1200V N-Channel Silicon Carbide Power MOSFET

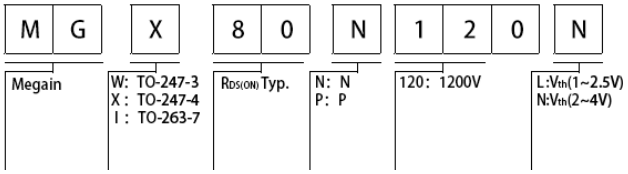
■ Product Summary

- V_{DS} 1200V
- I_D 35A
- $R_{DS(ON)}$ (at V_{GS} = 20V) 71mΩ（Max: 92mΩ）
- $R_{DS(ON)}$ (at V_{GS} = 18V) 80mΩ（Max: 104mΩ）
- $R_{DS(ON)}$ (at V_{GS} = 15V) 100mΩ（Max: 130mΩ）

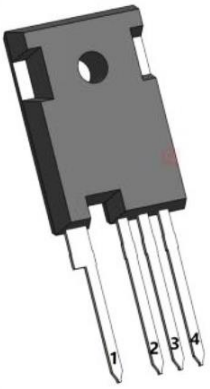
■ Applications

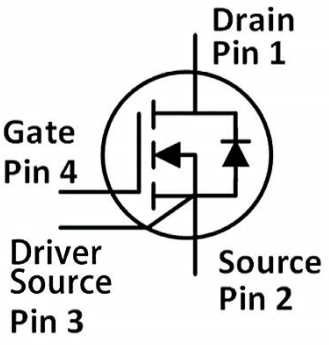
- PV string inverters
- Solar power optimizer
- Switch mode power supplies
- Online UPS/Industrial UPS
- High Voltage DC/DC Converters

■ Naming Convention



■ Package & Pin Configuration





■ Features

- High speed switching
- Very low switching losses
- High blocking voltage with low on-resistance
- Temperature independent turn-off switching losses
- Halogen free, RoHS compliant

■ Ordering Information

Order code	Package	Form	Quantity（PCS）	Marking
MGX80N120N	TO-247-4	Tube	30 / Tube	MGX80N120N

■ Absolute Maximum Ratings

T_C=25°C Unless Otherwise Noted.

Symbol	Parameter	Test Conditions	Value	Units
V_{DS}	Drain-Source Voltage	V_{GS} = 0 V, I_D = 100μA	1200	V
I_D(1)	Drain Current – Continuous	V_{GS} = 18 V, T_C = 25 ℃	35	A
I_{DM}(2)	Drain Current – Pulsed		106	A
P_D(1)	Total Power Dissipation	Tc = 25 ℃	175	W
V_{GS}	Recommend Gate Source Voltage		-5/+18	V
	Maximum Gate Source Voltage		-10/+25	
T_{STG}	Storage Temperature Range		-55 to 175	℃
T_J	Operating Junction Temperature Range		-55 to 175	℃
T_L	Soldering Temperature		260	℃

(1) I_D and P_D are limited by package.
(2) Pulse width is limited by safe operating area.

■ Thermal Characteristics

Symbol	Parameter	Max	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance Junction to Case	-	0.86	-	℃/W

■ Electrical Characteristics

T_J=25°C Unless Otherwise Noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 100μA	1200	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 1200V, V_{GS} = 0V	-	1	100	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS} = 18V	-	1	100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 10mA	1.8	2.7	3.6	V
$R_{DS(ON)}$	Drain-Source On-state Resistance	V_{GS} = 18V, I_D = 15A	-	80	104	mΩ
		V_{GS} = 15V, I_D = 15A	-	100	130	
Dynamic						
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DS} = 800V, f = 1MHz, V_{AC} = 25mV	-	659	-	pF
C_{oss}	Output Capacitance		-	45	-	
C_{rss}	Reverse Transfer Capacitance		-	5	-	
E_{oss}	C_{OSS} Stored Energy			25		μJ
Q_g	Total Gate Charge	V_{DS} = 800V, V_{GS} = -5/+18V, I_D = 15A	-	54	-	nC
Q_{gs}	Gate-Source Charge		-	9.5	-	
Q_{gd}	Gate-Drain Charge		-	30.5	-	
$R_{G(int)}$	Internal Gate Resistance	f = 1MHz, V_{AC} = 25mV	-	1	-	Ω
$t_{d(ON)}$	Turn-on Delay Time	V_{DS} = 800V, V_{GS} = -5/+18V, R_G = 2.5Ω, I_D = 15A	-	11	-	nS
t_r	Turn-on Rise Time		-	12	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	23	-	
t_f	Turn-off Fall Time		-	7.5	-	
E_{ON}	Turn-on Switching Energy	V_{DS} = 800V, V_{GS} = -5/+18V, R_G = 2.5Ω, I_D = 15A	-	121	-	μJ
E_{OFF}	Turn-off Switching Energy		-	24	-	μJ
Body Diode Characteristics						
I_S	Continuous Source Current		-	-	35	A
V_{SD}	Diode Forward Voltage	V_{GS} = 0V, I_S = 15A	-	4.3	-	V
t_{rr}	Reverse Recovery Time	I_S = 15A, V_{DS} = 800V V_{GS} = -5V di/dt = 1000A/μs	-	21.5	-	nS
Q_{rr}	Reverse Recovery Charge		-	113	-	nC
I_{rrm}	Peak Reverse Recovery Current		-	9	-	A

