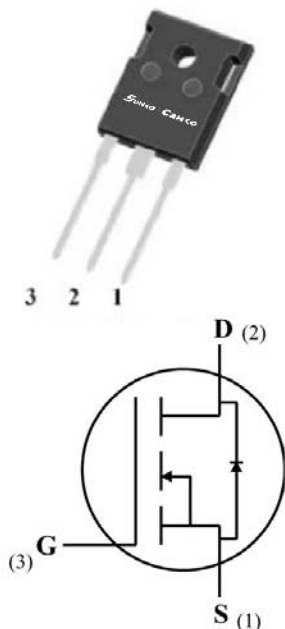


Silicon Carbide Power MOSFET (N-Channel Enhancement)

V_{DS}	1700V
I_D (25°C)	7.7A
$R_{DS(on)}$	500mΩ



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)

PARAMTETER	SYMBOL	UNIT	VALUE	TEST CONDITIONS	NOTE
Device marking code			D2170500NCTGH		
Drain source voltage @ T _j =25°C	$V_{DS,max}$	V	1700	$V_{GS}=0\text{ V}$, $I_D=100\mu\text{A}$	
Gate source voltage @ T _j =25°C	$V_{GS,max}$	V	-10/+25	Absolute maximum values (AC f > 1Hz, duty cycle < 1%)	Note1
Gate source voltage @ T _j =25°C	$V_{GS,op}$	V	-5/+20	Recommended operational values	
Continuous drain current @ T _c =25°C	I_D	A	7.7	$V_{GS}=20\text{V}$, T _c =25°C	Fig.14
Continuous drain current @ T _c =110°C			5.3	$V_{GS}=20\text{V}$, T _c =110°C	
Pulse Drain Current	$I_{D,pulse}$	A	22	Limited by t _{pw}	Fig.15
Power Dissipation	P_{TOT}	W	94	T _c =25°C , T _j = 175°C	Fig.13
Avalanche energy, Single Pulse	E_{AS}	mJ	80	$V_{DD}=75\text{V}$, L=25mH	
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	1.0	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	1.5	3.1	4.5	$V_{DS}=V_{GS}$, $I_D=1mA$	Fig.4, 11
Drain source breakdown voltage	$V_{(BR)DSS}$	V	1700			$V_{GS}=0$, $I_D=100\mu A$	
Zero gate voltage drain current	I_{DSS}	μA		<1	100	$V_{DS}=1700V$, $V_{GS}=0V$	
				5	500	$V_{DS}=1700V$, $V_{GS}=0V$, $T_j=175^\circ C$	
Gate source leakage current	I_{GSS}	nA			250	$V_{GS}=20V$, $V_{DS}=0V$	
Current drain source on-state resistance	$R_{DS\ ON}$	m Ω		480	650	$V_{GS}=20V$, $I_D=2A$	Fig.3, 5, 6
				1100		$V_{GS}=20V$, $I_D=2A$, $T_j=175^\circ C$	
Transconductance	g_f	S		2.0		$V_{DS}=10V$, $I_D=2A$	

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

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Input capacitance	C_{iss}	pF		490		$V_{DS}=1000V$, $V_{GS}=0V$, $T_j=25^\circ C$, $f=1MHz$, $V_{AC}=25mV$	Fig.10
Output capacitance	C_{oss}			17			
Reverse capacitance	C_{rss}			4			
Coss stored energy	E_{oss}	μJ		11			Fig.12
Gate source charge	Q_{gs}	nC		6		$V_{DS}=1000V$, $V_{GS}=-5/20V$, $I_D=2A$	Fig.16
Gate drain charge	Q_{gd}			22			
Gate charge	Q_g			36			
Internal Gate Resistance	$R_{G(int)}$	Ω		8.0	11.0	$f=1MHz$, $V_{AC}=25mV$	

