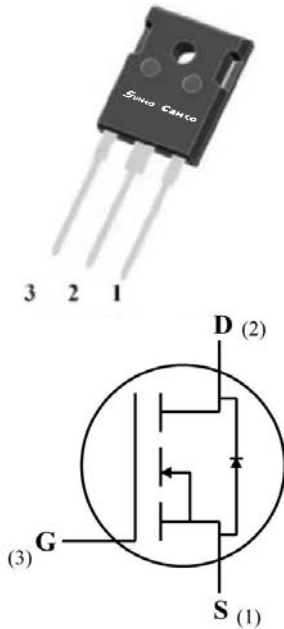


Silicon Carbide Power MOSFET (N-Channel Enhancement)

V_{DS}	1200V
I_D (25°C)	66A
$R_{DS(on)}$	33mΩ



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,

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°C Unless otherwise specified)

PARAMETER	SYMBOL	UNIT	VALUE	TEST CONDITIONS	NOTE
Device marking code			D212040NCTG2		
Drain source voltage @ T _j =25°C	$V_{DS,max}$	V	1200	$V_{GS}=0\text{ V}, I_D=100\mu\text{A}$	
Gate source voltage @ T _j =25°C	$V_{GS,max}$	V	-8/+19	Absolute maximum values	
Gate source voltage @ T _j =25°C	$V_{GS,op}$	V	-4/+15	Recommended operational values	Note1、 2
Continuous drain current @ T _c =25°C	I_D	A	66	$V_{GS}=15\text{V}, T_c=25^\circ\text{C}$	Fig.18
Continuous drain current @ T _c =100°C			48	$V_{GS}=15\text{V}, T_c=100^\circ\text{C}$	
Pulsed drain current	$I_{D(pulsed)}$	A	120	Pulse width t_p limited by $T_{j,max}$	Fig.23
Avalanche energy, Single Pulse	E_{AS}	mJ	500	$V_{DD}=75\text{V}, L=10\text{mH}$	
Power Dissipation	P_{TOT}	W	333	$T_c=25^\circ\text{C}, T_j = 175^\circ\text{C}$	Fig.17
Power Dissipation			144	$T_c=110^\circ\text{C}, T_j = 175^\circ\text{C}$	
Operating junction and Storage temperature range	T_j, T_{stg}	°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°C unless otherwise specified)

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Gate threshold voltage	$V_{GS(th)}$	V	2.0	2.5	4.0	$V_{DS}=V_{GS}, I_D=11.5mA$	Fig.4, 11
				2.0		$V_{DS}=V_{GS}, I_D=11.5mA, T_J=175^{\circ}C$	
Drain source breakdown voltage	$V_{(BR)DSS}$	V	1200			$V_{GS}=0, I_D=100\mu A$	
Zero gate voltage drain current	I_{DSS}	μA		1	50	$V_{DS}=1200V, V_{GS}=0V$	Fig.16
Gate source leakage current	I_{GSS}	nA		10	100	$V_{GS}=15V, V_{DS}=0V$	
Current drain source on-state resistance	$R_{DS(on)}$	m Ω		33	44	$V_{GS}=15V, I_D=40A$	Fig.5, 6, 7
				63		$V_{GS}=15V, I_D=40A, T_J=175^{\circ}C$	
Internal gate resistance	R_g	Ω		1.8	5.0	$f=1MHz$	
Diode forward voltage	V_{SD}	V		5.0		$V_{GS}=-4V, I_{SD}=20A$	Fig.8
				3.3		$V_{GS}=0V, I_{SD}=20A, T_J=175^{\circ}C$	Fig.9
Transconductance	g_f	S		26		$V_{DS}=20V, I_D=40A$	Fig.4
				22		$V_{DS}=20V, I_D=40A, T_J=175^{\circ}C$	

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

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Input capacitance	C_{iss}	pF		3456		$V_{DS}=1000V, V_{GS}=0V, T_J=25^{\circ}C, f=100kHz, V_{AC}=25mV$	Fig.13, 14
Output capacitance	C_{oss}			127			
Reverse capacitance	C_{rss}			7.2			
Coss stored energy	E_{oss}	μJ		69			Fig.15
Gate source charge	Q_{gs}	nC		39		$V_{DS}=800V, V_{GS}=-4/15V, I_D=40A$	Fig.12
Gate drain charge	Q_{gd}			44			
Gate charge	Q_g			116			

■Switching Characteristics (Tc=25°C unless otherwise specified)