■ Typical Characteristics

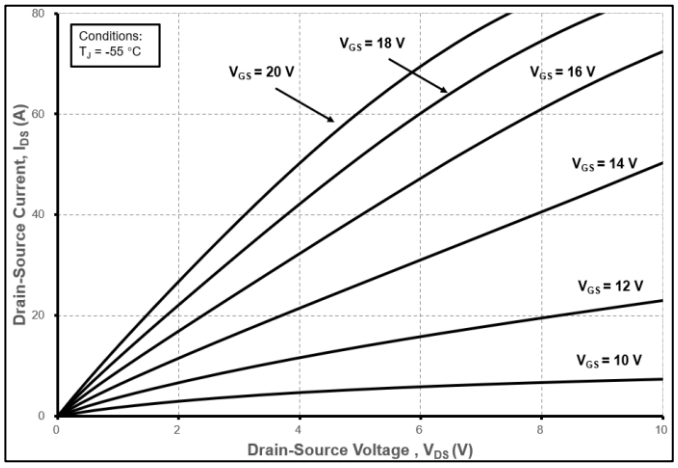


Fig 1. Typical Output Characteristics at T_J = -55℃

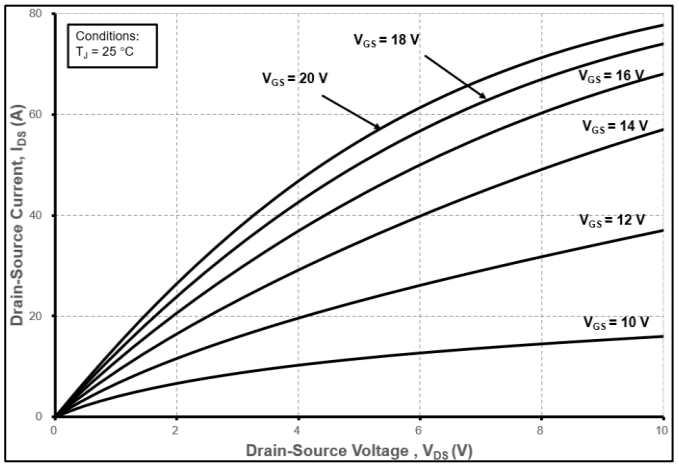


Fig 2. Typical Output Characteristics at T_J = 25℃

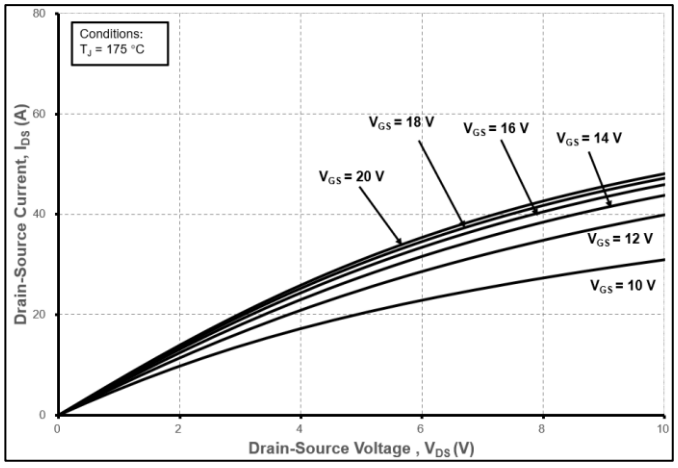


Fig 3. Typical Output Characteristics at T_J = 175℃

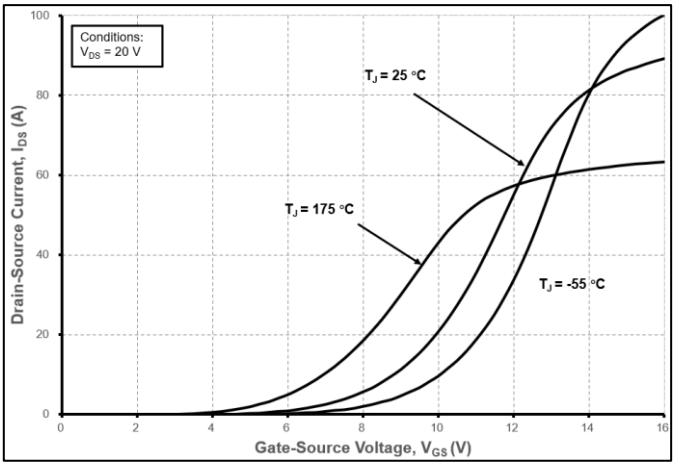


Fig 4. Typical Transfer Characteristics for Various Temperatures