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

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Turn on delay time	$t_{d(on)}$	ns		8		$V_{DD}=1200V$, $V_{GS}=-5/+20V$, $I_D=2A$, $L=300\mu H$, $R_{G(ext)}=2.7\Omega$	Fig.17, 18
Rise time	t_r			19			
Turn off delay time	$t_{d(off)}$			16			
Fall time	t_f			80			
Turn on switching energy	E_{on}	μJ		88			
Turn off switching energy	E_{off}			18			

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

PARAMETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Diode forward voltage	V_{SD}	V		4.3		$V_{GS}=0V, I_{SD}=2A$	Fig.8
Continuous diode forward current	I_S	A		10.7		$V_{GS}=0V, T_c=25^\circ C$	
Reverse recovery time	t_{rr}	nS		36		$V_{DS}=1200V, V_{GS}=0V, I_{SD}=2A, di/dt=300A/\mu S$	
Reverse recovery charge	Q_{rr}	nC		70			
Peak reverse recovery current	I_{rrm}	A		3.8			

Note 1: When using SiC Body Diode the maximum recommended $V_{GS} = -5V$

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

PARAMETER	SYMBOL	UNIT	Value
Thermal resistance	$R_{\theta J-C}$	$^\circ C/W$	1.6

■Typical Characteristics

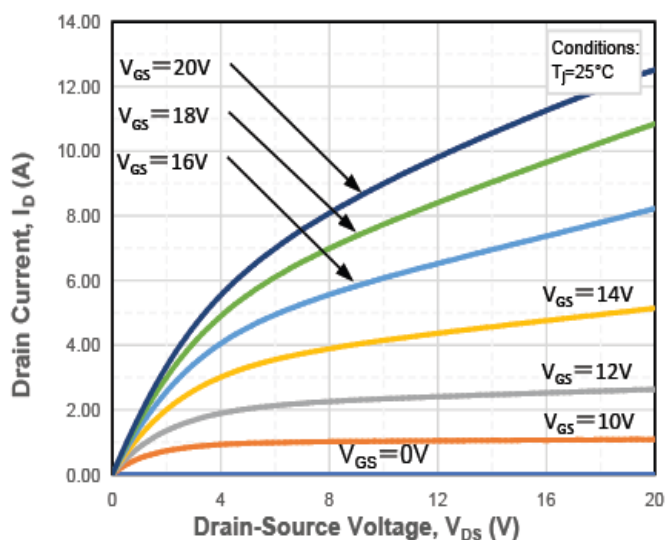


Figure 1. Output Characteristics Tj = 25°C

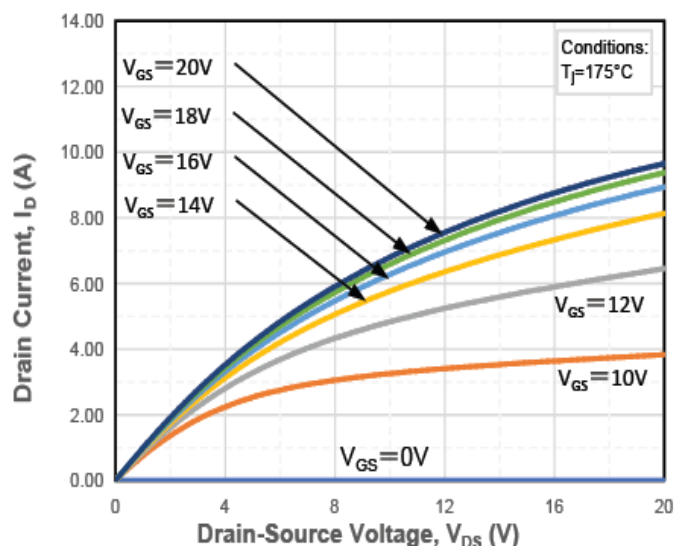


Figure2. Output Characteristics Tj = 175°C

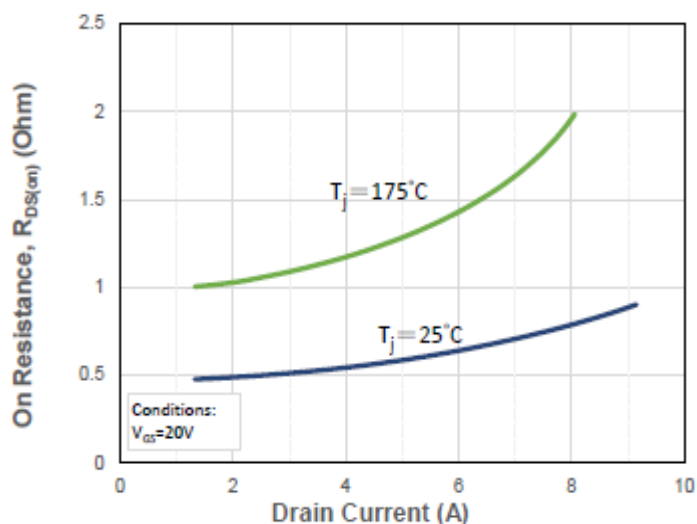


Figure 3. On-resistance vs. drain current

