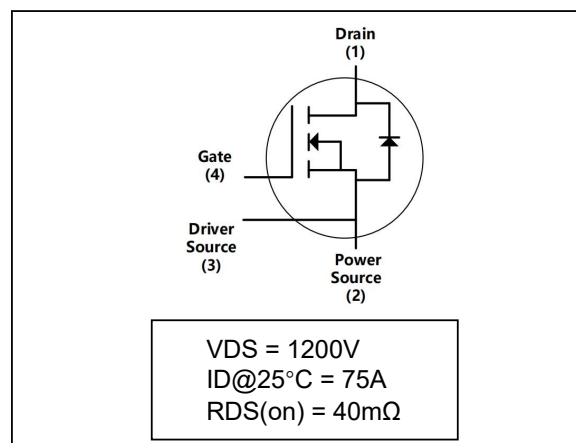
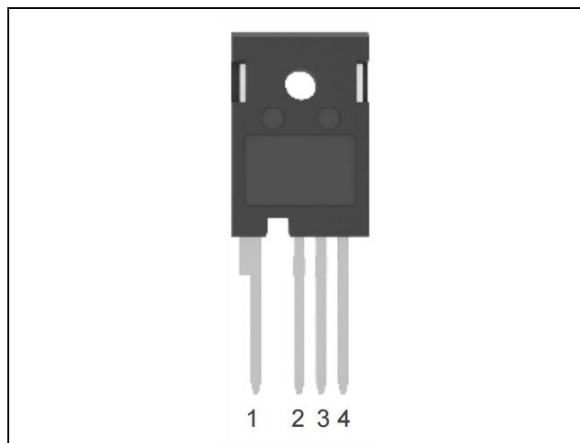


### 1200V 40mΩ SiC MOSFET



#### Features:

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

#### Typical Applications:

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

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

Item	Symbol	Conditions	Values	Unit
Drain-Source Voltage	$V_{DSmax}$	$V_{GS}=0V, I_D=100\mu A$	1200	V
Gate-Source Voltage	$V_{GSop}$	Static	-5/+20	V
Maximum Gate-Source Voltage	$V_{GSmax}$	Static	-8/+22	V
Continuous Drain Current	$I_D$	$V_{GS}=20V, T_c=25^\circ C$	75	A
		$V_{GS}=20V, T_c=100^\circ C$	53	
Pulsed Drain Current	$I_{D(pulse)}$	Pulse width $t_p$ limited by $T_{jmax}$	120	A
Power Dissipation	$P_D$	$T_C=25^\circ C, T_j=175^\circ C$	366	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)**

Item	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=100\mu A$	1200	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=10mA$	2.0	2.8	3.5	V
		$V_{DS}=V_{GS}, I_D=10mA, T_J=175^\circ C$	-	1.9	-	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=1200V, V_{GS}=0V$	-	1	100	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=20V, V_{DS}=0V$	-	10	100	nA
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=20V, I_D=35A$	-	40	60	m $\Omega$
		$V_{GS}=20V, I_D=35A, T_J=175^\circ C$	-	64	-	
		$V_{GS}=18V, I_D=35A$	-	43	70	
		$V_{GS}=18V, I_D=35A, T_J=175^\circ C$	-	67	-	
Transconductance	$g_{fs}$	$V_{DS}=20V, I_{DS}=35A$	-	20	-	S
		$V_{DS}=20V, I_{DS}=35A, T_J=175^\circ C$	-	18	-	
Turn-On Switching Energy (Body Diode FWD)	$E_{on}$	$V_{DS}=800V,$ $V_{GS}=-5V/20V, I_D=35A,$ $R_{G(ext)}=2.5\Omega, L=200\mu H,$ $T_J=25^\circ C$ FWD=SPS40MA12E4S	-	635	-	$\mu J$
Turn-Off Switching Energy (Body Diode FWD)	$E_{off}$		-	201	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=800V,$ $V_{GS}=-5V/20V,$ $I_D=35A,$ $R_{G(ext)}=2.5\Omega, L=200\mu H$	-	9	-	ns
Rise Time	$t_r$		-	30	-	
Turn-Off Delay Time	$t_{d(off)}$		-	31	-	
Fall Time	$t_f$		-	12	-	
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	-	
Internal Gate Resistance	$R_{G(int)}$	$f=1MHz, V_{AC}=25mV$	-	1.6	-	$\Omega$

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

Item	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =-5V, I <sub>SD</sub> =20A	-	4.9	7	V
		V <sub>GS</sub> =-5V, I <sub>SD</sub> =20A, T <sub>J</sub> =175°C	-	4.1	-	V
Continuous Diode Forward Current	I <sub>S</sub>	V <sub>GS</sub> =-5V	-	75	-	A
Reverse Recovery Time	t <sub>rr</sub>	V <sub>GS</sub> =-5V,	-	32	-	ns
Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>SD</sub> =35A,	-	769	-	nC
Peak Reverse Recovery Current	I <sub>rrm</sub>	V <sub>R</sub> =800V, di/dt=3000A/μs	-	39	-	A

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

Item	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal Resistance from Junction to Case	R <sub>θJC</sub>		-	0.41	-	°C/W