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Turn on switching energy	E_{on}	μJ		835		$V_{DD}=800V, V_{GS}=-4/+15V, I_D=40A, R_g=2.7\Omega, L=100\mu H$	Fig.21, 20
Turn off switching energy	E_{off}			163.6			
Turn on delay time	$t_{d(on)}$	ns		20			

Rise time	t_r			30			
Turn off delay time	$t_{d(off)}$	ns		25		$V_{DD}=800V, V_{GS}=-4/+15V, I_D=40A, R_g=2.7\Omega, L=100\mu H$	Fig.21, 20
Fall time	t_f			12			

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

PARAMETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Diode forward voltage	V_{SD}	V		5.0		$V_{GS}=-4V, I_{SD}=20A$	Fig.8
				3.3		$V_{GS}=0V, I_{SD}=20A, T_J=175^\circ C$	Fig.9
Continuous diode forward current	I_S	A		66		$T_C=25^\circ C$	Note1
Reverse recovery time	t_{rr}	nS		27		$V_R=800V, V_{GS}=-4V, I_D=40A, di/dt=2250A/\mu S$	
Reverse recovery charge	Q_{rr}	nC		478			
Peak reverse recovery current	I_{rrm}	A		27			

Note 1: When using SiC Body Diode the maximum recommended $V_{GS} = -4V$

Note 2: MOSFET can also safely operate at 0/15 V

■Thermal Characteristics (Ta=25°C Unless otherwise specified)

