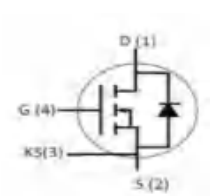
JNCF120R040HR1
1200V40mΩ SiC MOSFET

V_{DS}	=	1200V
I_D@25°C	=	75A
$R_{DS(on)}$	=	40mΩ

Features

- High blocking voltage with low On-resistance
- High speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery (Qrr)

Package



Applications

- PV Inverters
- Charging Piles
- Energy storage systems
- Industrial power supply
- Industrial Motors

JNCF120R040HR1 = Product number
RXXXX HXXX = Wafer-batch Packging-batch

Maximum Ratings @Tc=25°C (unless otherwise specified)

Parameter	Symbol	Test conditions	Values	Unit
Drain-Source Voltage	V_{DSmax}	V_{GS}=0V, I_D=100μA	1200	V
Gate-Source Voltage (static)	V_{GSop}	Static	-5/+20	V
Continuous Drain Current	I_D	V_{GS}=20V, T_c=25°C	75	A
		V_{GS}=20V, T_c=100°C	54	
Pulsed Drain Current	$I_{D(pulse)}$	Pulse width t_p limited by T_{jmax}	120	A
Power Dissipation	P_D	T_C=25°C, T_j=175°C	375	W
Operating Junction Range	T_j		-55 to +175	°C
Storage Temperature Range	T_{stg}		-55 to +175	°C

Electrical Characteristics @Tc=25°C (unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=100μA	1200	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=10mA	-	2.8	-	V
		V_{DS}=V_{GS}, I_D=10mA, T_j=175°C	-	1.9	-	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V	-	1	-	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=20V, V_{DS}=0V	-	10	-	nA
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS}=20V, I_D=35A	-	40	-	mΩ
		V_{GS}=20V, I_D=35A, T_j=175°C	-	64	-	
		V_{GS}=18V, I_D=35A	-	43	-	
		V_{GS}=18V, I_D=35A, T_j=175°C	-	67	-	
Transconductance	g_{fs}	V_{DS}=20V, I_{DS}=35A	-	20	-	S
		V_{DS}=20V, I_{DS}=35A, T_j=175°C	-	18	-	
Turn-On Switching Energy (Body Diode FWD)	E_{ON}	V_{DS}=800V, V_{GS}=-5V/20V, I_D=35A, $R_{G(ext)}$=2.5Ω, L=200μH, T_j=25°C FWD=NC1M120C40GT	-	850	-	μJ
Turn-Off Switching Energy (Body Diode FWD)	E_{OFF}		-	140	-	
Turn-On Delay Time	$t_{d(on)}$	V_{DD}=800V, V_{GS}=-5V/20V, I_D=35A, $R_{G(ext)}$=2.5Ω, L=200μH	-	33	-	ns
Rise Time	t_r		-	26	-	
Turn-Off Delay Time	$t_{d(off)}$		-	39	-	
Fall Time	t_f		-	14	-	
Gate to Source Charge	Q_{gs}	V_{DS}=800V, V_{GS}=-5V/20V, I_D=35A	-	40	-	nC
Gate to Drain Charge	Q_{gd}		-	60	-	
Total Gate Charge	Q_g		-	163	-	
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=1000V f=1MHz V_{AC}=25mV	-	2534	-	pF
Output Capacitance	C_{oss}		-	110	-	
Reverse Transfer Capacitance	C_{rss}		-	26	-	
C_{OSS} Stored Energy	E_{oss}		-	70	-	μJ
Internal Gate Resistance	$R_{G(int)}$	f=1MHz, V_{AC}=25mV	-	1.6	-	Ω

Reverse Diode Characteristics @Tc=25°C (unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Diode Forward Voltage	V_{SD}	V_{GS}=-5V, I_{SD}=20A	-	4.9	-	V
		V_{GS}=-5V, I_{SD}=20A, T_j=175°C	-	4.1	-	V
Continuous Diode Forward Current	I_S	V_{GS}=-5V	-	76	-	A
Reverse Recovery Time	t_{rr}	V_{GS}=-5V, I_{SD}=35A, V_R=800V, di/dt=3000A/μs	-	13	-	ns
Reverse Recovery Charge	Q_{rr}		-	110	-	nC
Peak Reverse Recovery Current	I_{rrm}		-	14	-	A