Typical Performance

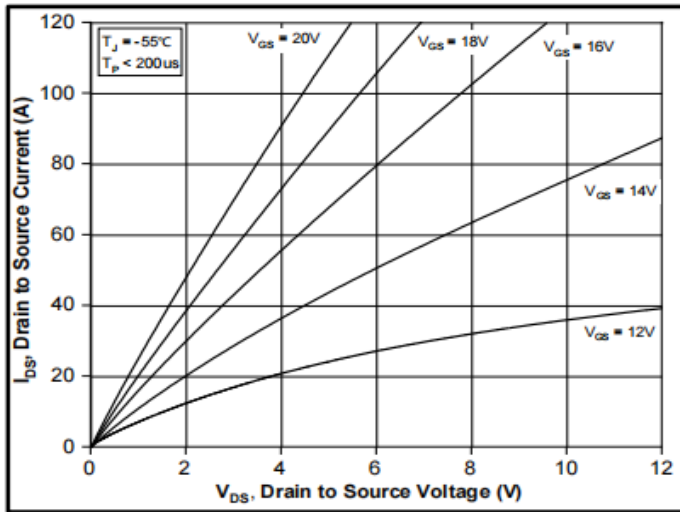


Figure 1. Output Characteristics  $T_J = -55^\circ\text{C}$

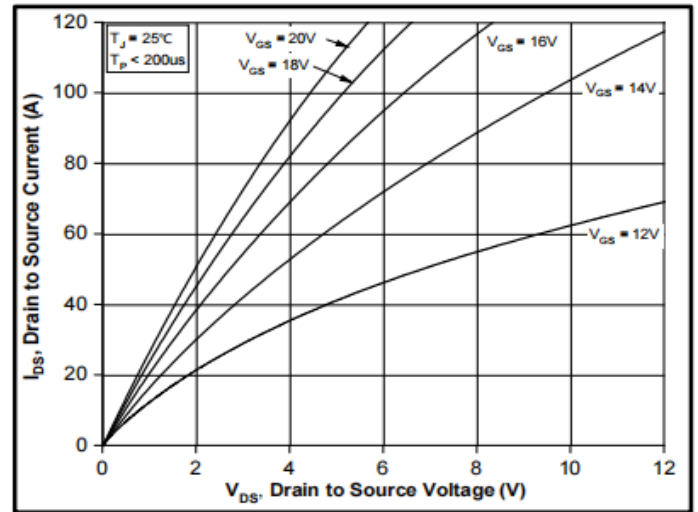


Figure 2. Output Characteristics  $T_J = 25^\circ\text{C}$

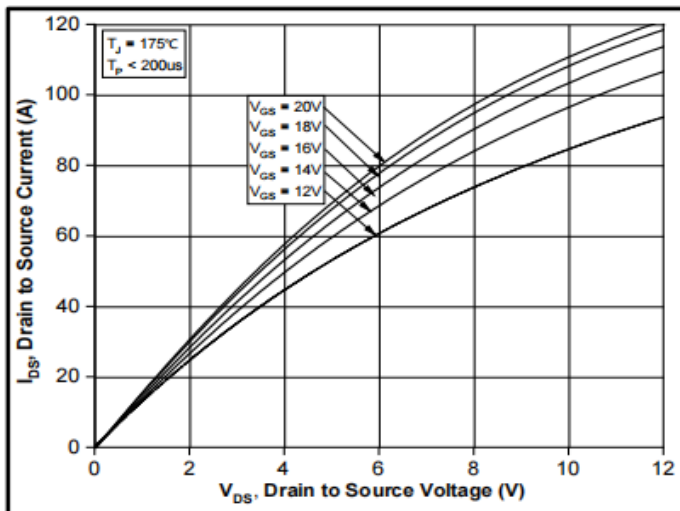


Figure 3. Output Characteristics  $T_J = 175^\circ\text{C}$

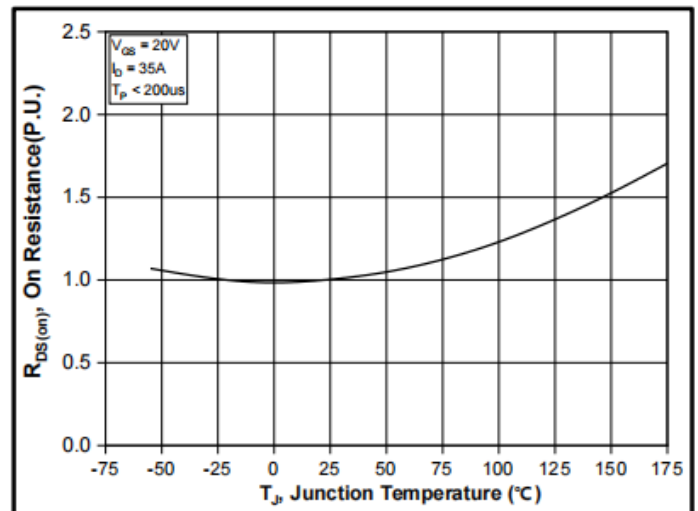


Figure 4. Normalized On-Resistance vs. Temperature