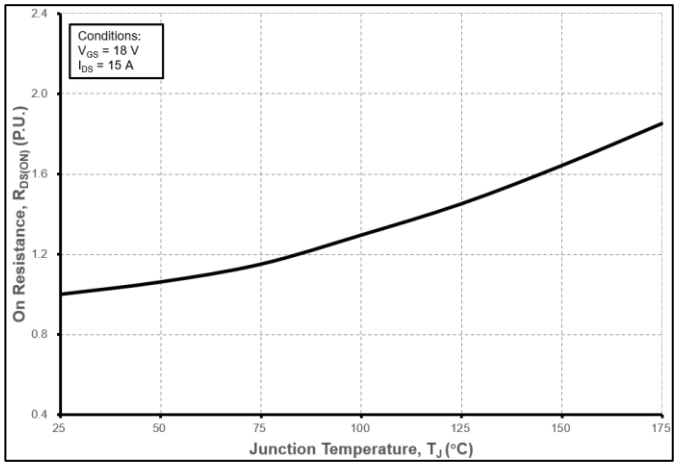


Fig 5. Normalized On-Resistance vs. Temperature

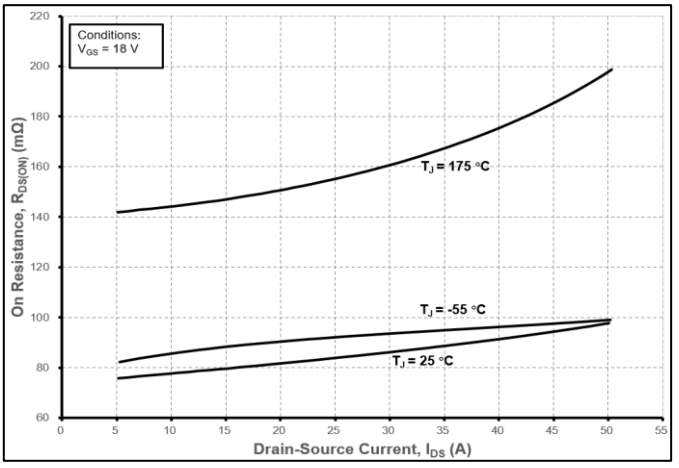


Fig 6. On-Resistance vs. Drain Current for Various Temperatures

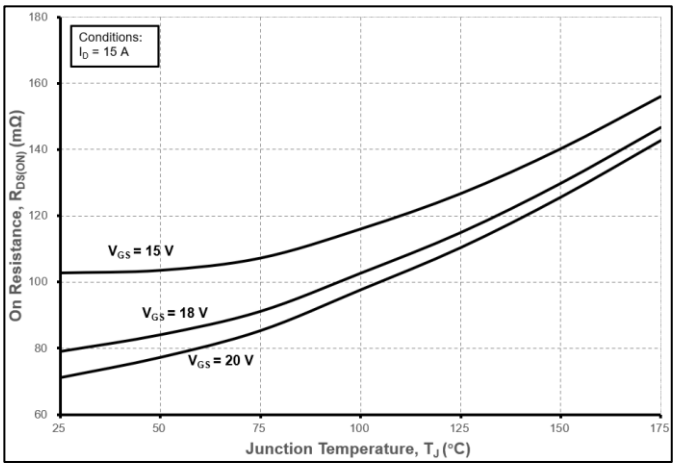


Fig 7. On-Resistance vs. Temperature for Various Gate Voltage

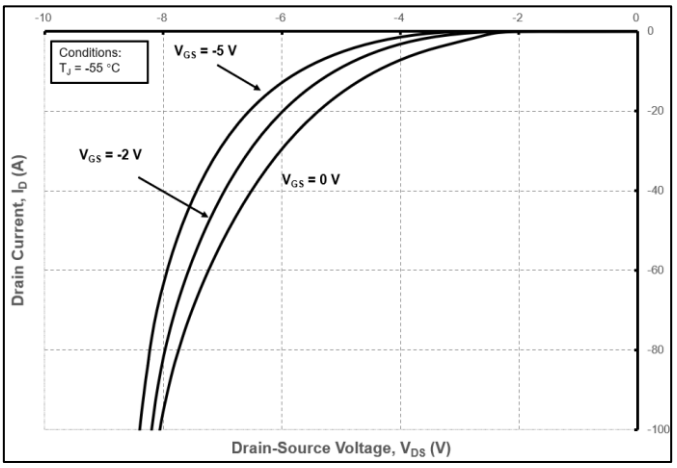


Fig 8. Typical Body Diode Characteristics at T_J = -55℃