Thermal Characteristics

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal Resistance from Junction to Case	$R_{\theta JC}$		-	0.4	-	°C/W

Typical Performance

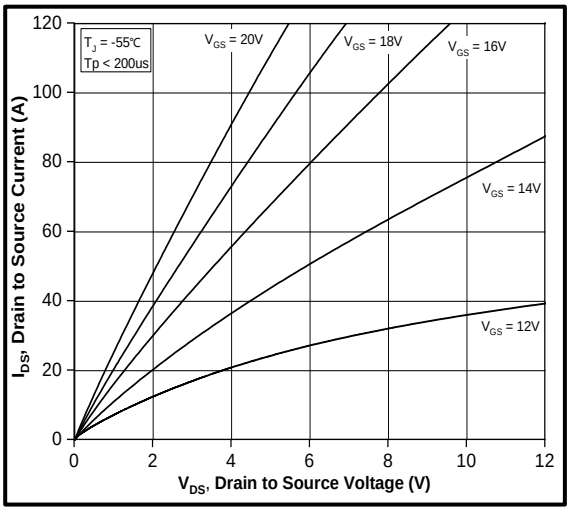


Figure 1. Output Characteristics T_J=-55°C

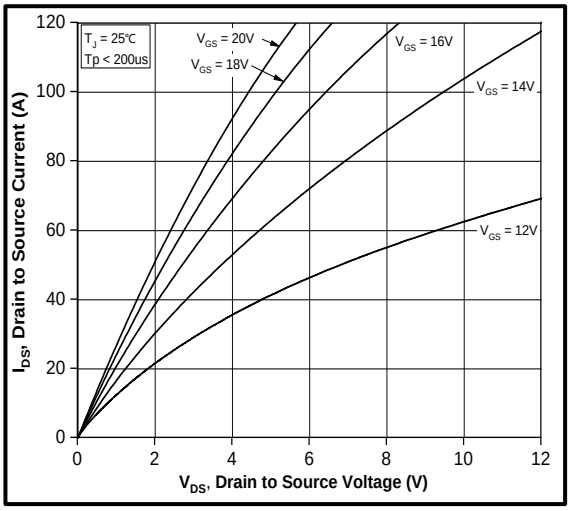


Figure 2. Output Characteristics T_J=25°C

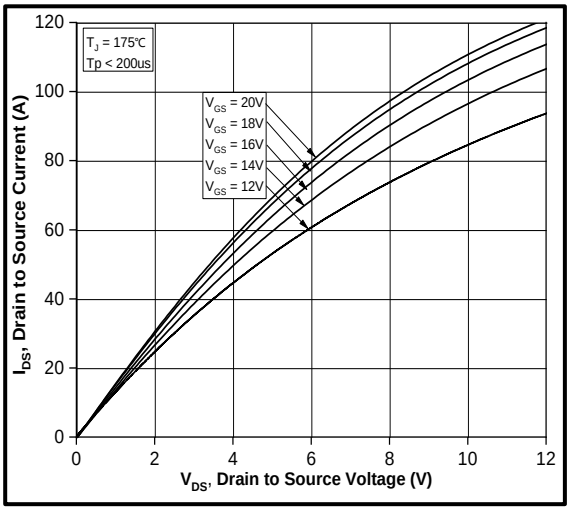


Figure 3. Output Characteristics T_j=175°C