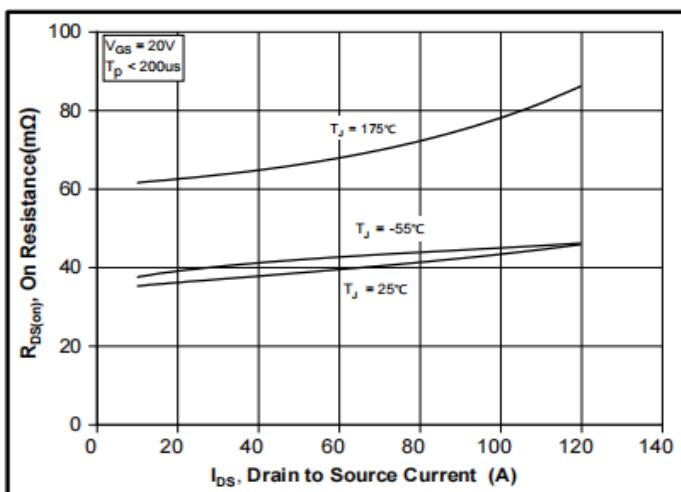


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

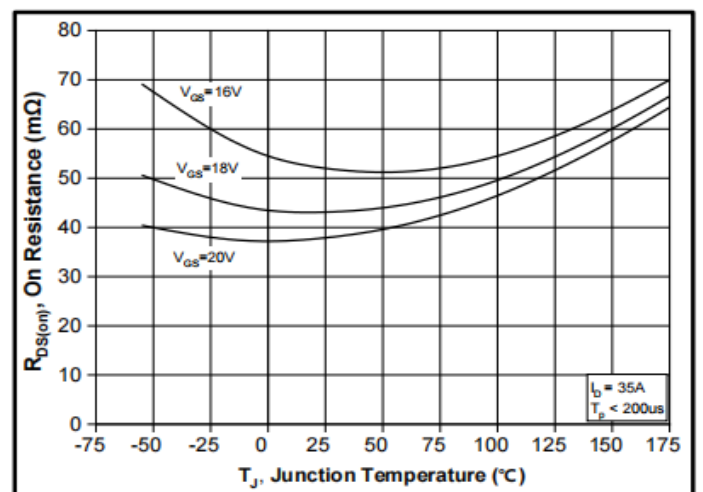


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

Typical Performance

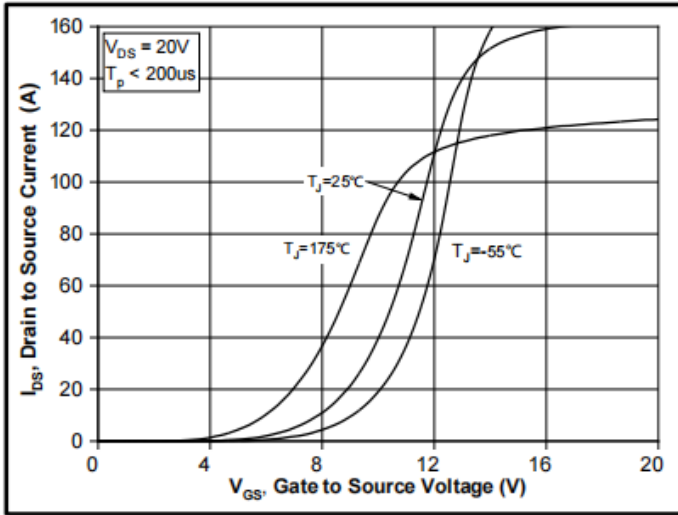


Figure 7. Transfer Characteristic for Various Junction Temperatures

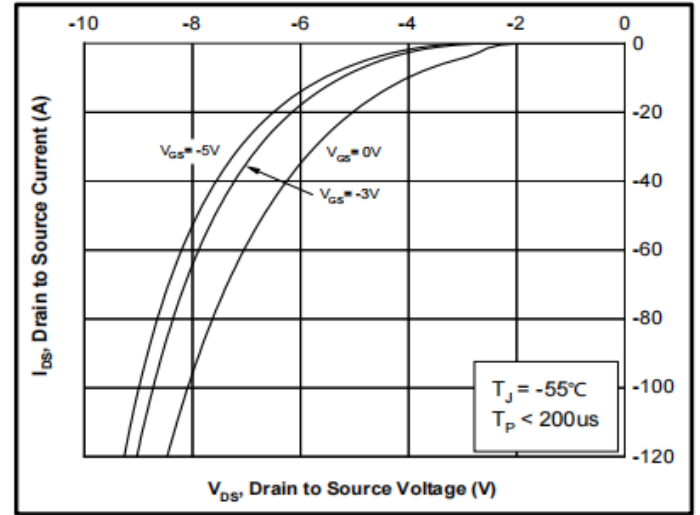


Figure 8. Body Diode Characteristic at  $-55^\circ C$