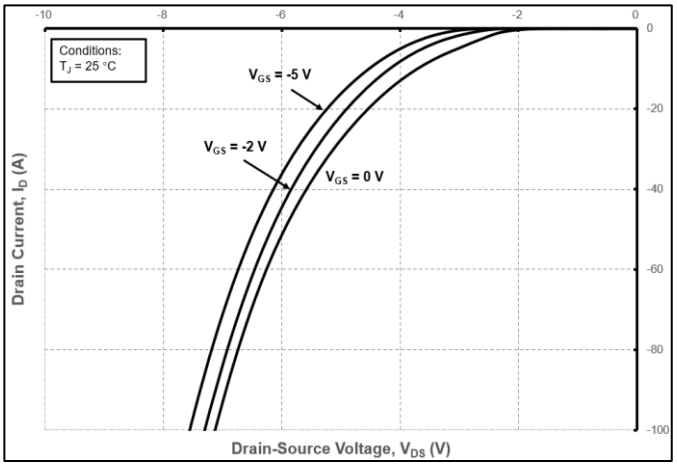


Fig 9. Typical Body Diode Characteristics at T_J = 25℃

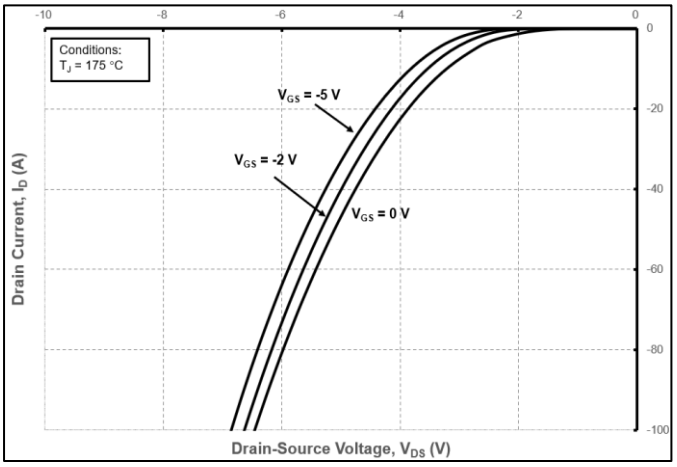


Fig 10. Typical Body Diode Characteristics at T_J = 175℃

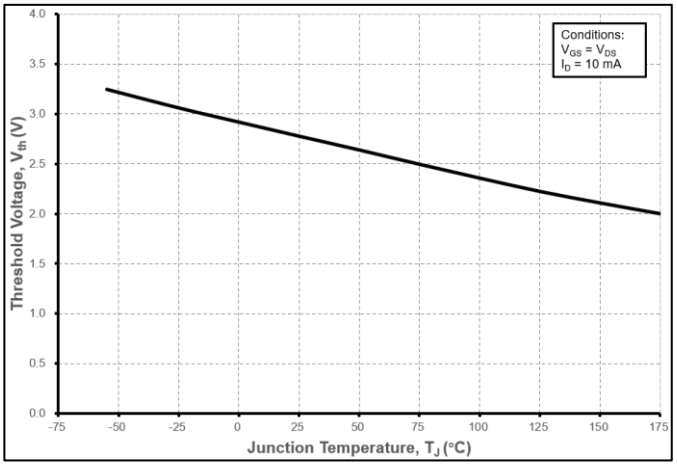


Fig 11. Typical Threshold Voltage vs. Temperature

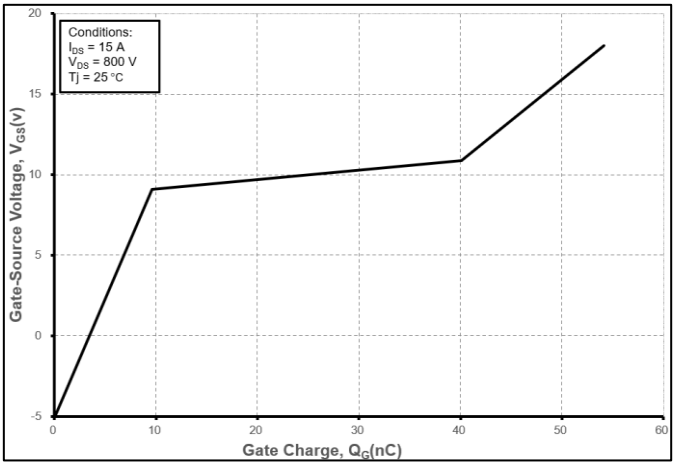


Fig 12. Gate Charge Characteristics

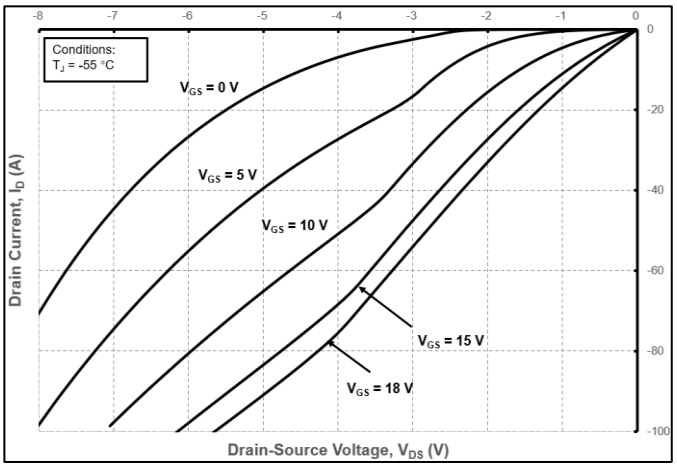