PARAMETER	SYMBOL	UNIT	Typ.
Thermal resistance	$R_{\theta J-C}$	$^\circ C/W$	0.45

■Typical Characteristics

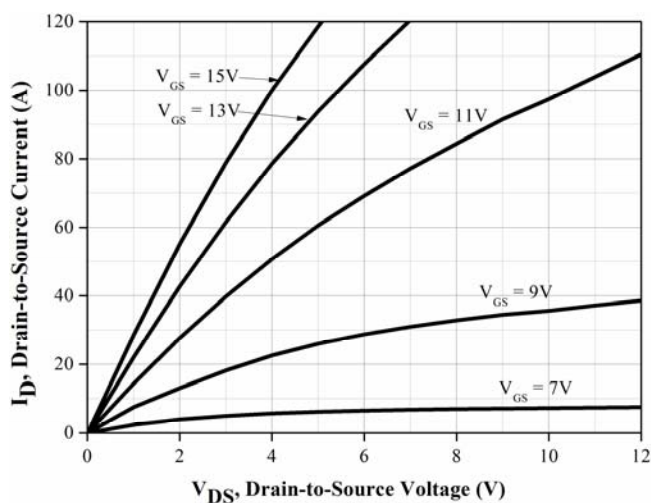


Figure 1. Output Characteristics Tj = -55°C

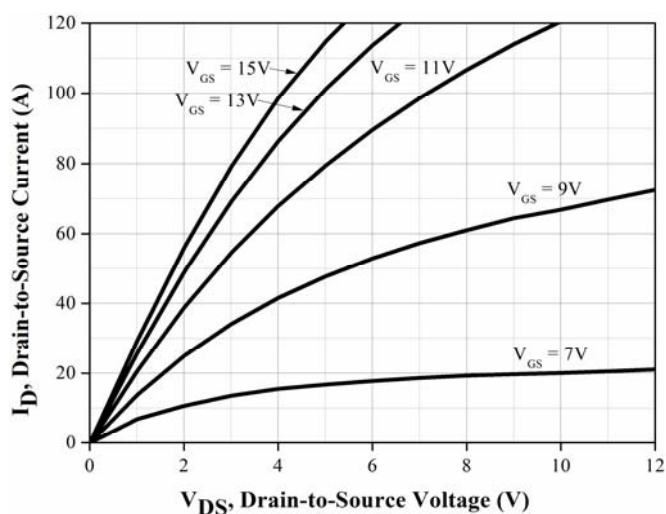


Figure2. Output Characteristics Tj = 25°C

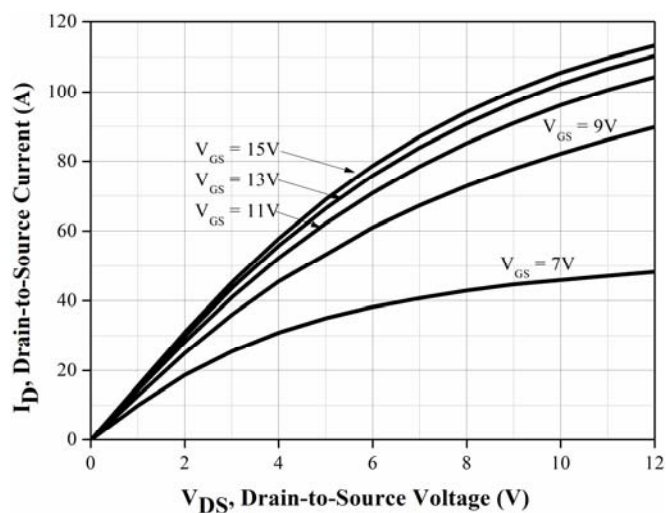


Figure 3. Output Characteristics $T_j = 175^\circ\text{C}$

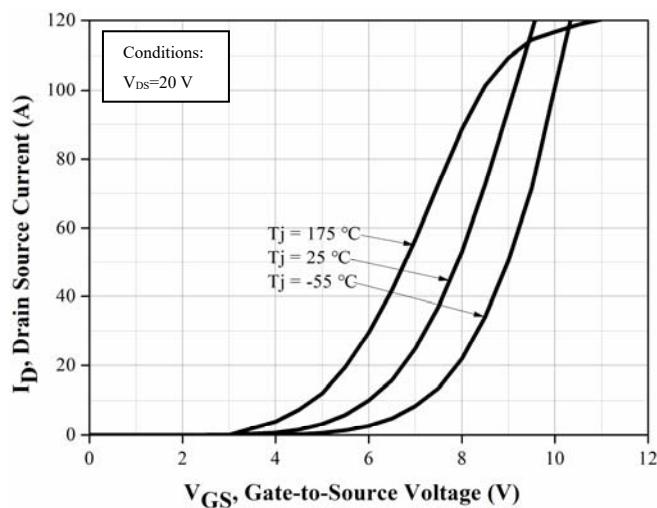


Figure 4. Transfer Characteristics for various junction temperature