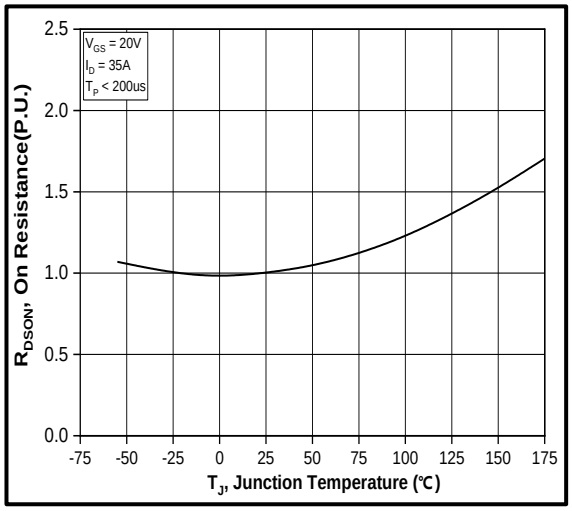


Figure 4. Normalized On-Resistance vs. Temperature

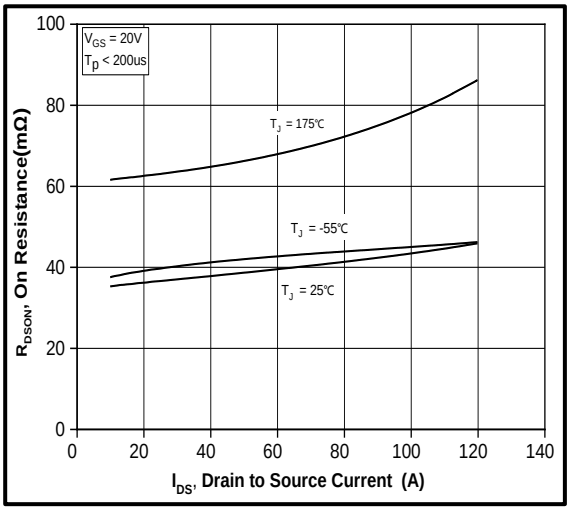


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

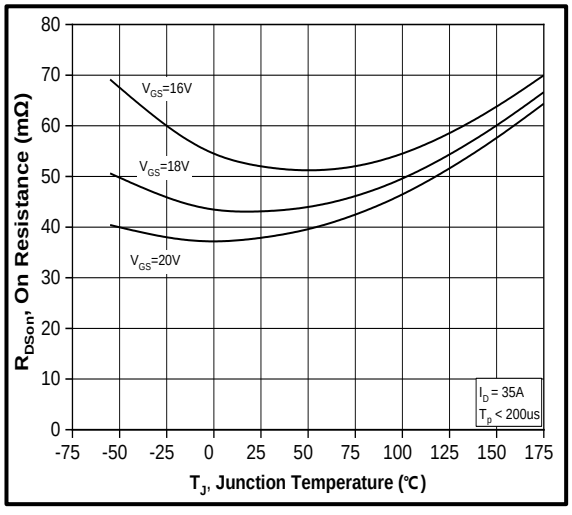


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

Typical Performance

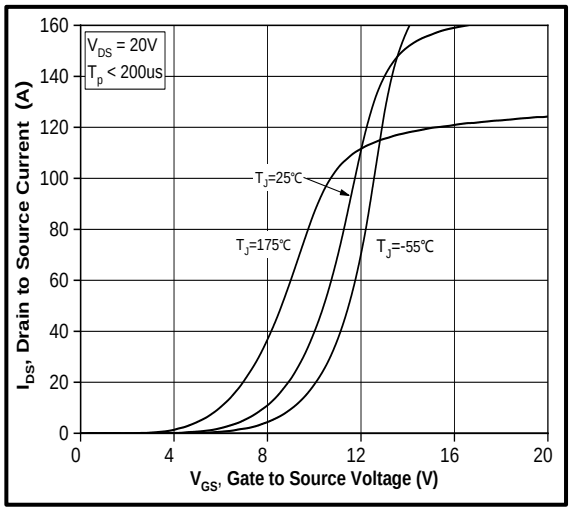


Figure 7. Transfer Characteristic for Various Junction Temperatures