Fig 13. Typical 3rd Quadrant Characteristics at T_J = -55℃

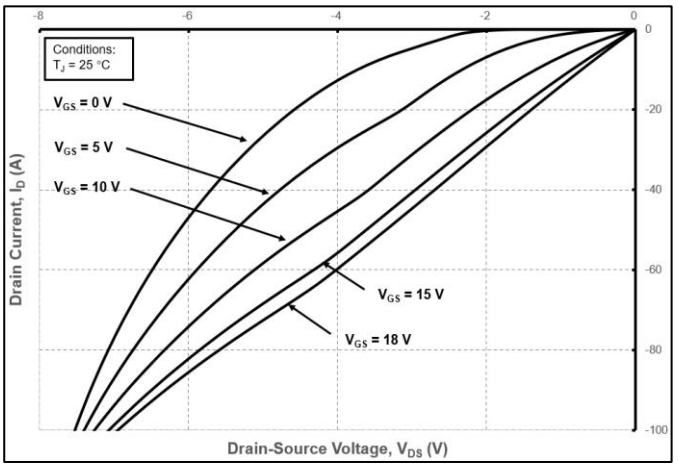


Fig 14. Typical 3rd Quadrant Characteristics at T_J = 25℃

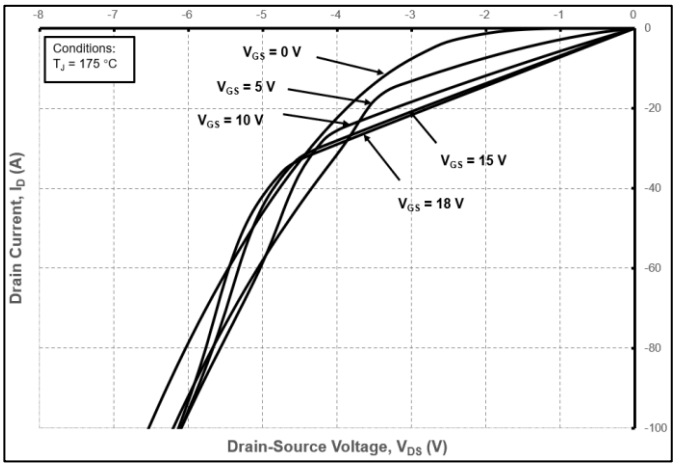


Fig 15. Typical 3rd Quadrant Characteristics at T_J = 175℃

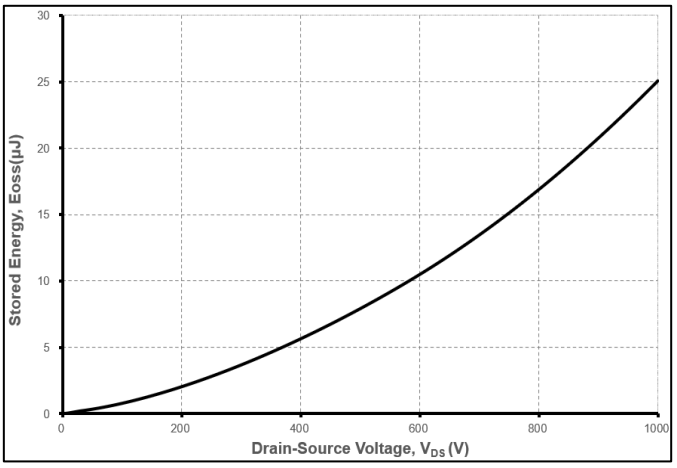


Fig 16. Output Capacitor Stored Energy

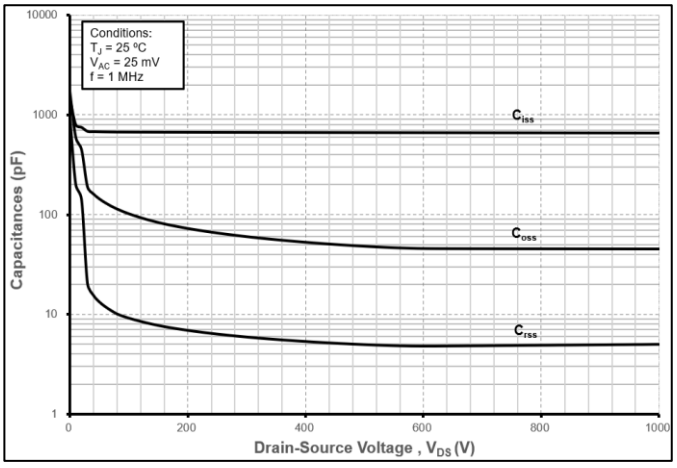


Fig 17. Capacitances vs. Drain-Source Voltage