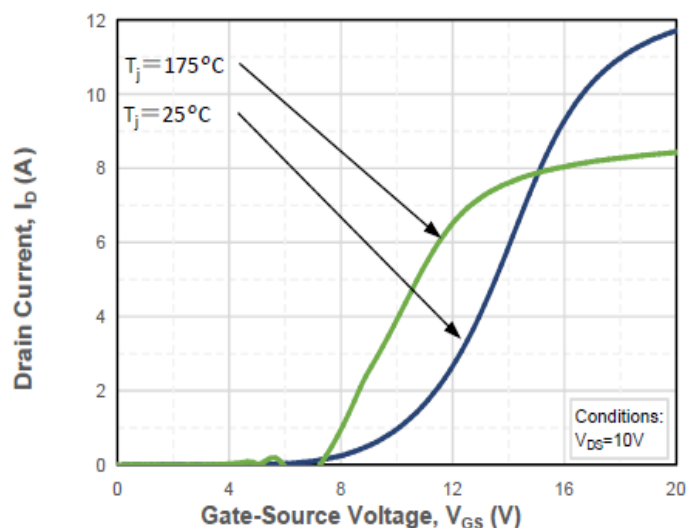


Figure 4. Transfer Characteristics for various Tj

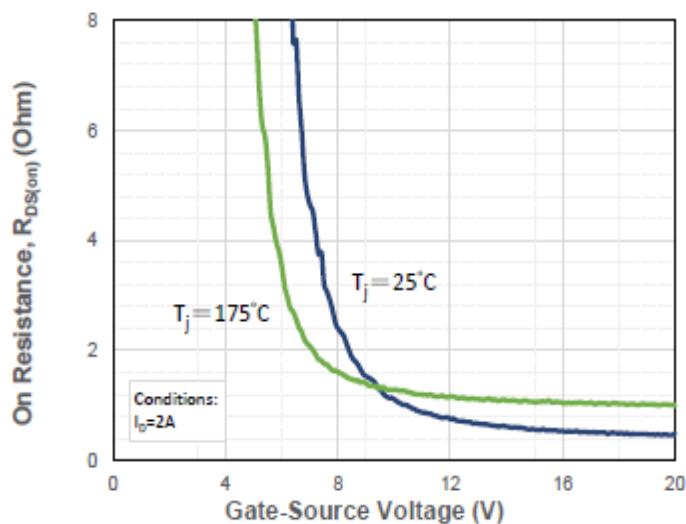


Figure 5. On-resistance vs. gate voltage for various Tj

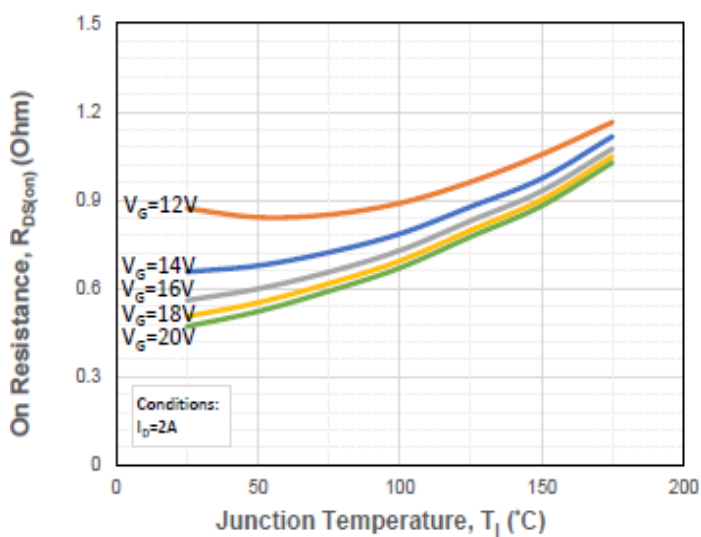


Figure 6. On-resistance vs. Temperature for various Gate voltage

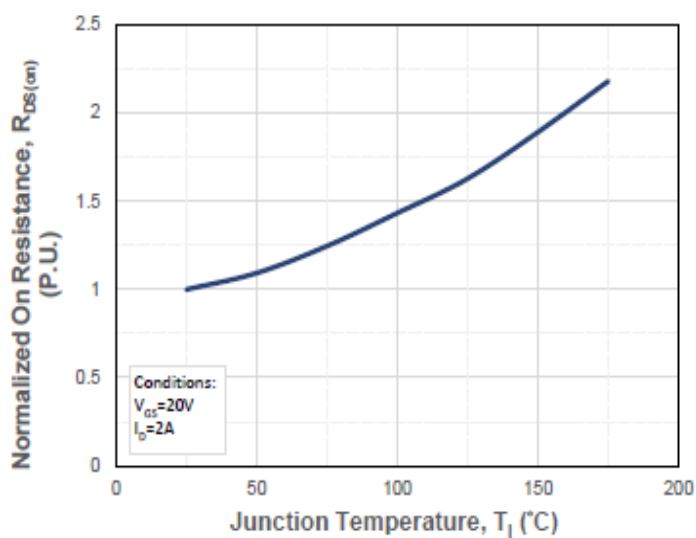


Figure 7. Normalized On-Resistance vs. Temperature

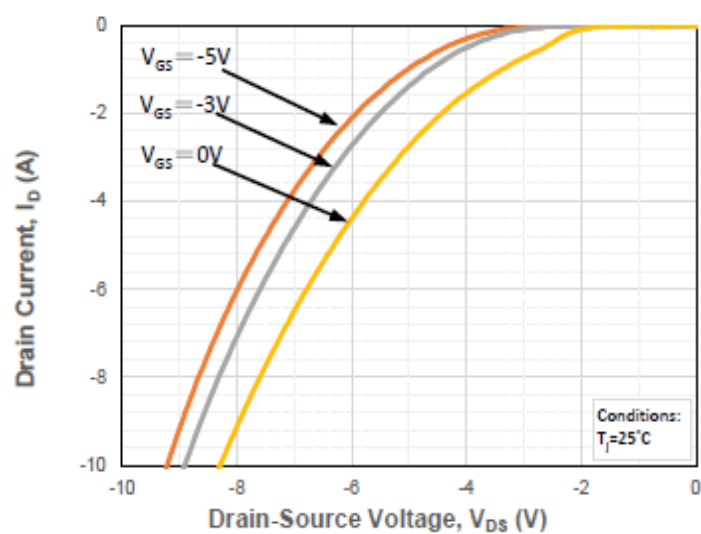


Figure 8. Body Diode Characteristics at Tj = 25°C

