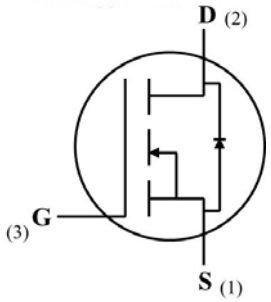
Silicon Carbide Power MOSFET （N-Channel Enhancement）

V_{DS}	1200V
$I_{D\ (25°C)}$	46A
$R_{DS(on)}$	50mΩ





Features

- High speed switching
- Essentially no switching losses
- Reduction of heat sink requirements
- Maximum working temperature at 175 °C
- High blocking voltage
- Fast Intrinsic diode with low recovery current
- High-frequency operation
- Halogen free, RoHS compliant

Typical Applications

Typical applications are in power factor correction(PFC), solar inverter, uninterruptible power supply, motor drives, photovoltaic inverter, electric car and charger.

Mechanical Data

- **Package**: TO-247AB
- **Terminals**: Tin plated leads
- **Polarity**: As marked

■Maximum Ratings (T_C=25℃ Unless otherwise specified）

PARAMTETER	SYMBOL	UNIT	VALUE	TEST CONDITIONS	NOTE
Device marking code			D212060NCTYG3		
Drain source voltage @ T_j=25°C	$V_{DS,max}$	V	1200	V_{GS}=0V, I_D=100uA	
Gate source voltage @ T_j=25°C	$V_{GS,max}$	V	-8/+22	Absolute maximum values (AC f >1Hz, duty cycle < 1%)	
Gate source voltage @ T_j=25°C	$V_{GS,op}$	V	-5/+18	Recommended operational values	
Continuous drain current @ T_c=25°C	I_D	A	46	V_{GS}=18V, Tc=25℃	Fig.17
Continuous drain current @ T_c=100°C			31	V_{GS}=18V, Tc=100℃	
Pulsed drain current	$I_{D(pulsed)}$	A	90	Pulse width t_p limited by $T_{j,max}$	Fig.22
Avalanche energy,Single pulse	E_{AS}	mJ	534	V_{DD}=75V, L=30mH	
Power Dissipation	P_{TOT}	W	214	T_c=25°C , Tj = 175℃	Fig.16
Power Dissipation			107	T_c=100°C, Tj = 175℃	
Operating junction and Storage temperature range	Tj ,Tstg	°C	-55 to +175		
Soldering temperature	T_L	°C	260	1.6mm (0.063”) from case for 10s	
Mounting torque	T_M	Nm	0.6	M3 screw Maximum of mounting process: 3	

■Static Electrical Characteristics（Tc=25℃ unless otherwise specified ）

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Gate threshold voltage	$V_{GS(th)}$	V	2.0	3.0	4.0	V_{DS}=V_{GS}, I_D= 8mA	Fig.4, 11
				2.3		V_{DS}=V_{GS}, I_D= 8mA, Tj=175℃	
Drain source breakdown voltage	$V_{(BR)DSS}$	V	1200			V_{GS}=0V, I_D=100uA	
Drain source leakage current	I_{DSS}	uA		10	100	V_{DS}=1200V, V_{GS}= 0V	
Gate source leakage current	I_{GSS}	nA		10	100	V_{GS}= 18V, V_{DS}=0V	
Current drain source on-state resistance	$R_{DS\ ON}$	mΩ		60		V_{GS}=15V, I_D=20A	Fig.5, 6, 7
				50	66	V_{GS}=18V, I_D=20A	
				100		V_{GS}=15V, I_D=20A,Tj=175℃	
				92		V_{GS}=18V, I_D=20A,Tj=175℃	
Transconductance	g_f	S		15		V_{DS}=20V,I_D=20A	Fig.4
				14.5		V_{DS}=20V,I_D=20A,Tj=175℃	

■Dynamic Electrical Characteristics（Tc=25℃ unless otherwise specified ）

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Input capacitance	Ciss	pF		2138		V_{DS}=800V, V_{GS}=0V, Tj=25℃, f=1 MHz, V_{AC} = 25mV	Fig.13, 14
Output capacitance	Coss			88			
Reverse capacitance	Crss			4.6			
Coss stored energy	Eoss	uJ		35			Fig.15
Gate source charge	Qgs	nC		21.4		V_{DS}=800V, V_{GS}=-5/+18V, I_D=20A	Fig.12
Gate drain charge	Qgd			41.6			
Gate charge	Qg			78.8			
Internal gate resistance	Rg	Ω		1.5		f=1MHz	

■Switching Characteristics（Tc=25℃ unless otherwise specified ）

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Turn on delay time	$t_{d(on)}$	ns		10.8		V_{DD}=800V, V_{GS}=-5/+18V, I_D=20A, Rg=2.4Ω, L=100uH	Fig.21
Rise time	t_r			12.4			
Turn off delay time	$t_{d(off)}$	ns		20.8			
Fall time	t_f			16.3			
Turn on switching energy	E_{on}	uJ		218		V_{DD}=800V, V_{GS}=-5/+18V, I_D=20A, Rg=2.4Ω, L=100uH	Fig.19, 20
Turn off switching energy	E_{off}			59			