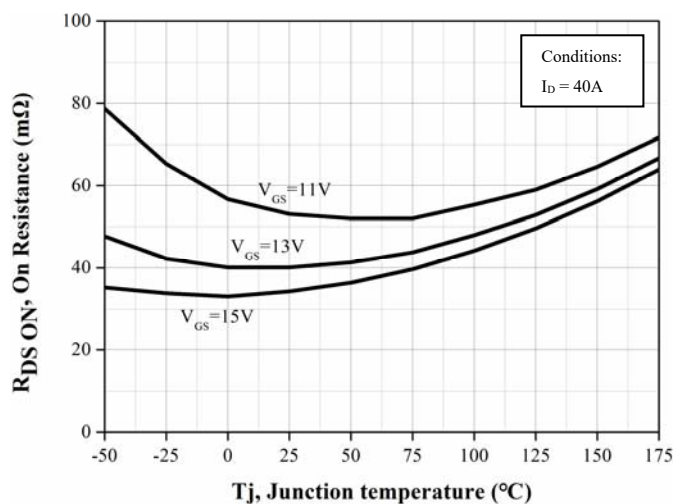


Figure 5. On-resistance vs. temperature for various gate voltage

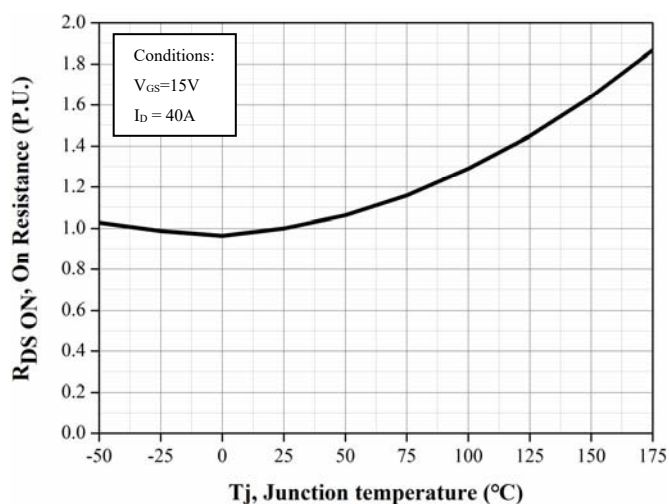


Figure 6. Normalized on-resistance vs. temperature

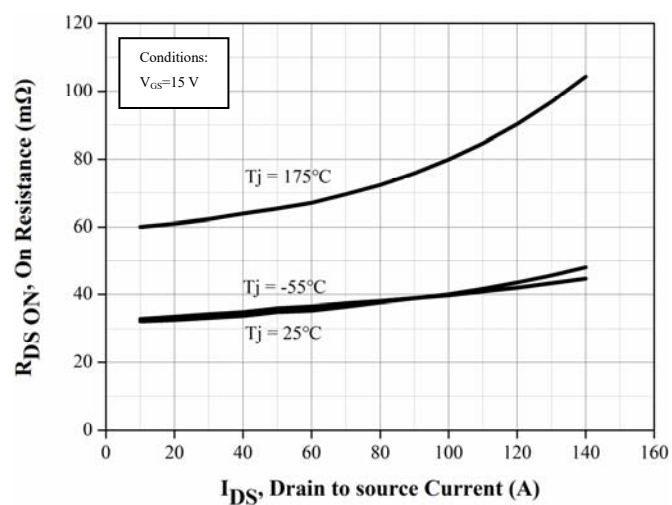


Figure 7. On-resistance vs. drain current

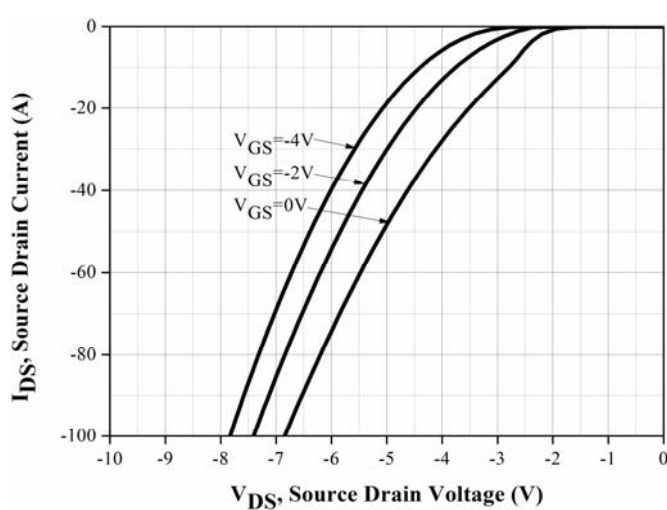


Figure 8. Body diode characteristic at $T_j = 25^\circ\text{C}$

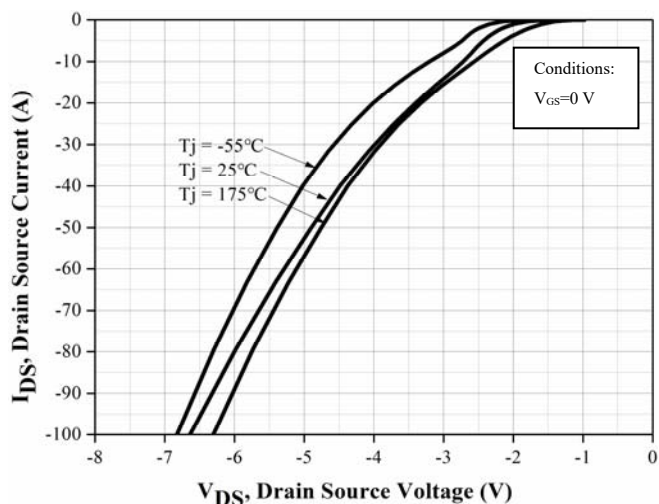


Figure 9. Body diode characteristic