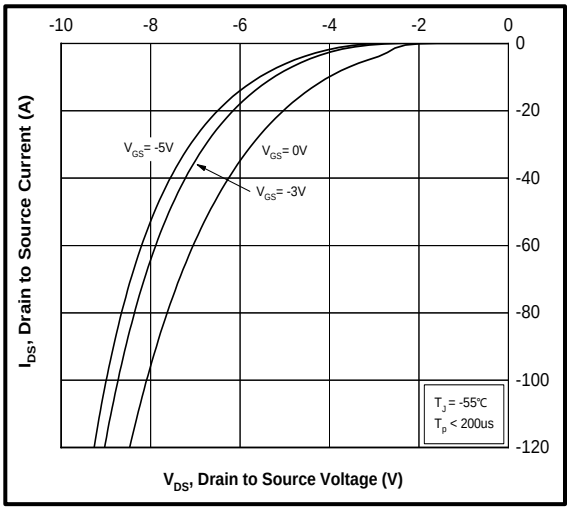


Figure 8. Body Diode Characteristic at -55°C

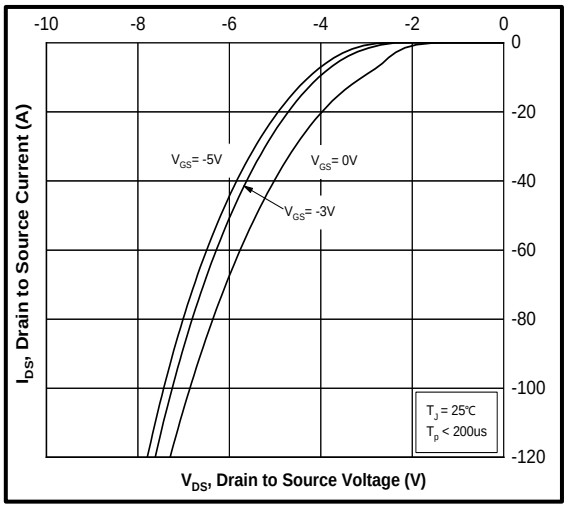


Figure 9. Body Diode Characteristic at 25°C

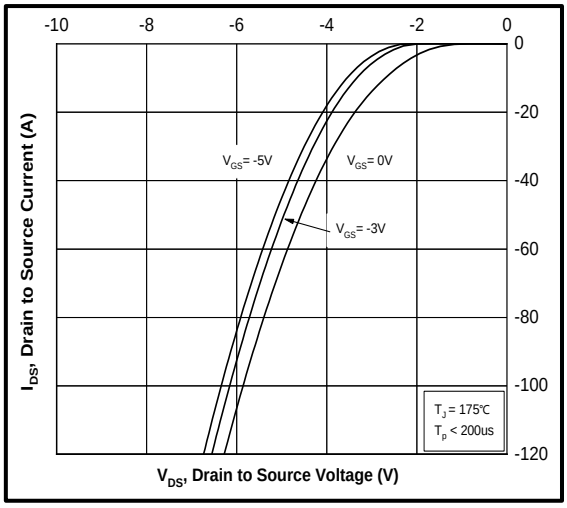


Figure 10. Body Diode Characteristic at 175°C

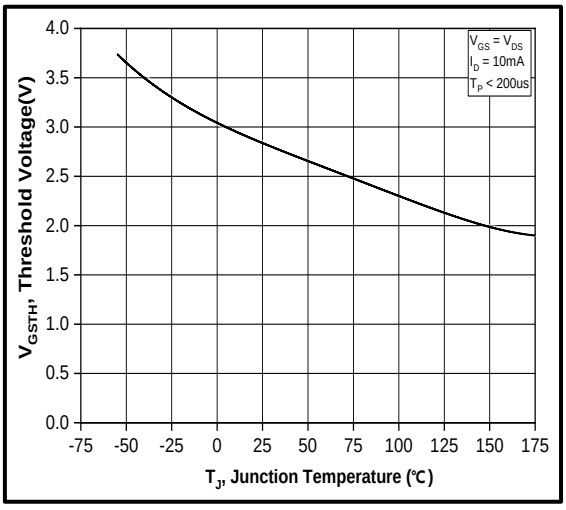


Figure 11. Threshold Voltage vs. Temperature

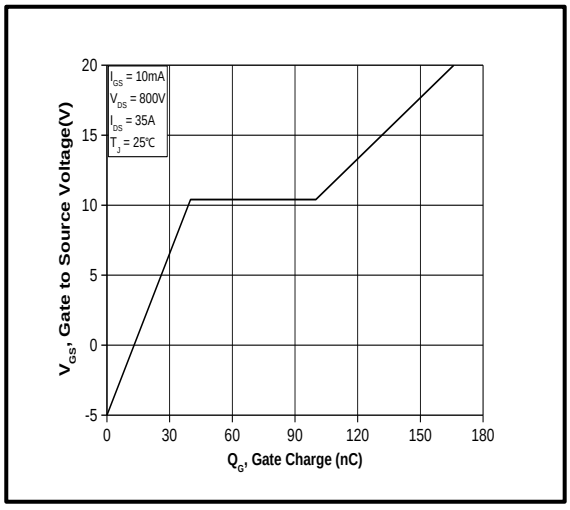