■Body diode characteristics（Tc=25℃ unless otherwise specified ）

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Diode forward voltage	V_{SD}	V		4.3		V_{GS}=-5V,I_{SD}=10A	Fig.8
				3.1		V_{GS}=0V, I_{SD}=10A, Tj=175℃	Fig.9
Continuous diode forward current	I_S	A		39		V_{GS}=-5V,Tc=25℃	
Reverse recovery time	trr	nS		15.6		V_R=800V, V_{GS}=-5V, I_D=20A, di/dt=2000A/uS	
Reverse recovery charge	Qrr	nC		127			
Peak reverse recovery current	Irrm	A		13.6			

■Thermal Characteristics （T_a=25℃ Unless otherwise specified）

PARAMETER	SYMBOL	UNIT	Typ.
Thermal resistance	$R_{\theta J-C}$	°C /W	0.7

■Typical Characteristics

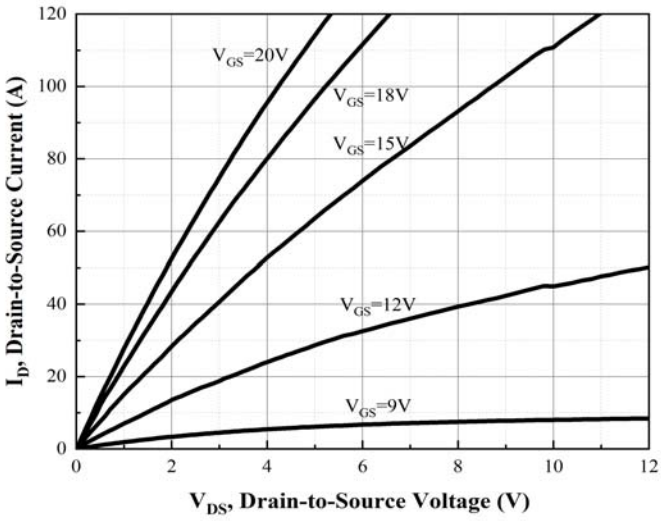


Figure 1. Output Characteristics Tj = -55℃

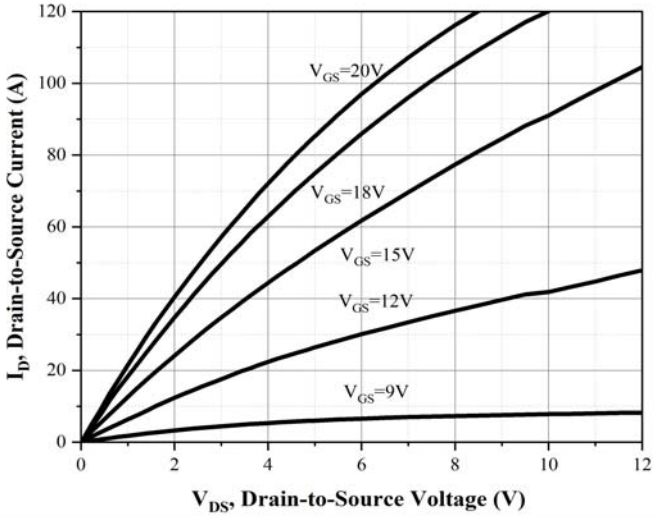


Figure2. Output Characteristics Tj = 25℃

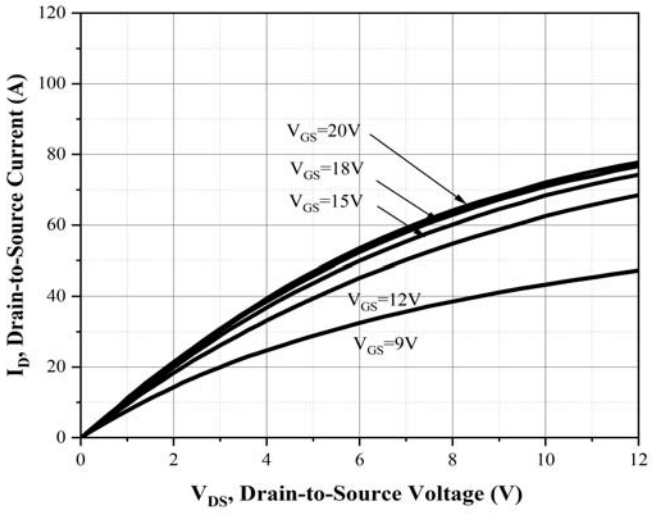


Figure 3. Output Characteristics Tj = 175℃

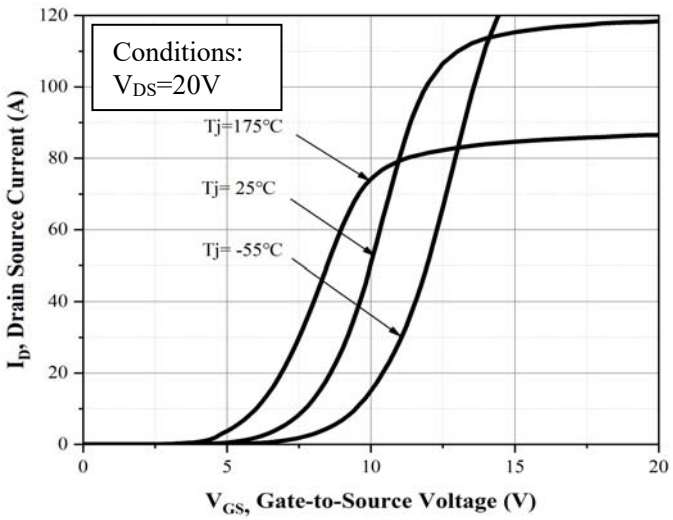


Figure 4. Transfer Characteristics for Various Junction Temperature