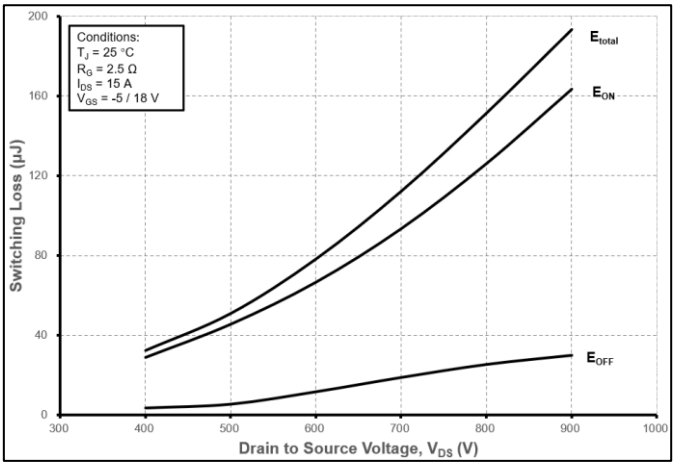


Fig 18. Clamped Inductive Switching Energy vs. V_{DS}

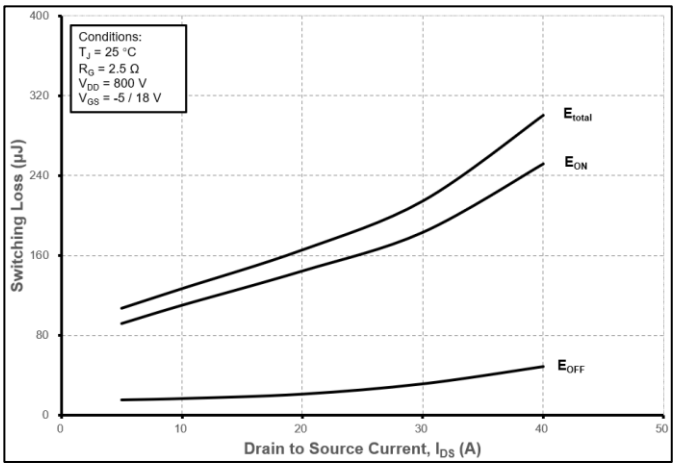


Fig 19. Clamped Inductive Switching Energy vs. I_{DS}

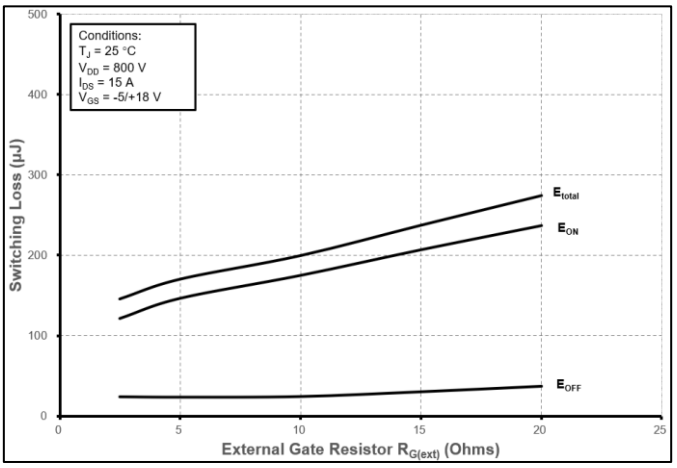


Fig 20. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

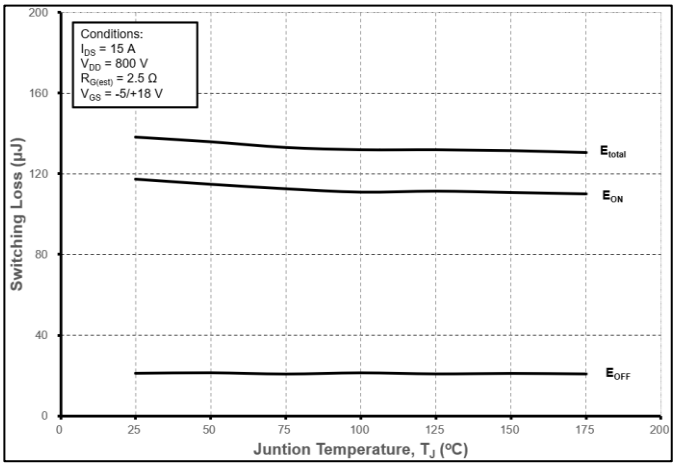


Fig 21. Clamped Inductive Switching Energy vs. T_J