Figure 12. Gate Charge Characteristics

Typical Performance

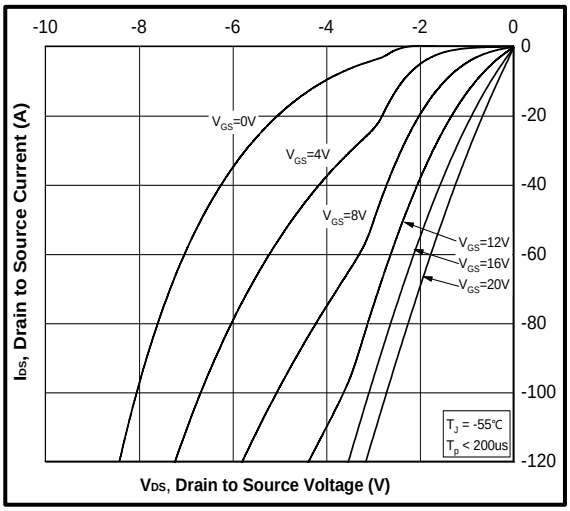


Figure 13. 3rd Quadrant Characteristic at -55°C

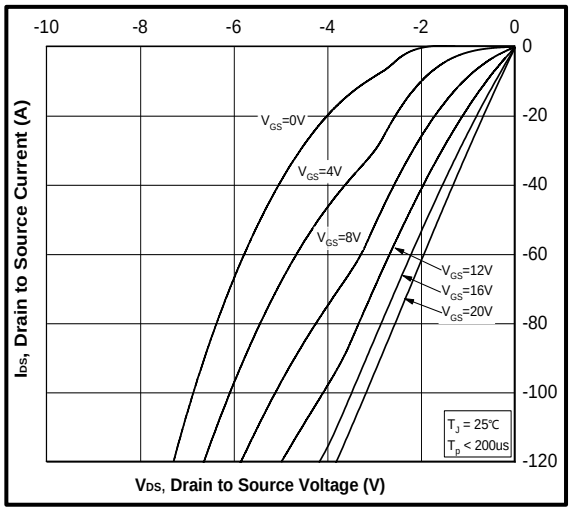


Figure 14. 3rd Quadrant Characteristic at 25°C

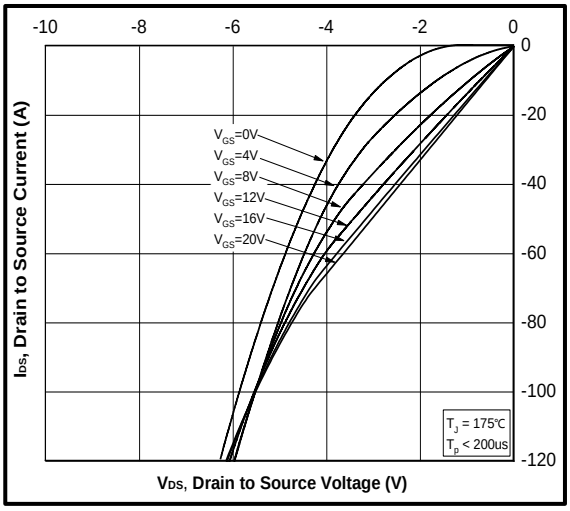


Figure 15. 3rd Quadrant Characteristic at 175°C

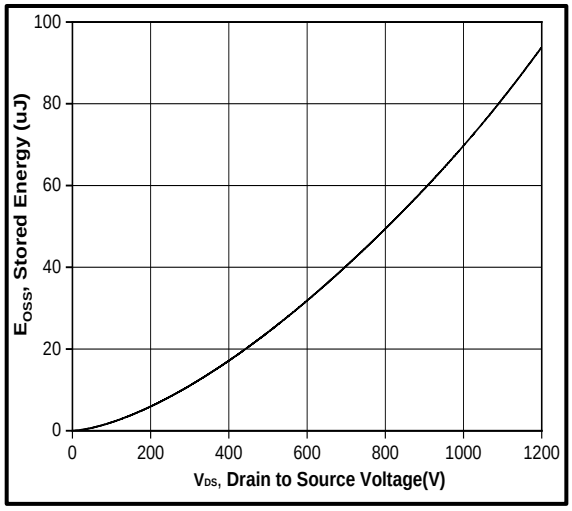


Figure 16. Output Capacitor Stored Energy