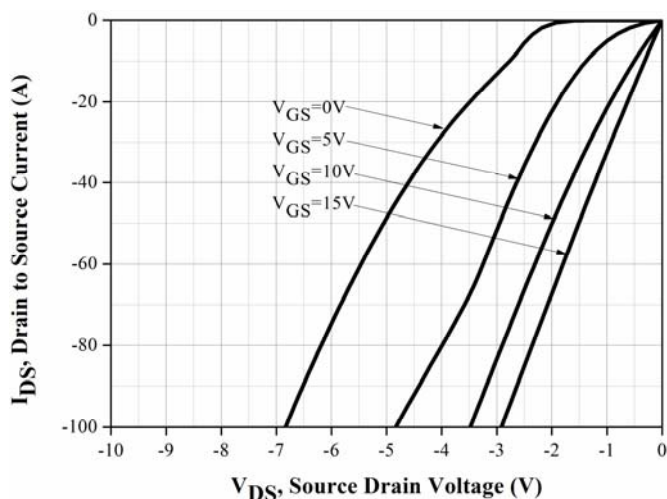


Figure 10. 3rd quadrant characteristic at $T_j = 25\text{ }^{\circ}\text{C}$

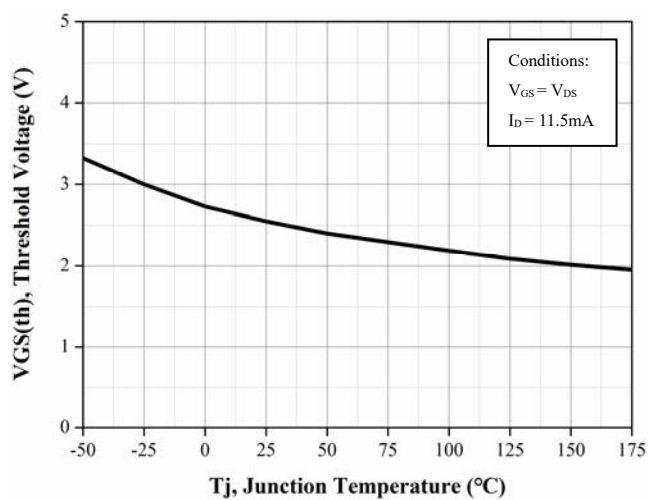


Figure 11. Threshold voltage vs. temperature

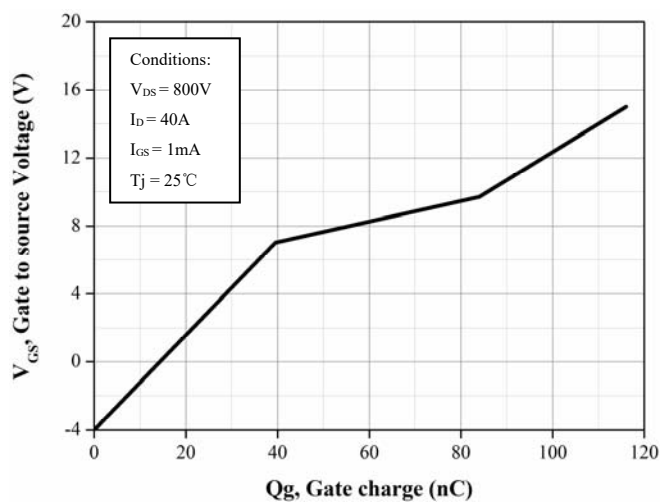


Figure 12. Gate charge characteristic

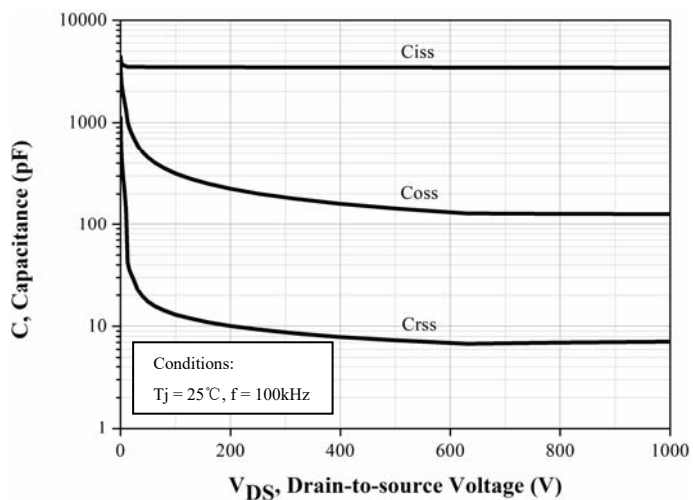


Figure 13. Capacitances vs. drain source voltage (0-1000V)

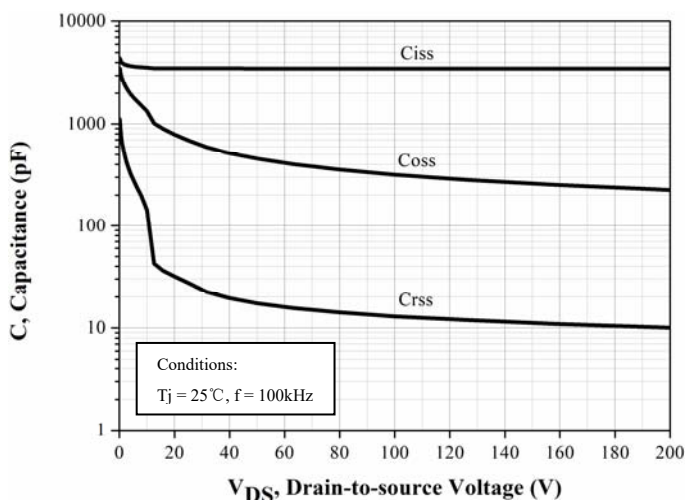


Figure 14. Capacitances vs. drain source voltage (0-200V)