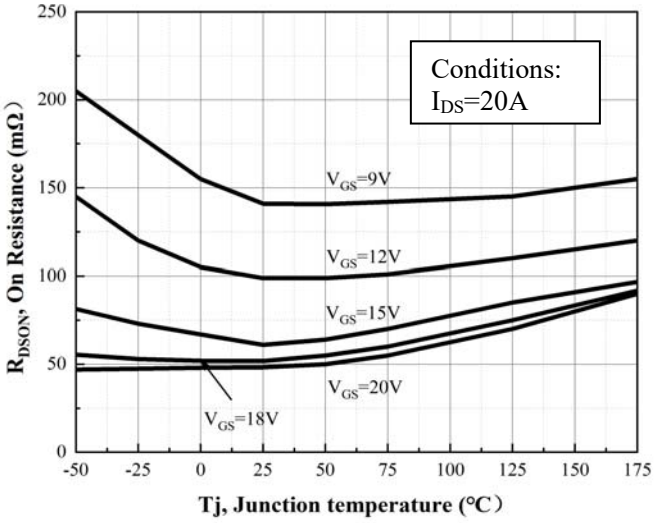


Figure 5. On-resistance vs. Temperature for Various Gate Voltage

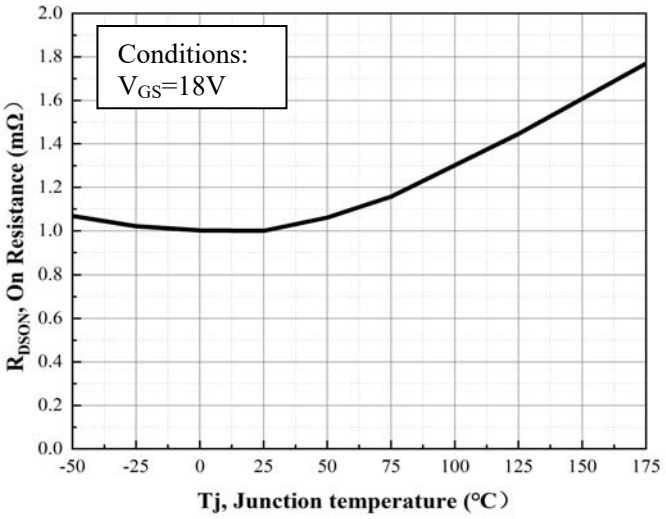


Figure 6. Normalized on-resistance vs. Temperature

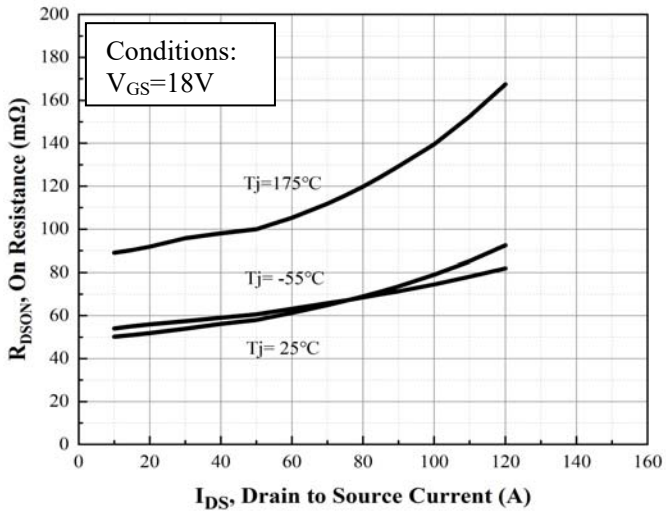


Figure 7. On-resistance vs. Drain Current

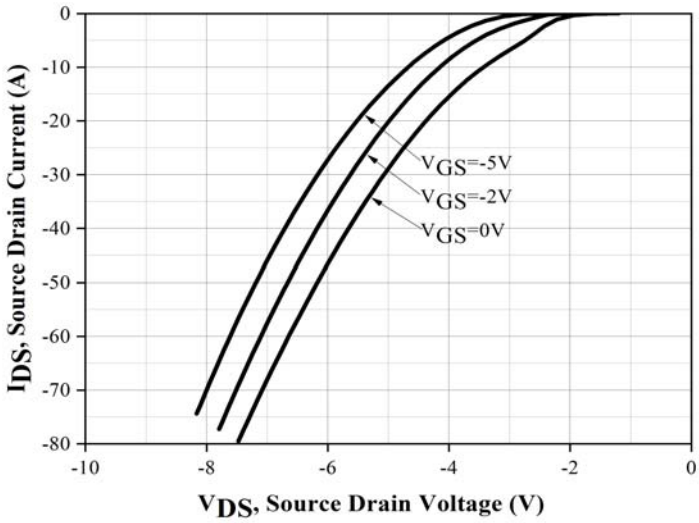


Figure 8. Body Diode Characteristic at Tj= 25 ℃

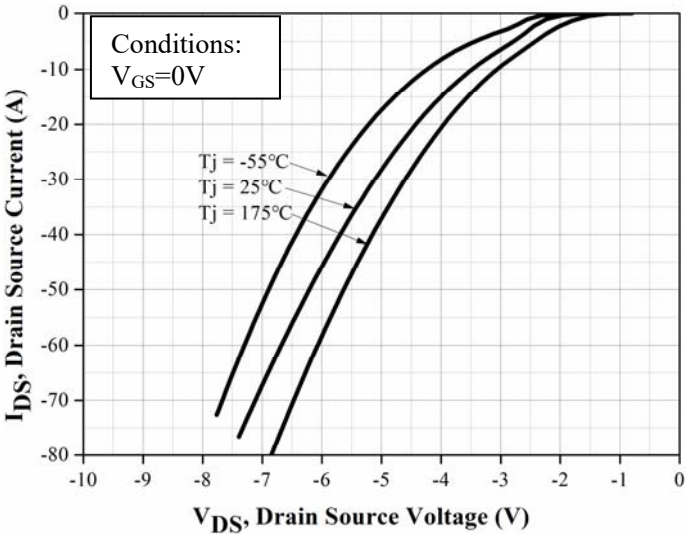


Figure 9. Body Diode Characteristic