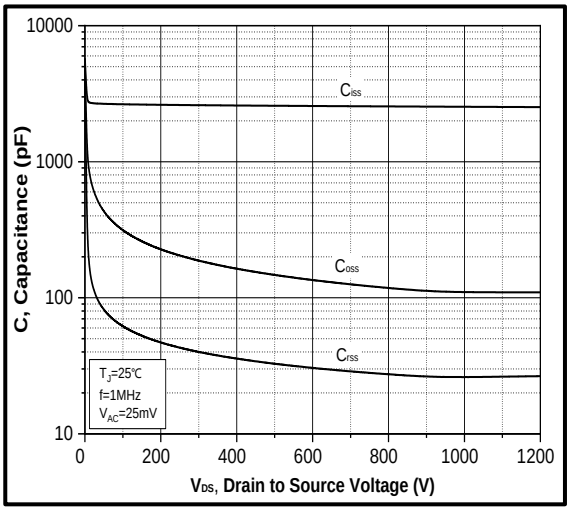


Figure 17. Capacitances vs. Drain-Source Voltage

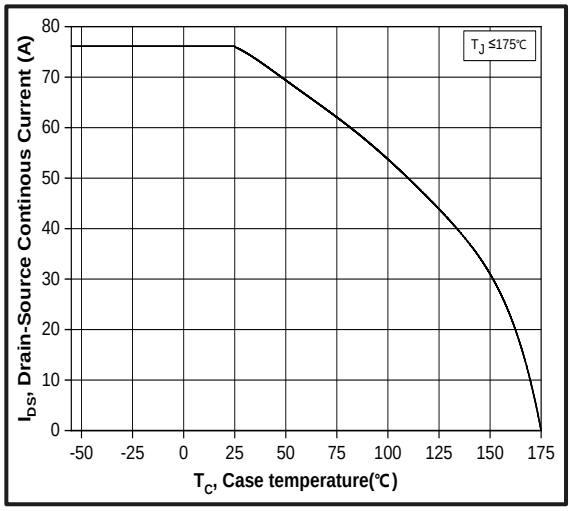


Figure 18. Continuous Drain Current Derating vs. Case Temperature

Typical Performance

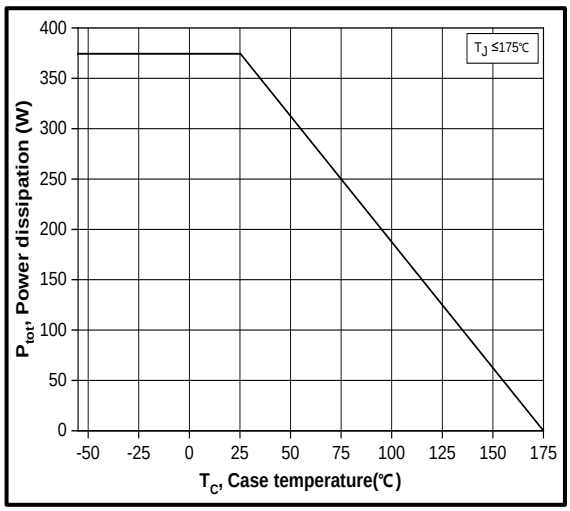


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

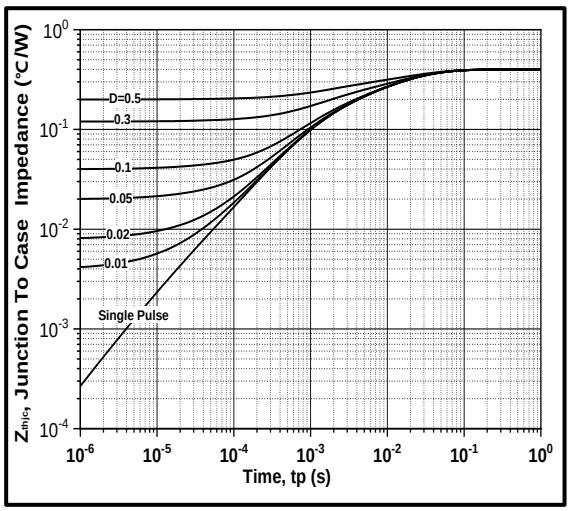


Figure 20. Transient Thermal Impedance (Junction - Case)