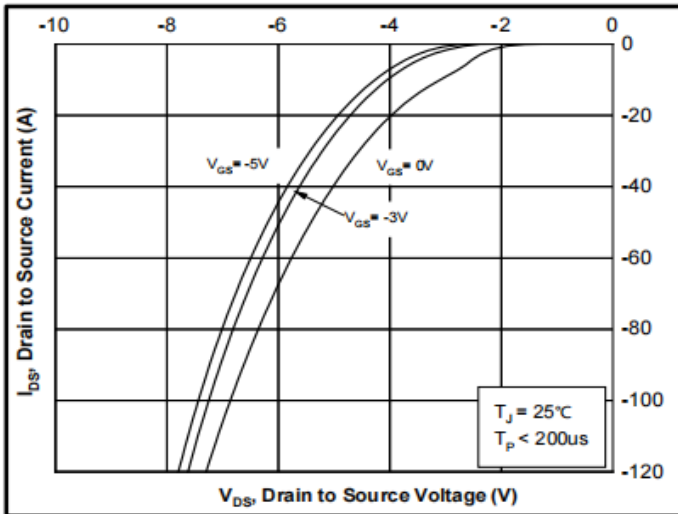


Figure 9. Body Diode Characteristic at  $25^\circ C$

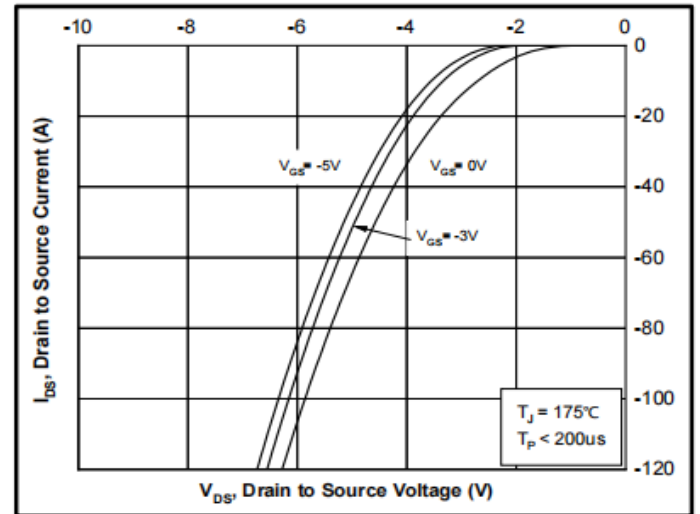


Figure 10. Body Diode Characteristic at  $175^\circ C$

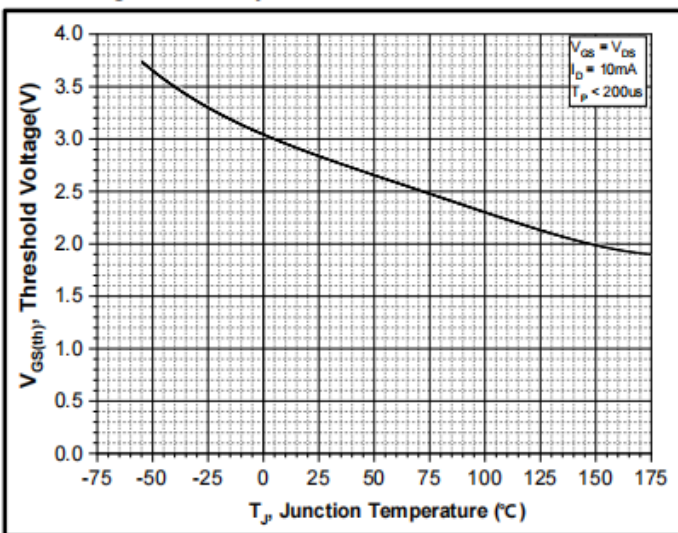


Figure 11. Threshold Voltage vs. Temperature

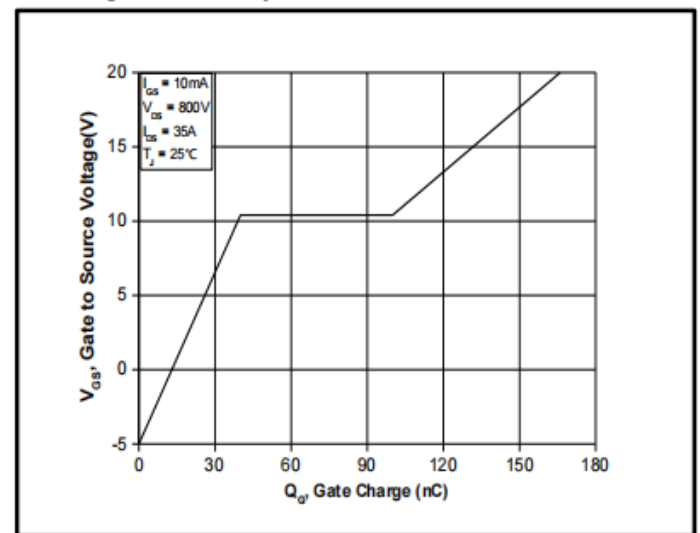


Figure 12. Gate Charge Characteristics

Typical Performance