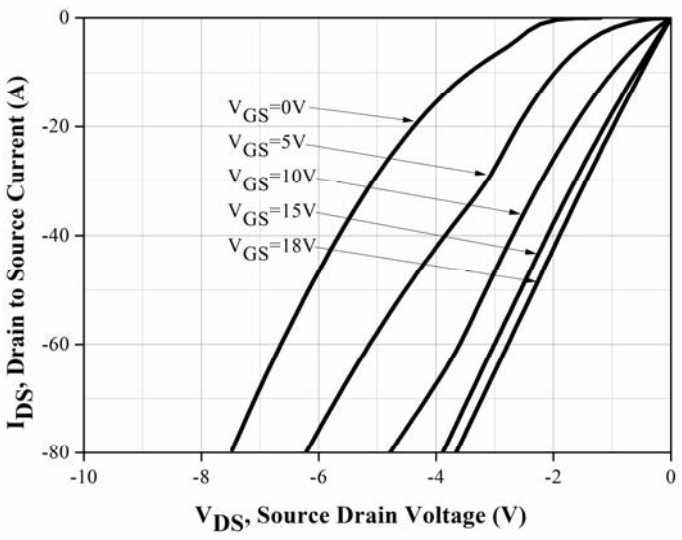


Figure 10. 3rd quadrant Characteristic at Tj= 25 ℃

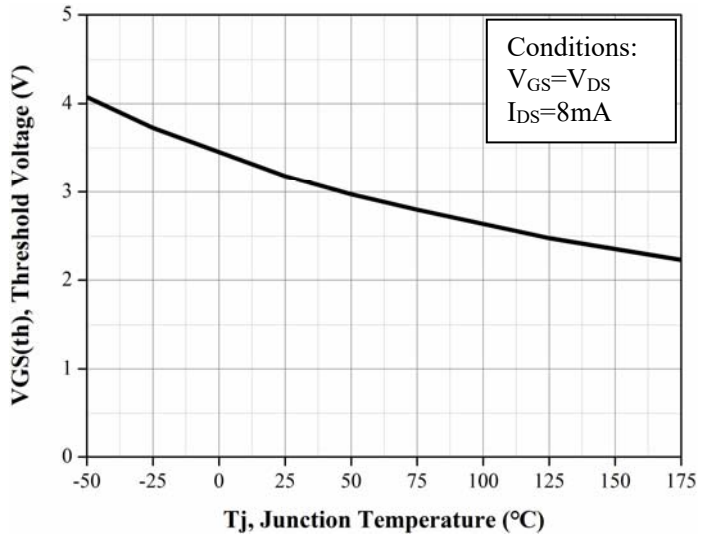


Figure 11. Threshold Voltage vs. Temperature

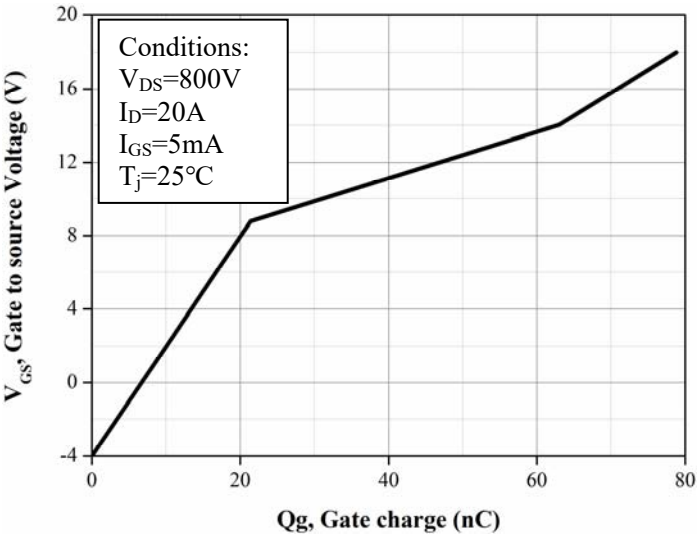


Figure 12. Gate Charge Characteristic

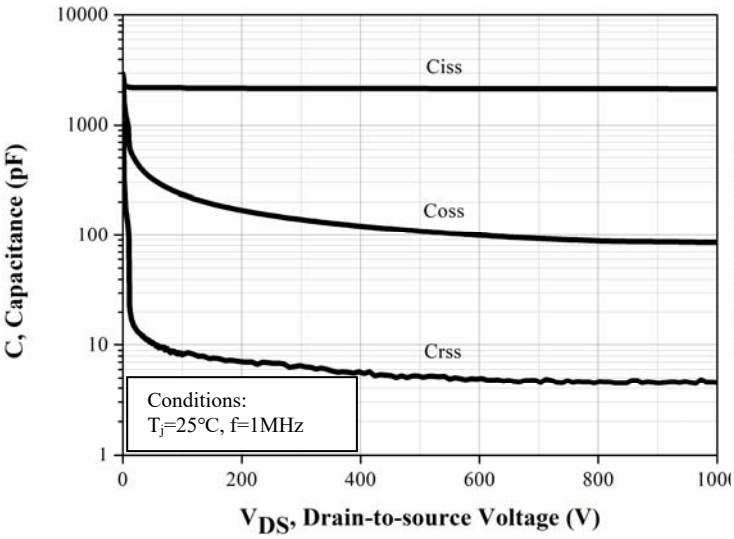


Figure 13. Capacitances vs. Drain Source Voltage (0-1000V)

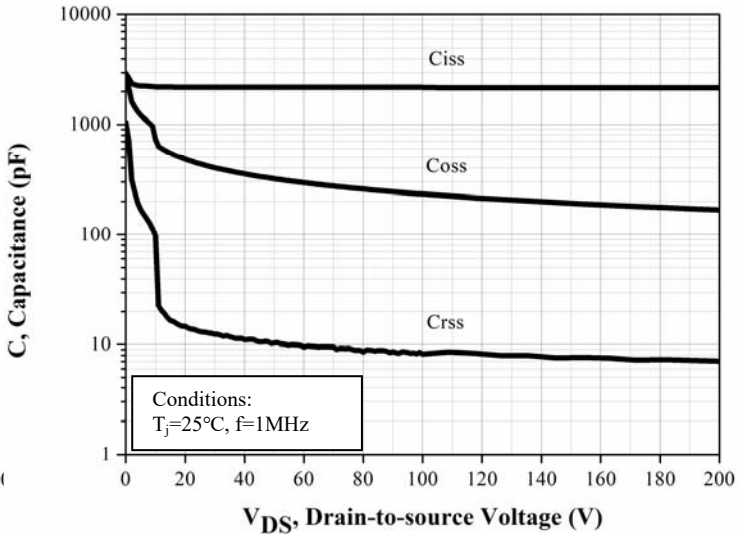


Figure 14. Capacitances vs. Drain Source Voltage (0-200V)