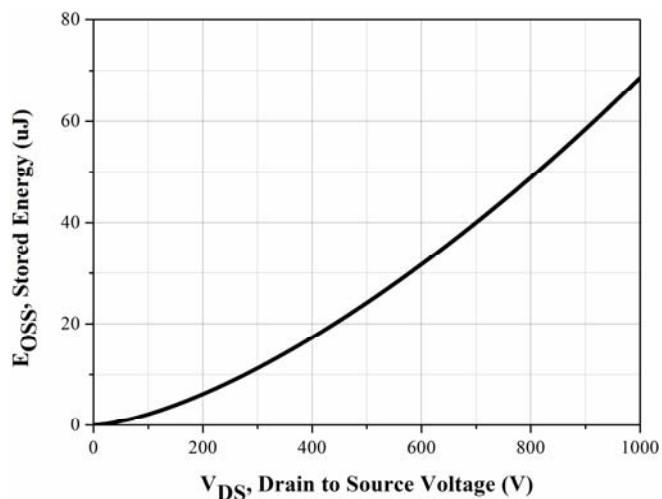


Figure 15. Output capacitor stored energy

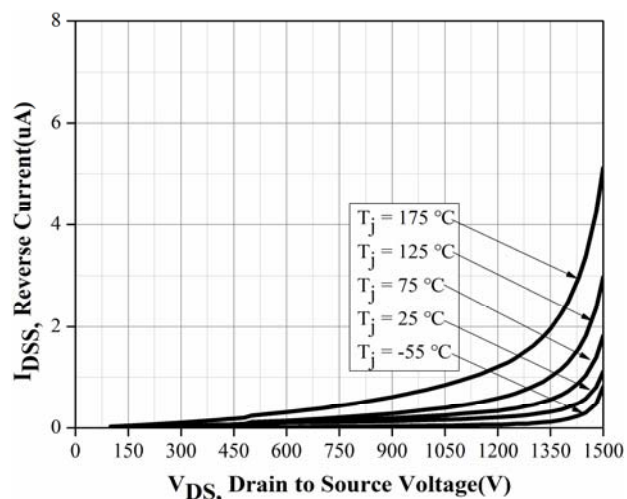


Figure 16. Reverse characteristics vs. T_J

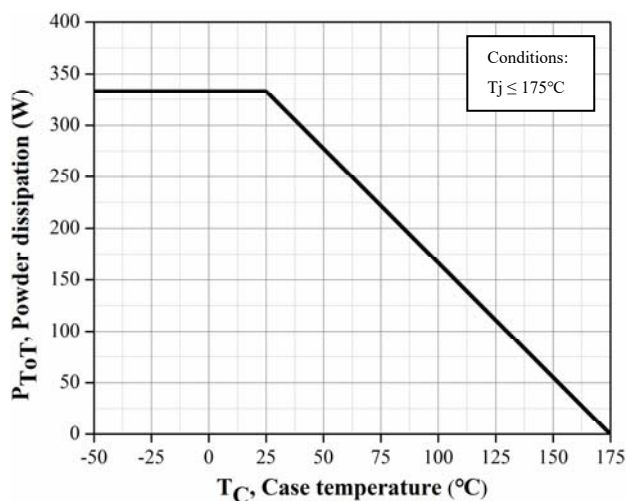


Figure 17. Maximum power dissipation derating vs. case temperature

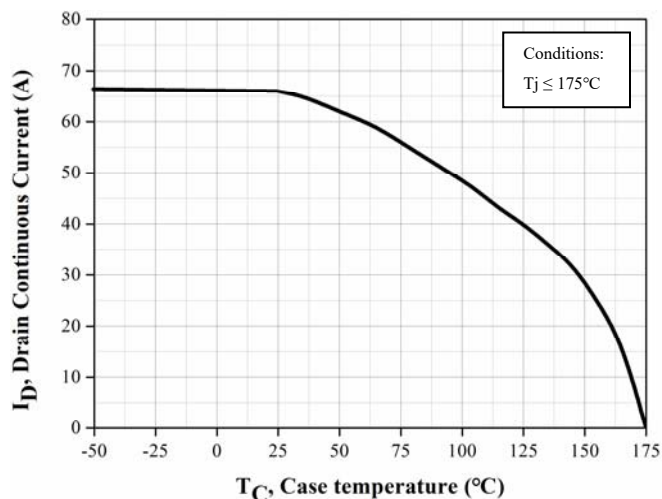


Figure 18. Continuous drain current derating vs. case temperature

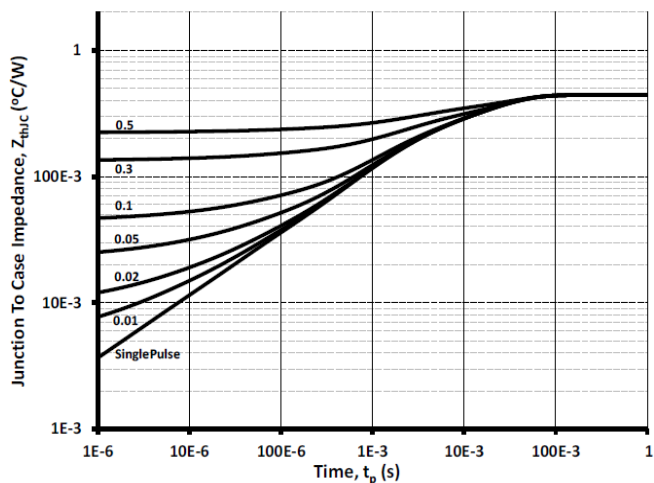


Figure 19. Transient thermal impedance (junction - case)