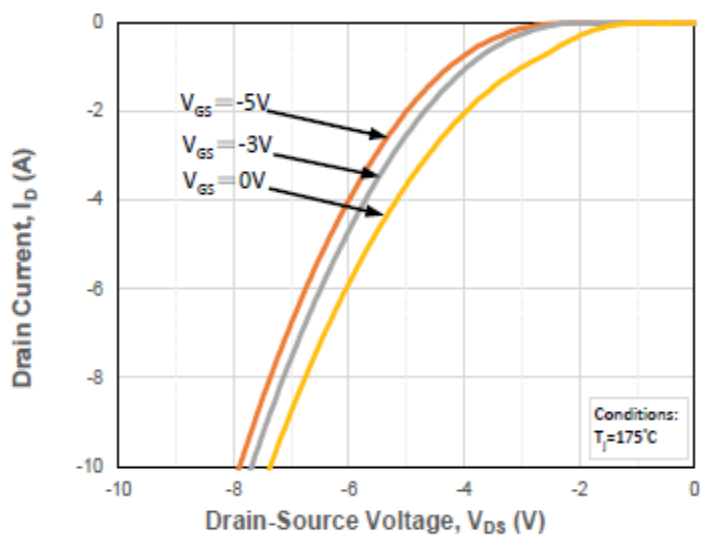


Figure 9. Body Diode Characteristics at $T_j = 175^\circ\text{C}$

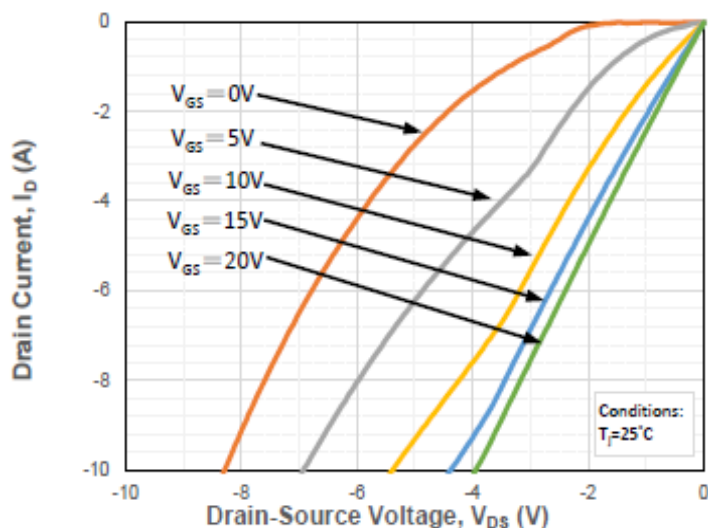


Figure 10. 3rd Quadrant Characteristics at $T_j = 25^\circ\text{C}$

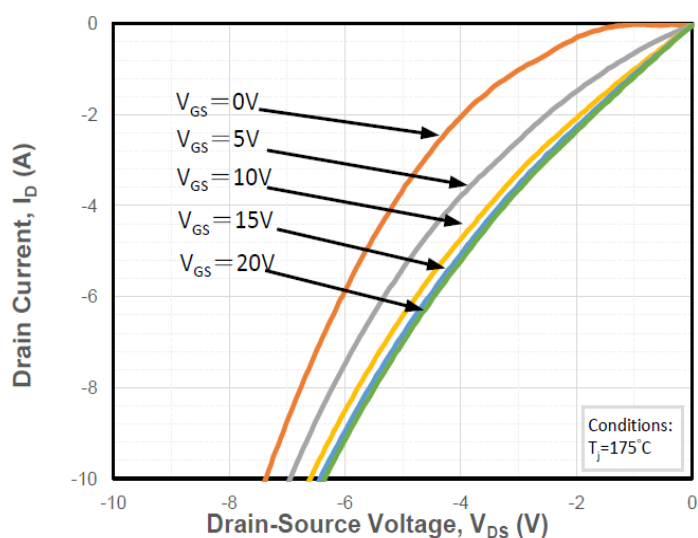


Figure 11. 3rd Quadrant Characteristics at $T_j = 175^\circ\text{C}$

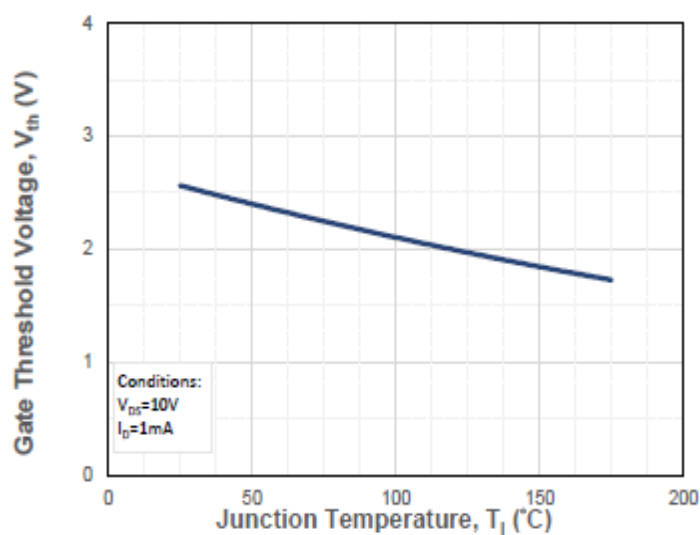


Figure 12. Threshold Voltage vs. Temperature