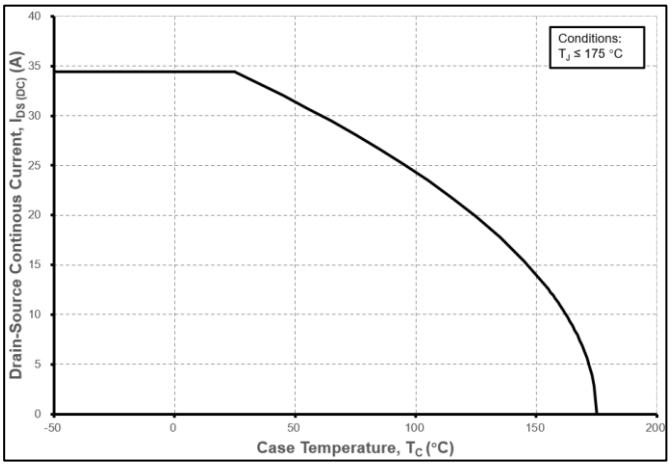


Fig 22. Continuous IDS Current Derating Curve

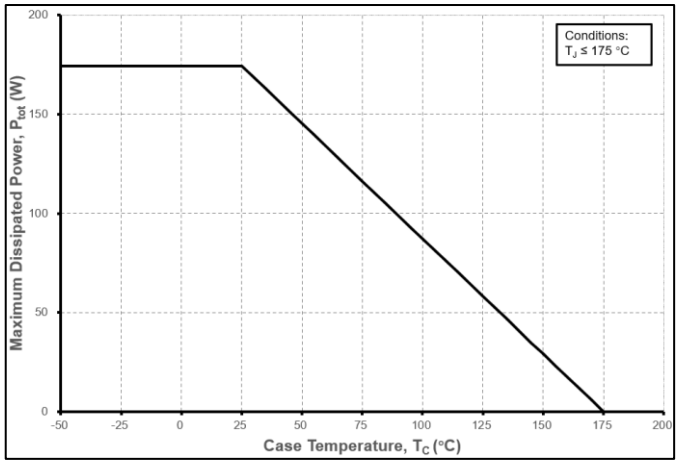


Fig 23. Power Dissipation Derating Curve

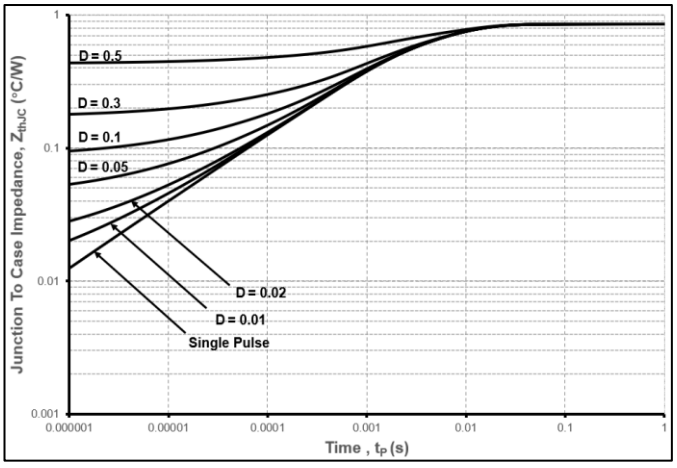


Fig 24. Typical Transient Thermal Impedance

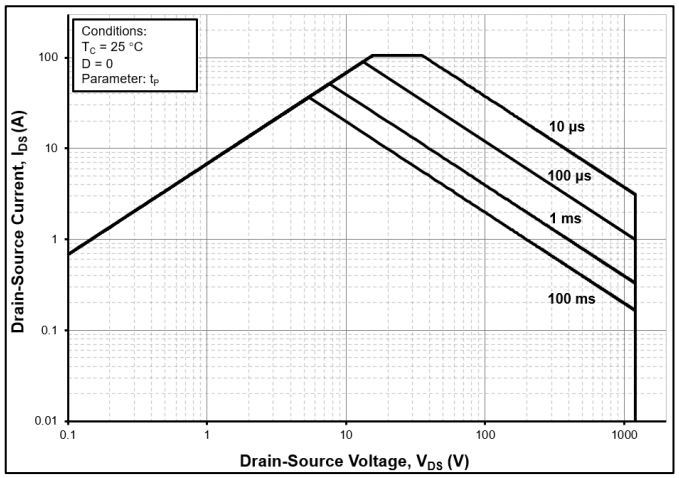
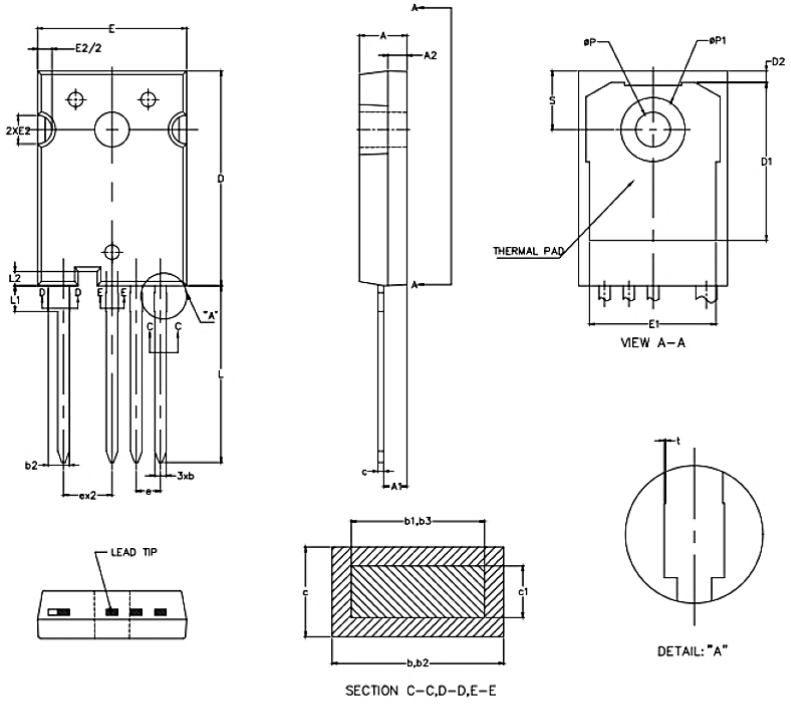


Fig 25. Safe Operating Area

■ Package size

Unit：mm。

TO-247-4：



SYMBOLS	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	2.16	2.26	0.085	0.089
b3	2.15	2.22	0.085	0.087
c	0.59	0.66	0.023	0.026
c1	0.58	0.62	0.023	0.024
D	22.40	22.60	0.882	0.890
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	2.90	3.10	0.114	0.122
e	2.54BSC		0.1BSC	
L	18.30	18.60	0.720	0.732
L1	——	2.80	——	0.110
L2	——	1.50	——	0.059
øP	3.50	3.70	0.138	0.146
øP1	——	7.40	——	0.291
S	6.05	6.25	0.238	0.246
t	0.00	0.15	0.000	0.006