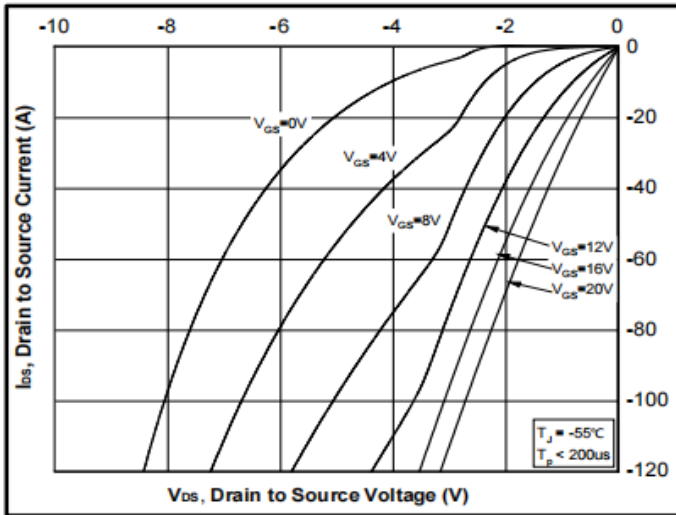


Figure 13. 3<sup>rd</sup> Quadrant Characteristic at  $-55^\circ\text{C}$

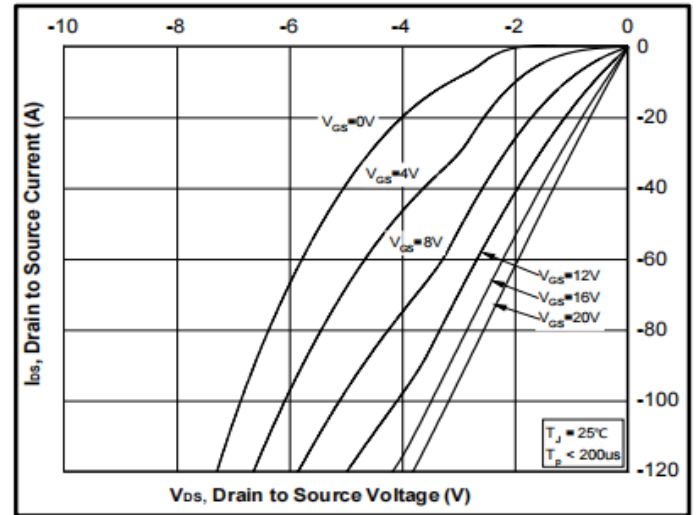


Figure 14. 3<sup>rd</sup> Quadrant Characteristic at  $25^\circ\text{C}$

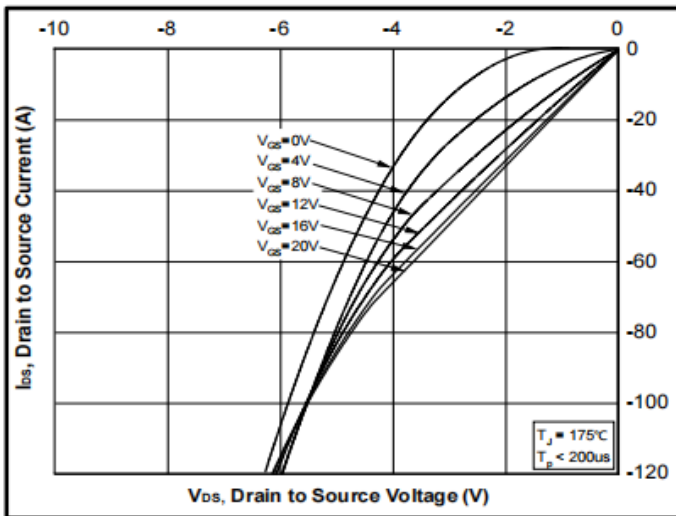


Figure 15. 3<sup>rd</sup> Quadrant Characteristic at  $175^\circ\text{C}$

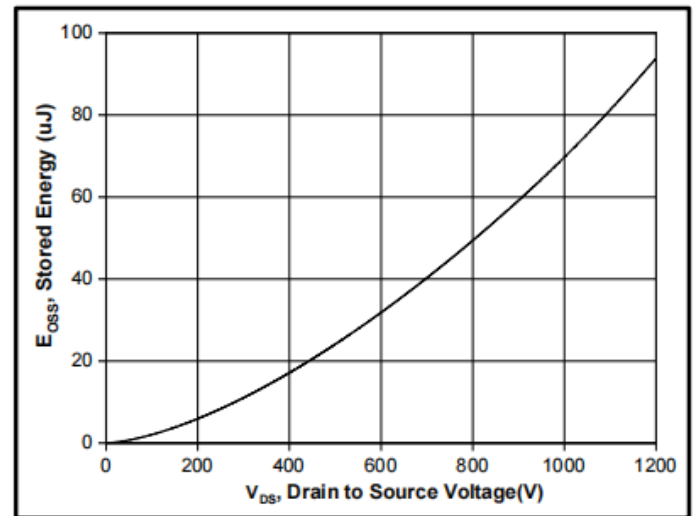


Figure 16. Output Capacitor Stored Energy