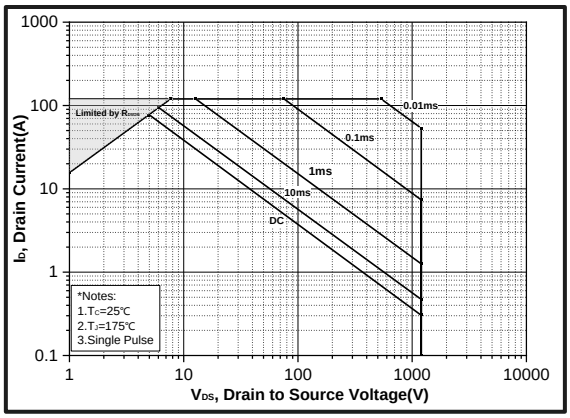


Figure 21. Safe Operating Area

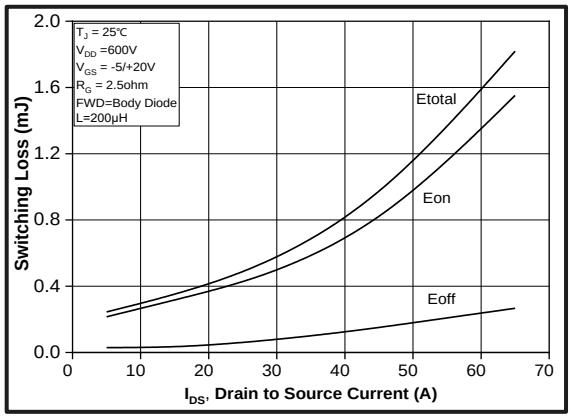


Figure 22. Clamped Inductive Switching Energy vs. Drain Current (V_{DD}=600V)

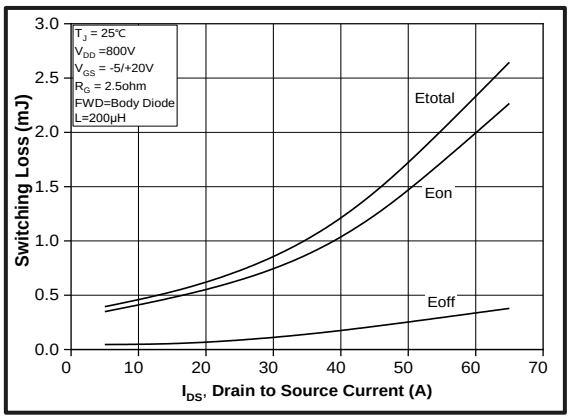


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD}=800V)