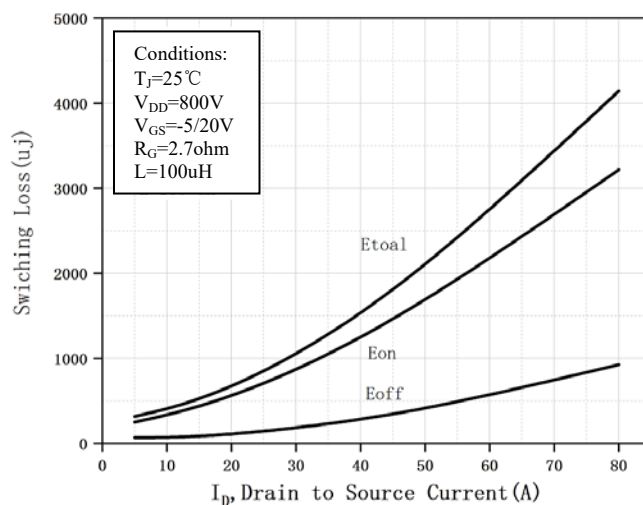


Figure 20. Clamped Inductive switching energy vs. drain current

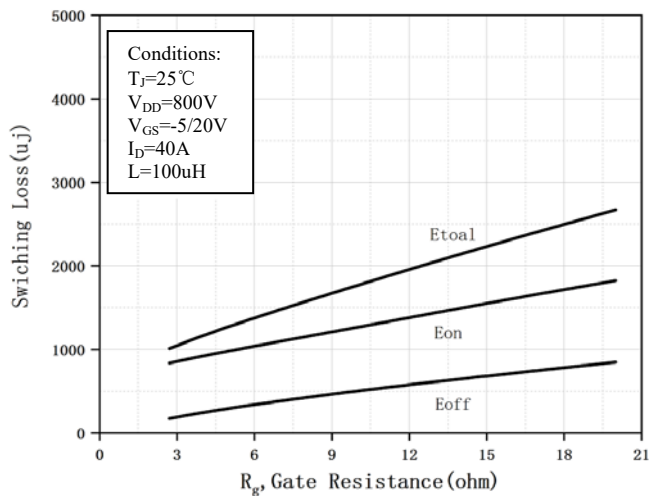


Figure 21. Clamped inductive switching energy vs. R_g

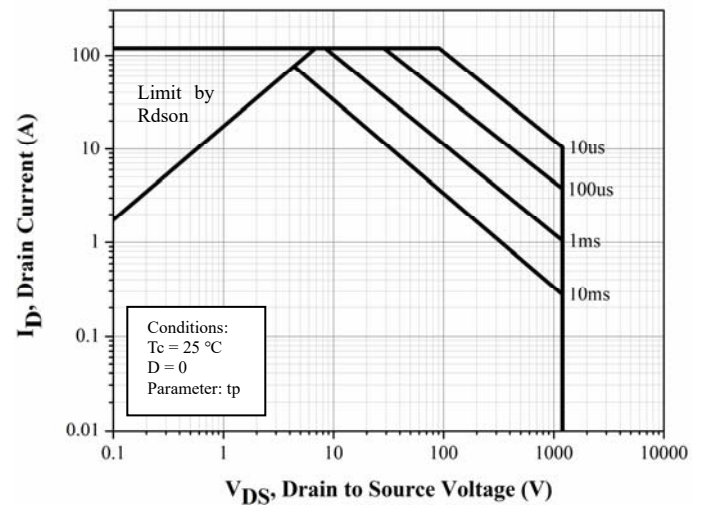


Figure 22. Safe Operating Area

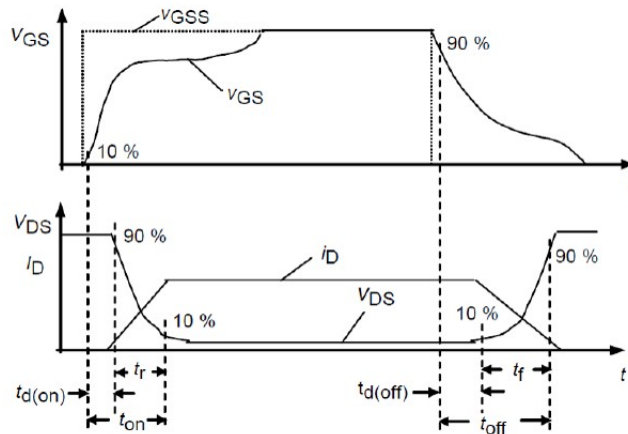