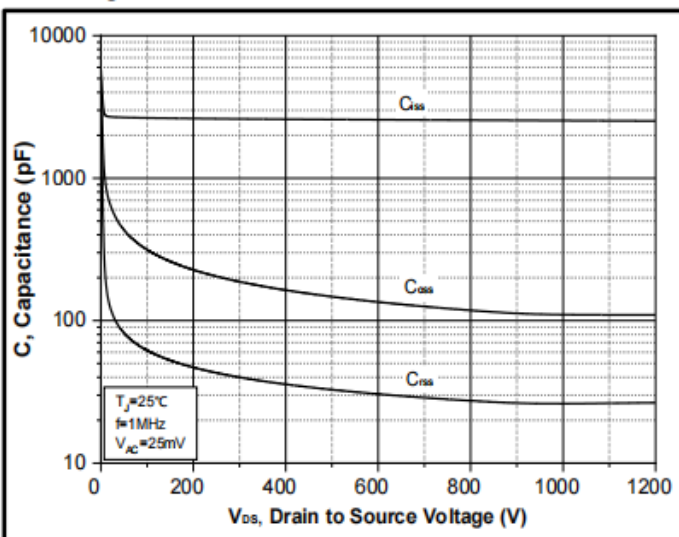


Figure 17. Capacitances vs. Drain-Source Voltage

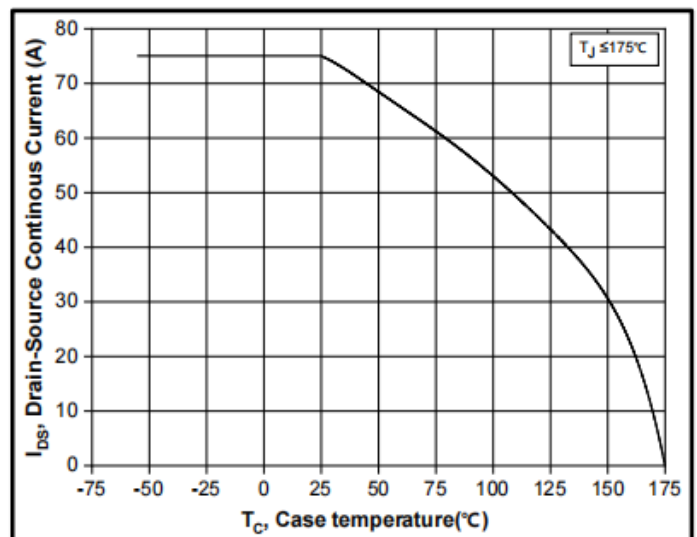


Figure 18. Continuous Drain Current Derating vs. Case Temperature

Typical Performance

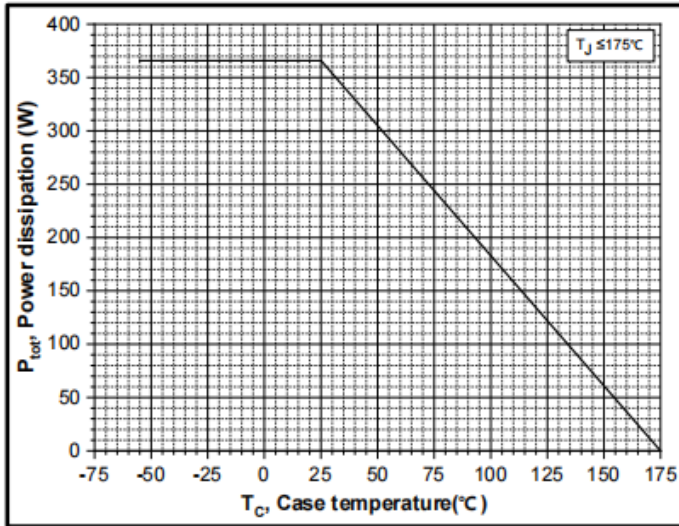


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

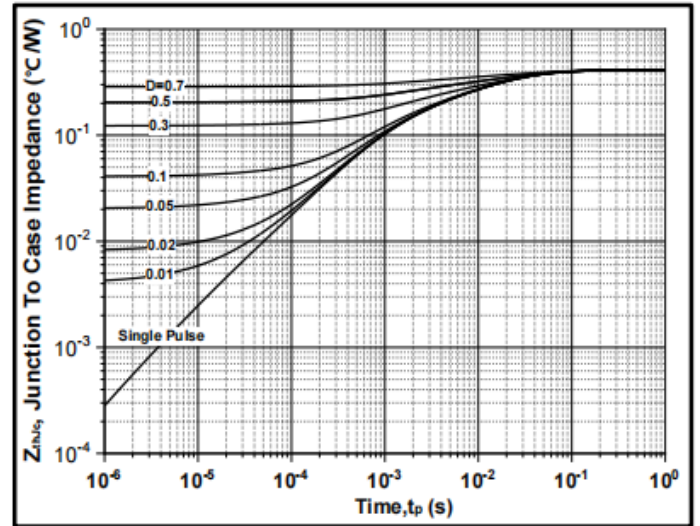


Figure 20. Transient Thermal Impedance (Junction - Case)

