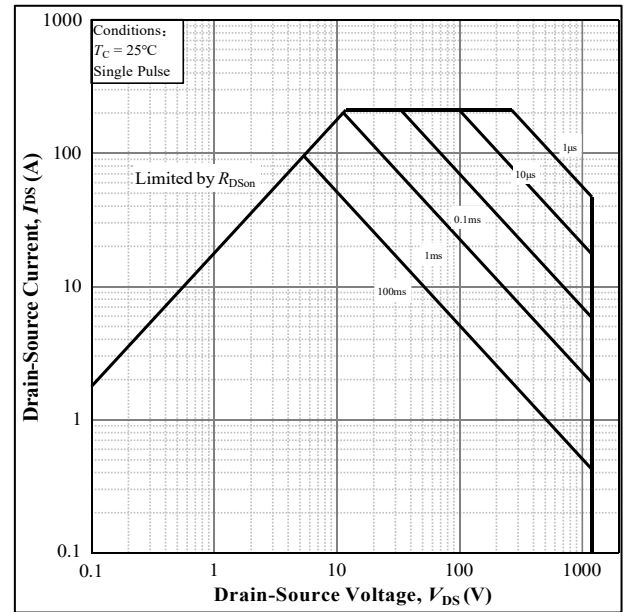
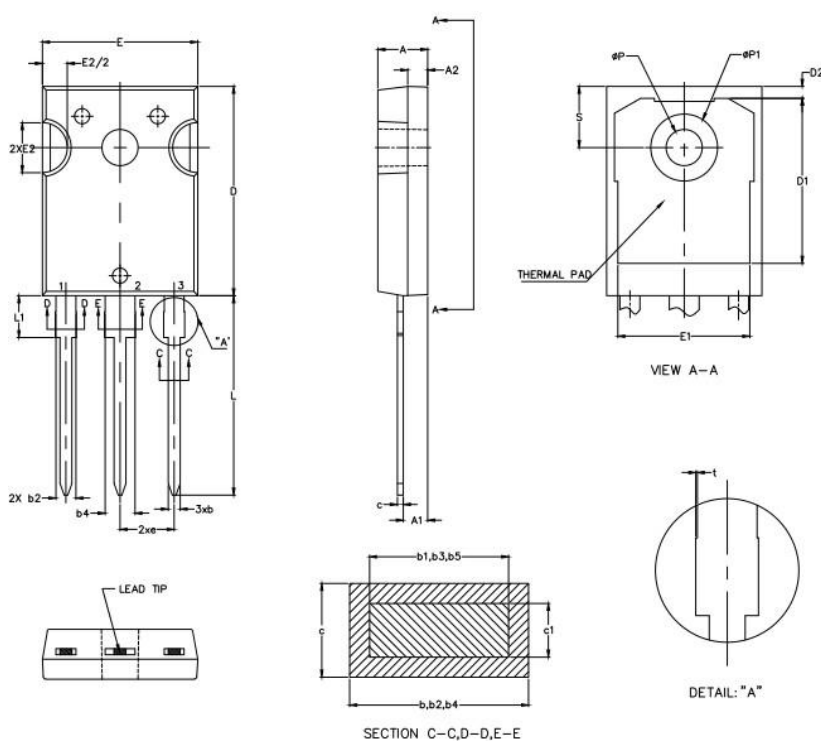


Figure 22: Safe Operating Area

Package Dimensions

Package: TO-247-3



DIMENSIONS	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A	4.90	5.10	0.193	0.201
A1	2.31	2.51	0.091	0.099
A2	1.90	2.10	0.075	0.083
b	1.16	1.26	0.046	0.050
b1	1.15	1.22	0.045	0.048
b2	1.96	2.06	0.077	0.081
b3	1.95	2.02	0.077	0.080
b4	2.96	3.06	0.117	0.120
b5	2.95	3.02	0.116	0.119
c	0.59	0.66	0.023	0.026
c1	0.58	0.62	0.023	0.024
D	20.90	21.10	0.823	0.831
D1	16.25	16.85	0.640	0.663
D2	1.05	1.35	0.041	0.053
E	15.75	15.90	0.620	0.626
E1	13.26	—	0.552	—
E2	4.90	5.10	0.193	0.201
e	5.44BSC		0.214BSC	
L	19.80	20.10	0.780	0.791
L1	—	4.30	—	0.169
φP	3.50	3.70	0.138	0.146
φP1	—	7.40	—	0.291
S	6.05	6.25	0.238	0.246
t	0.00	0.15	0.000	0.006

Revision History

Document Version	Description of Changes
Rev.G1.0	Released