Figure 23. Switching Times Definition

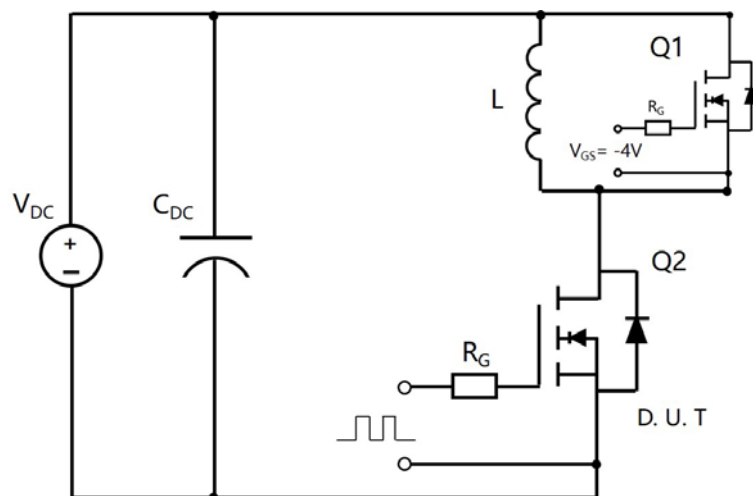
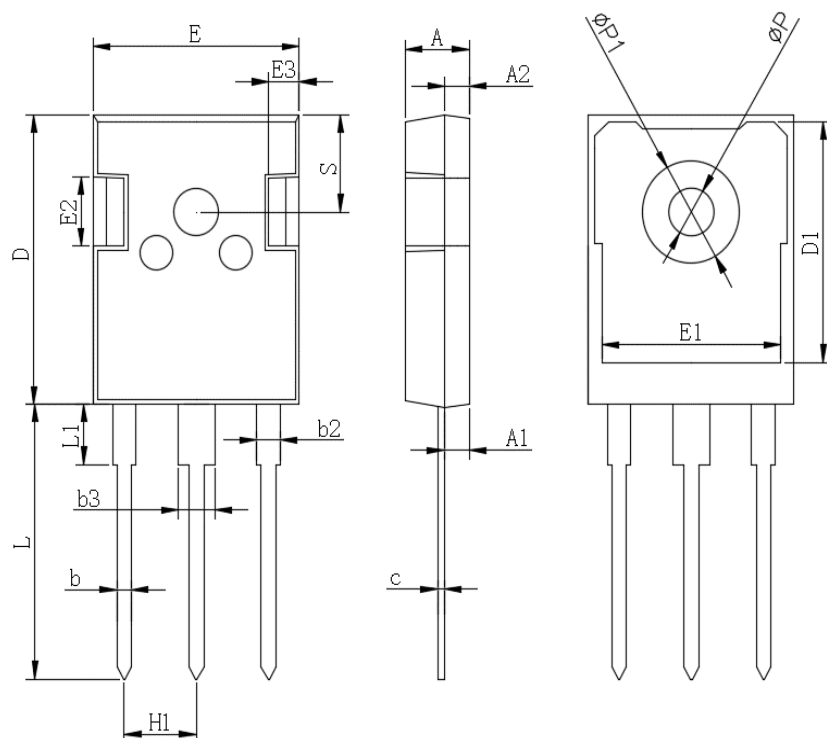


Figure 24. Clamped Inductive Switching Waveform Test Circuit

■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

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