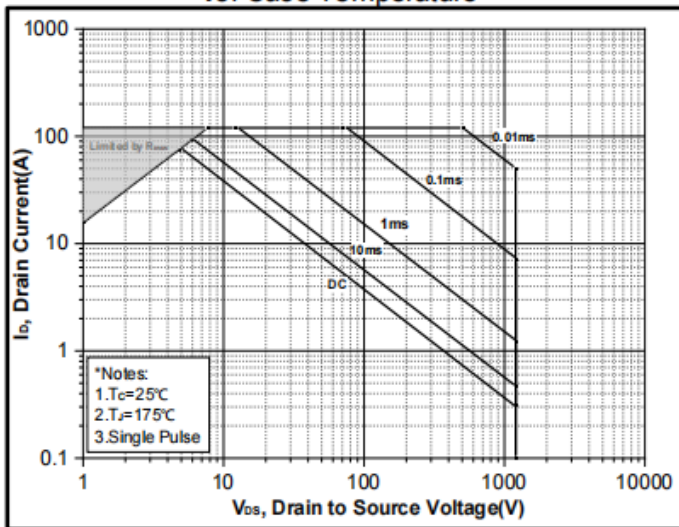


Figure 21. Safe Operating Area

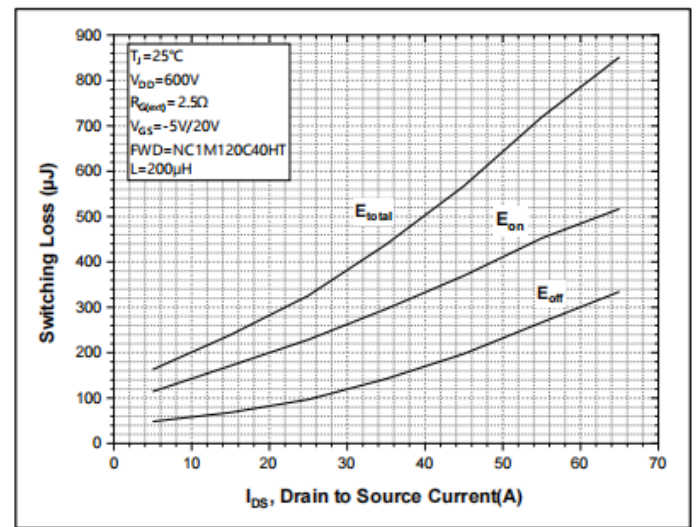


Figure 22. Clamped Inductive Switching Energy vs. Drain Current ( $V_{DD}=600V$ )

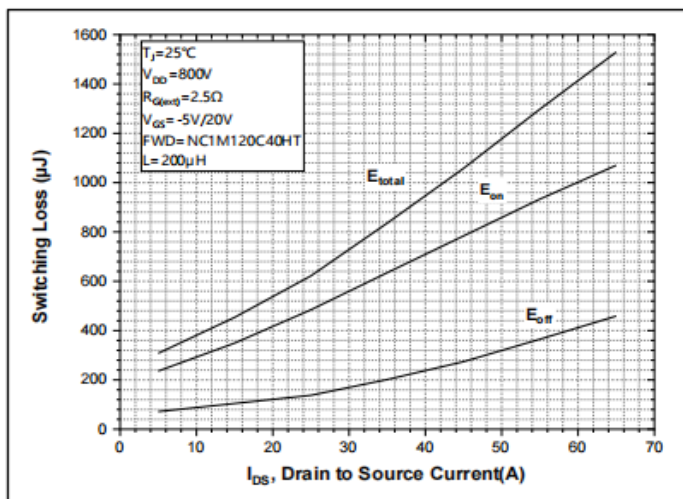


Figure 23. Clamped Inductive Switching Energy vs. Drain Current ( $V_{DD}=800V$ )