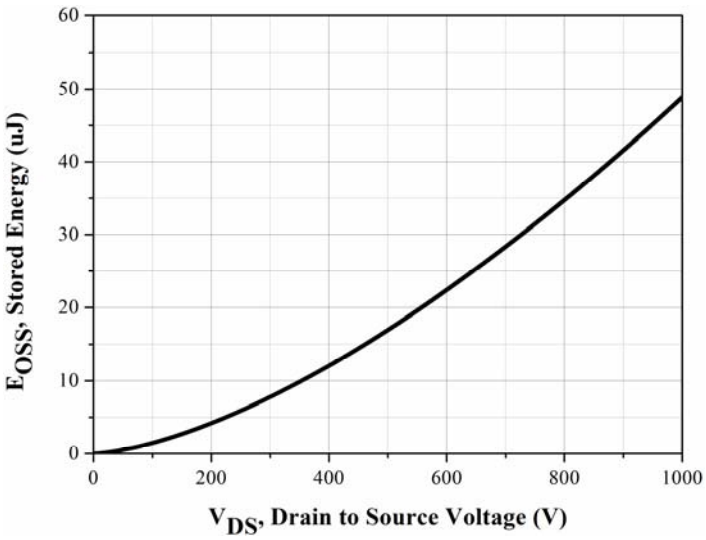


Figure 15. Output Capacitor Stored Energy

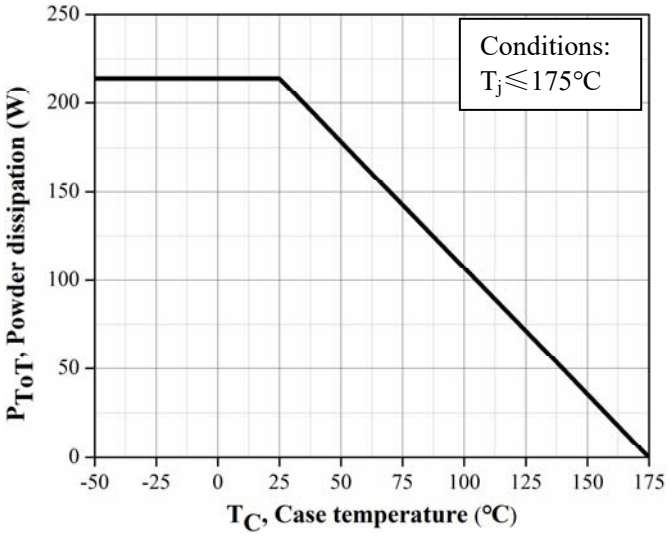


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

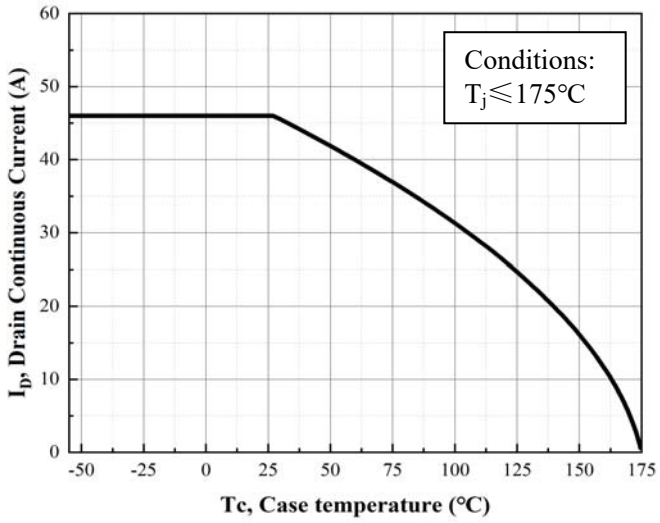


Figure 17. Coutinuous Drain Current Derating vs. Case Temperature

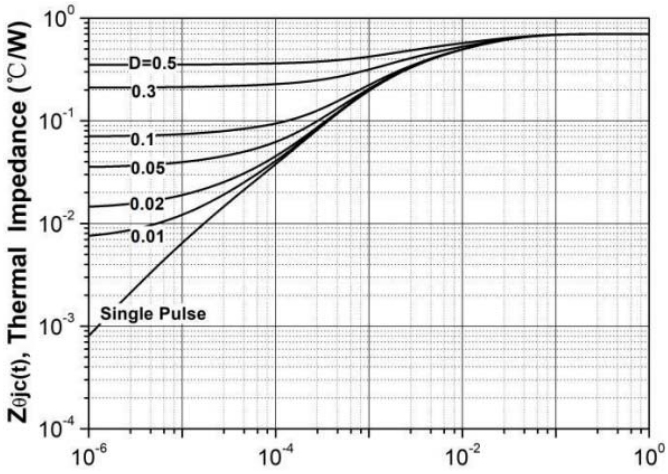


Figure18 Transient Thermal Impedance (Junction - Case)