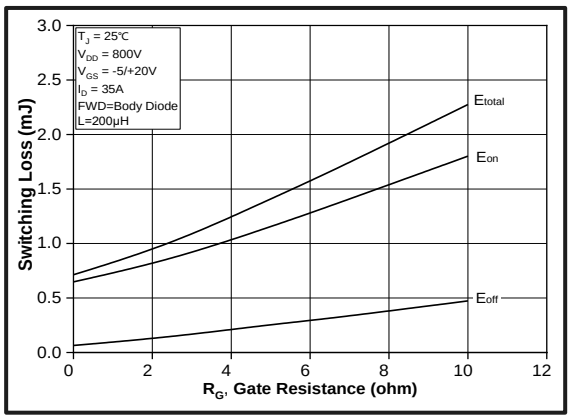


Figure 24. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

Typical Performance

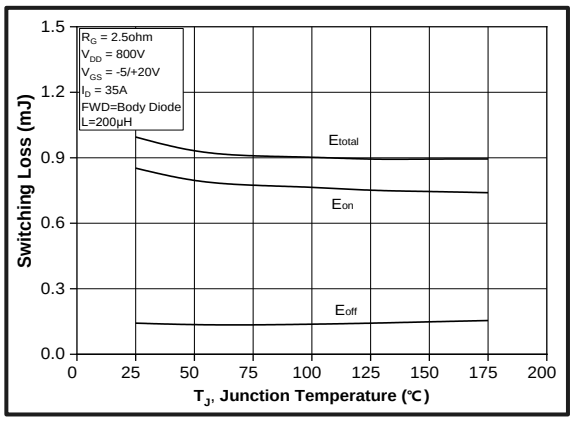


Figure 25. Clamped Inductive Switching Energy vs. T_J

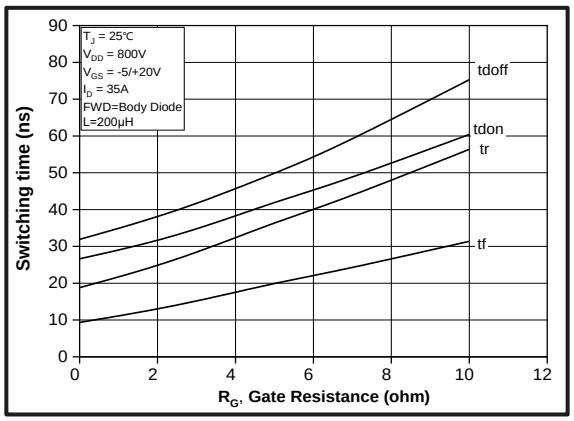
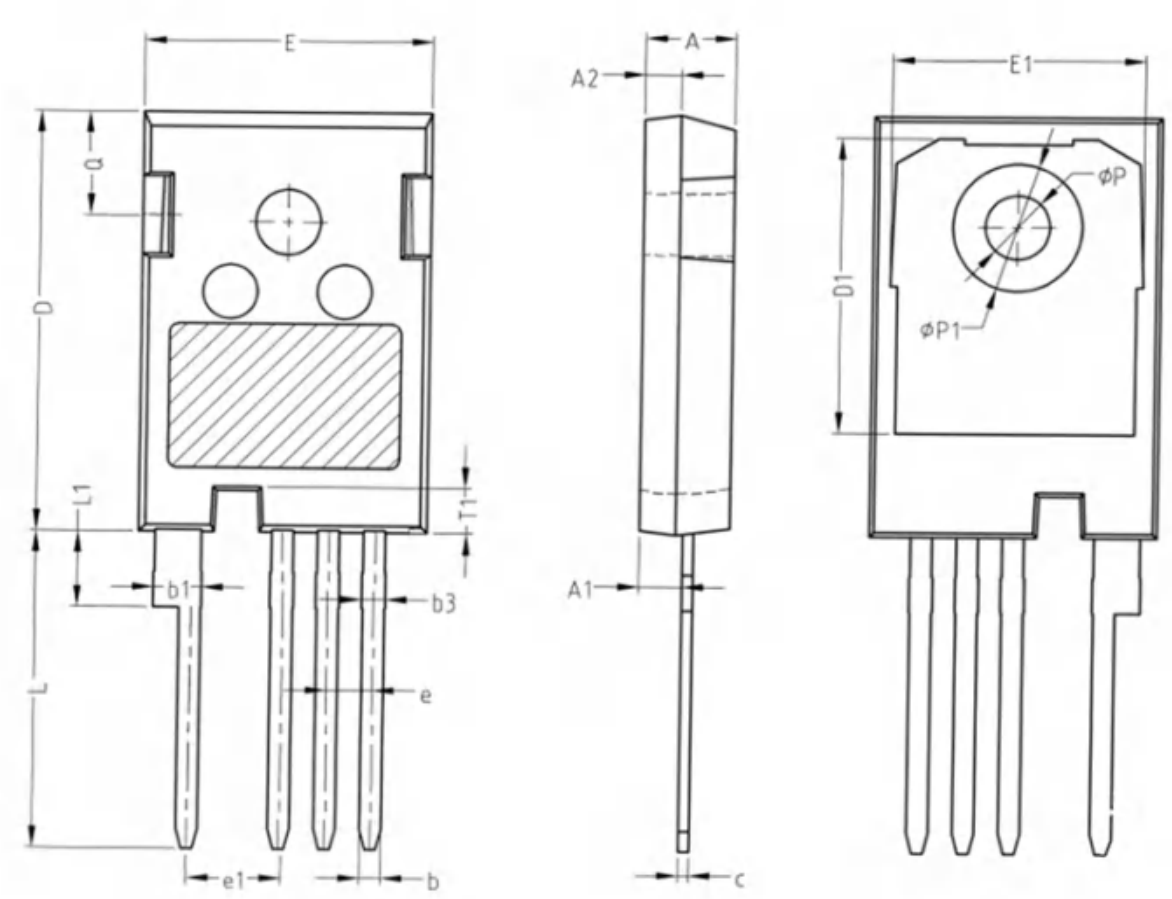


Figure 26. Switching Time vs. $R_{G(ext)}$

Package Outline: 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	2.68	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	2.25	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	3.98	4.19	4.39
ΦP	3.40	3.60	3.80
ΦP1	7.19 REF		

NOTE:
1. ALL DIMENSIONS ARE LISTED IN MILLIMETERS, ANGLES ARE IN DEGREES.
2. ALL METAL SURFACES ARE TIN PLATED (MATTE), EXCEPT AREA OF CUT.

Product Ordering Information

Order Number	Packing Type
JNCF120R040HR1	Tube

Revision History

Revision	Date	Subjects (major changes since last revision)
1.0	6 June，2024	Official first release