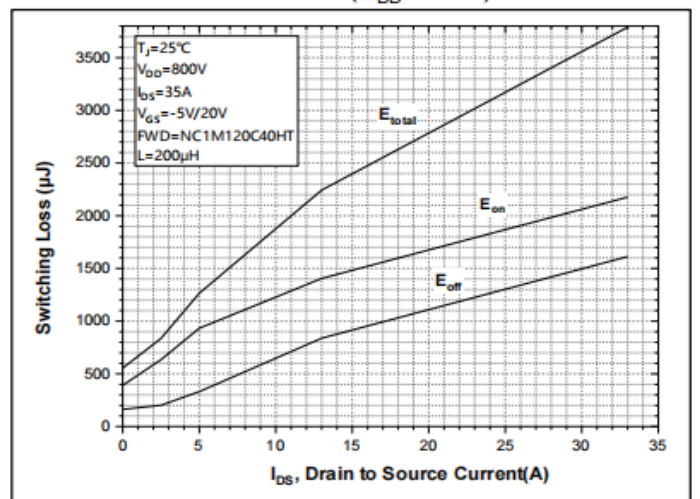


Figure 24. Clamped Inductive Switching Energy vs.  $R_{G(ext)}$



## Typical Performance

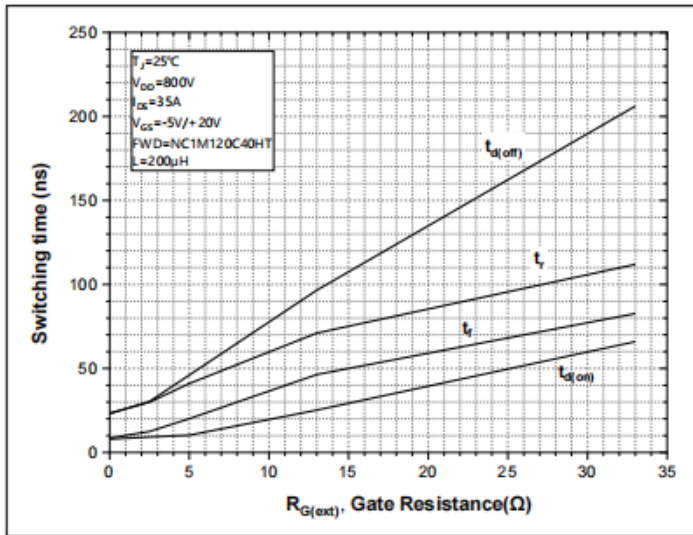
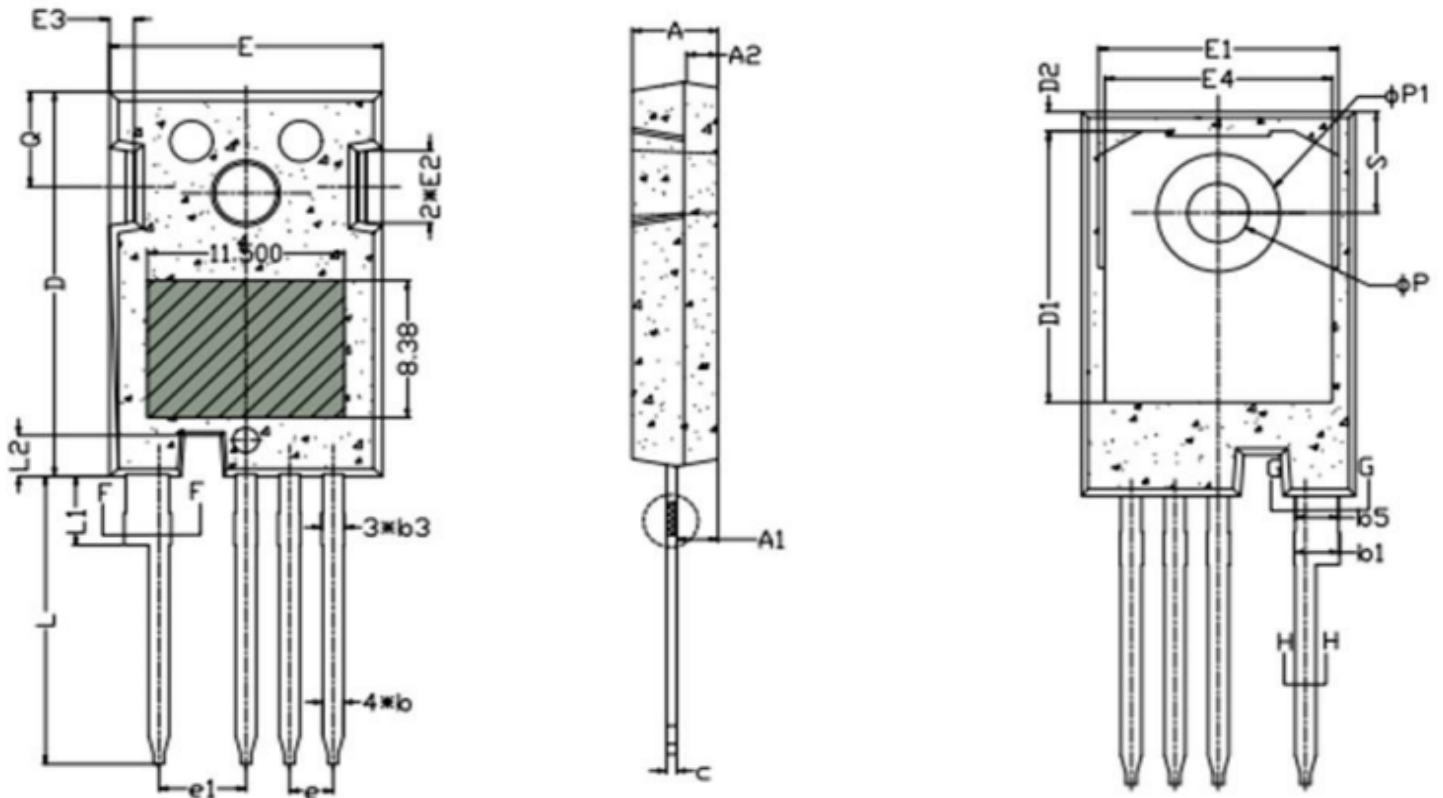
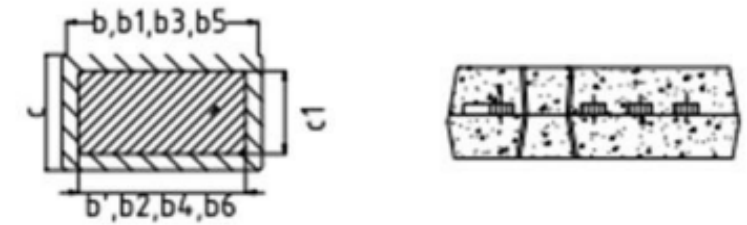


Figure 25. Switching Time vs.  $R_{G(ext)}$

## Package Outline: TO-247-4L



SYM	MILLIMETERS		
	MIN	NOM	MAX
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b'	1.07	1.20	1.28
b	1.07	1.20	1.33
b1	2.39	2.67	2.94
b2	2.39	2.67	2.84
b3	1.07	1.30	1.60
b4	1.07	1.30	1.50
b5	2.39	2.53	2.69
b6	2.39	2.53	2.64
c	0.55	0.60	0.68
c1	0.55	0.60	0.65
D	23.30	23.45	23.60
D1	16.25	16.55	17.65
D2	0.95	1.19	1.25
E	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e	2.54 BSC		
e1	5.08 BSC		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
φP	3.51	3.61	3.65
φP1	7.19 REF.		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30
N*	4		



截面 F-F, H-H, G-G

NOTE:

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