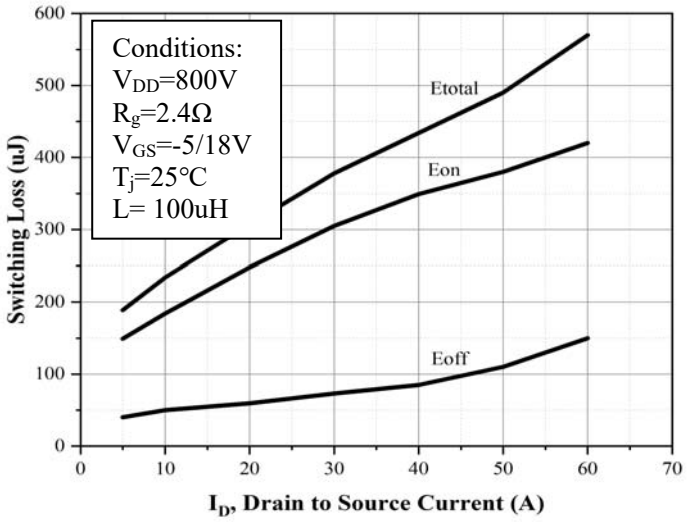


Figure 19. Clamped Inductive Switching Energy vs. Darin Current

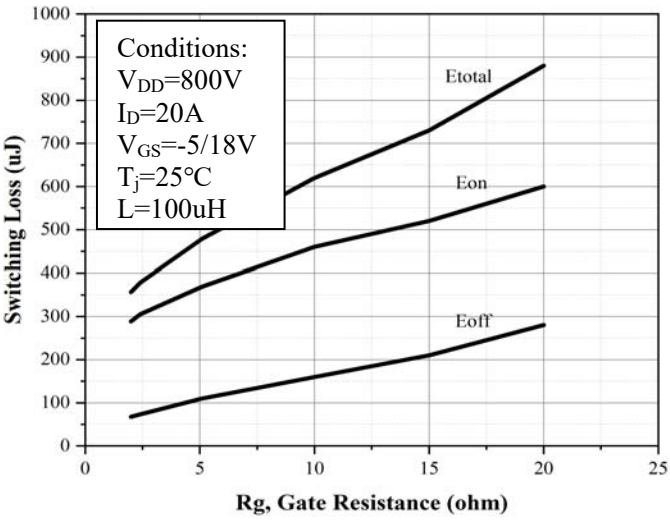


Figure 20. Clamped Inductive Switching Energy vs. Rg

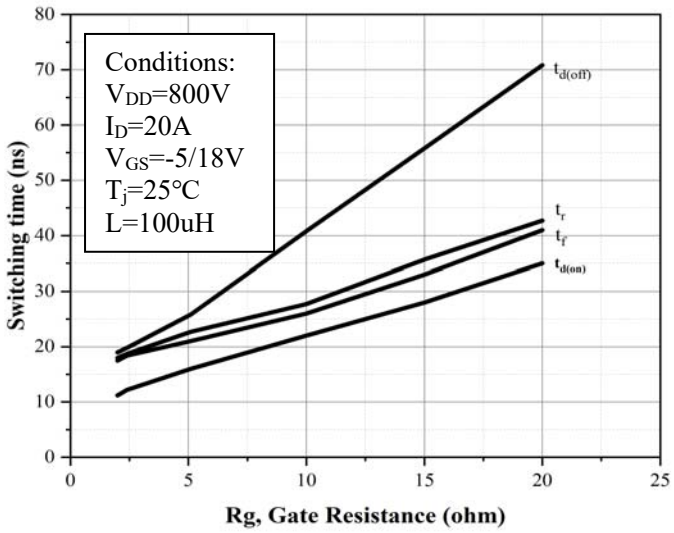


Figure 21. Switching Times vs. Rg

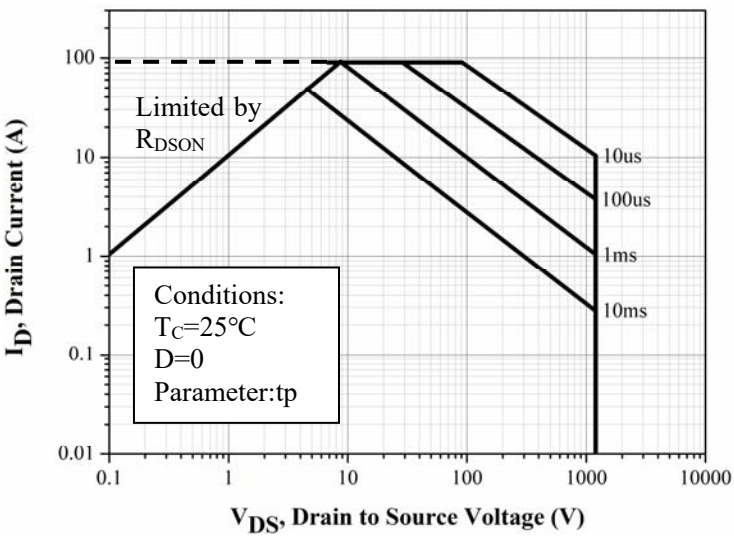


Figure 22. Safe Operating Area

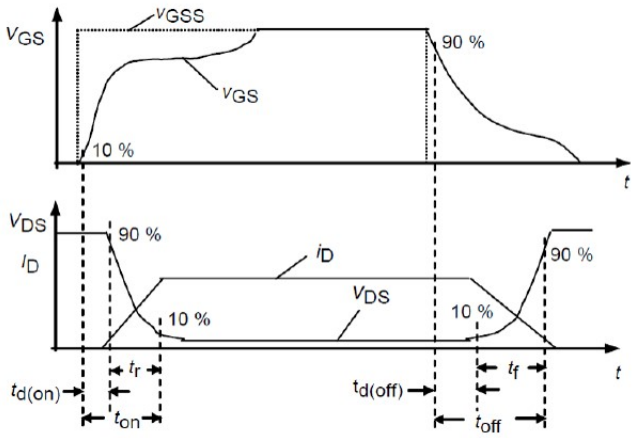


Figure 23. Switching Times Definition

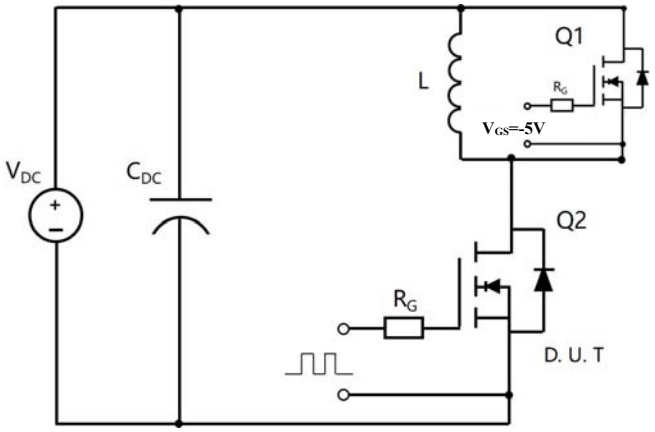
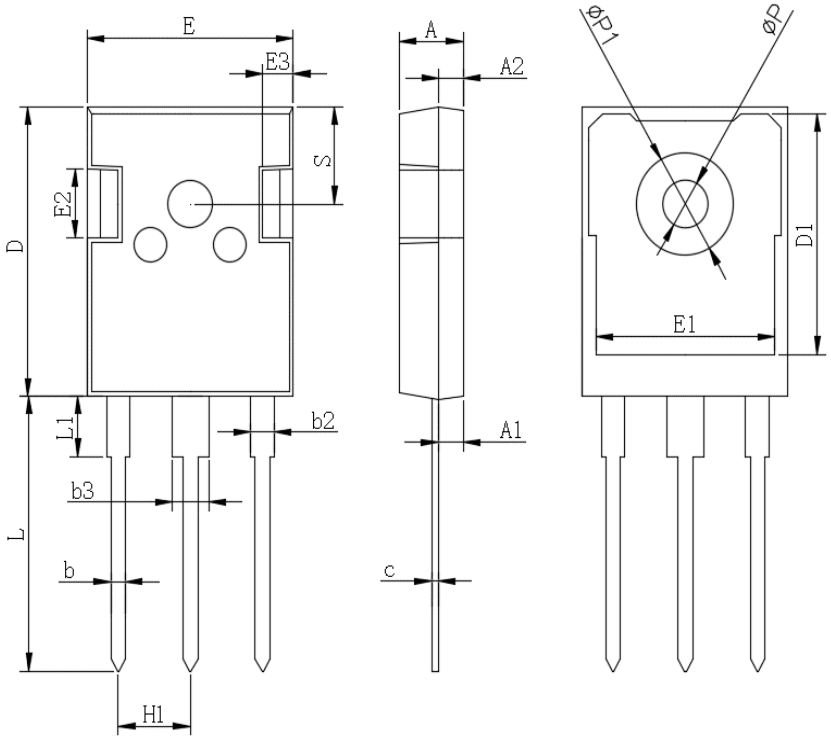


Figure 24. Clamped Inductive Switching Waveform Test Circuit

■Outline Dimensions

TO-247AB



TO-247AB		
Dim	Min	Max
A	4.80	5.20
A1	2.21	2.61
A2	1.85	2.15
b	1.0	1.4
b2	1.91	2.21
C	0.5	0.7
D	20.70	21.30
D1	16.25	16.85
E	15.50	16.10
E1	13.0	13.6
E2	4.80	5.20
E3	2.30	2.70
L	19.62	20.22
L1	-	4.30
ΦP	3.40	3.80
ΦP1	-	7.30
S	6.15TYP	
H1	5.44TYP	
b3	2.80	3.20

Notice

All products, product specifications and data are subject to change without notice to improve reliability, function or design or otherwise. Information contained herein is intended to provide a product description only. No license, express or implied, to any intellectual property rights is granted by this document. Except as provided in STARSEA's terms and conditions of sale for such products, STARSEA assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of STARSEA products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.