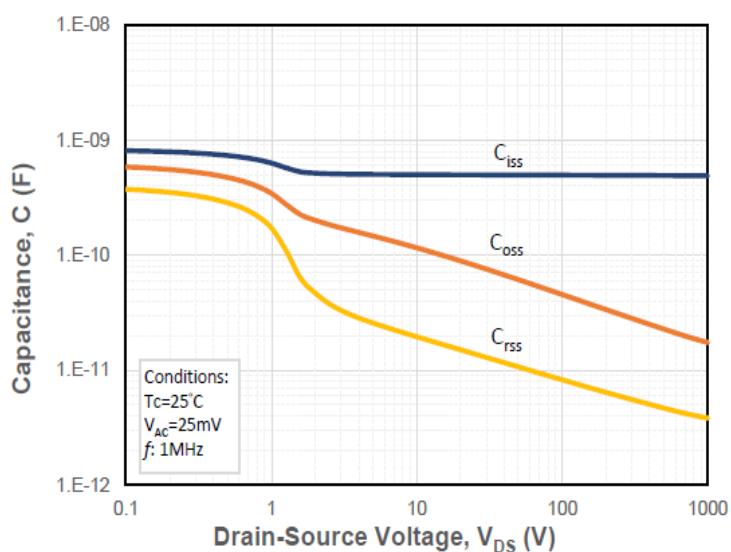


Figure 13. Capacitances vs. Drain to Source Voltage

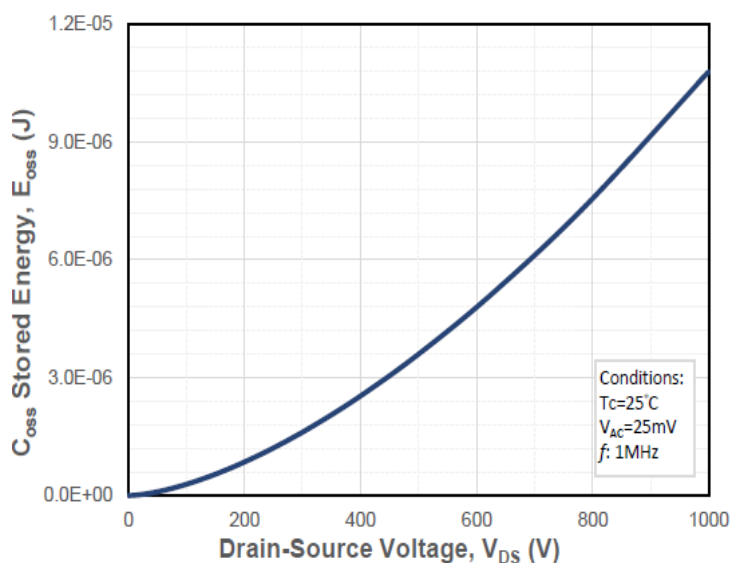


Figure 14. Output Capacitor Stored Energy

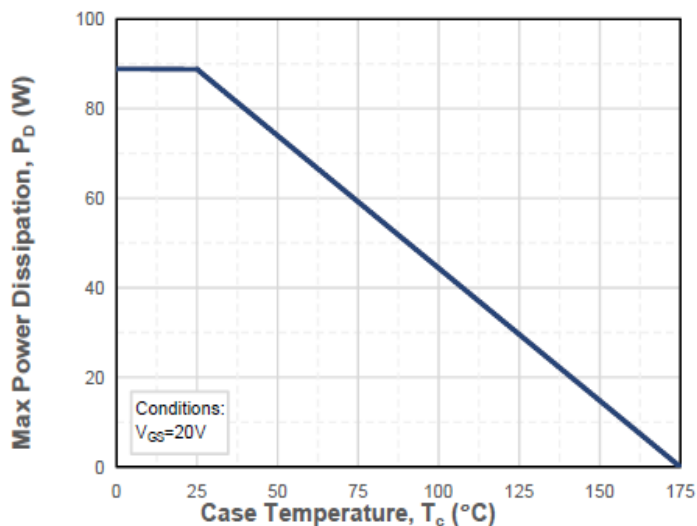


Figure 15. Maximum Power Dissipation Derating vs. Case Temperature

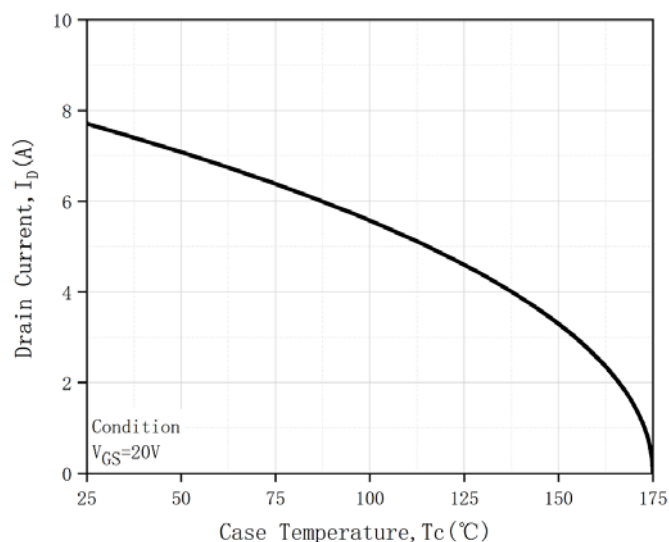


Figure 16. Drain Current Derating vs. Case Temperature

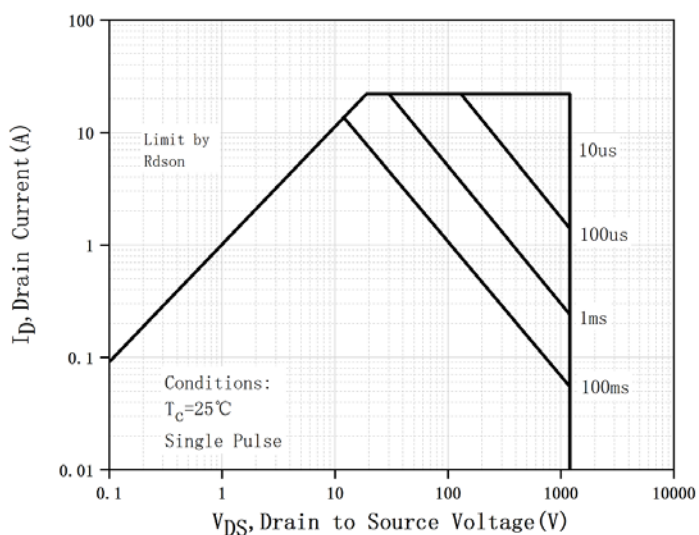


Figure 17. Safe Operating Area

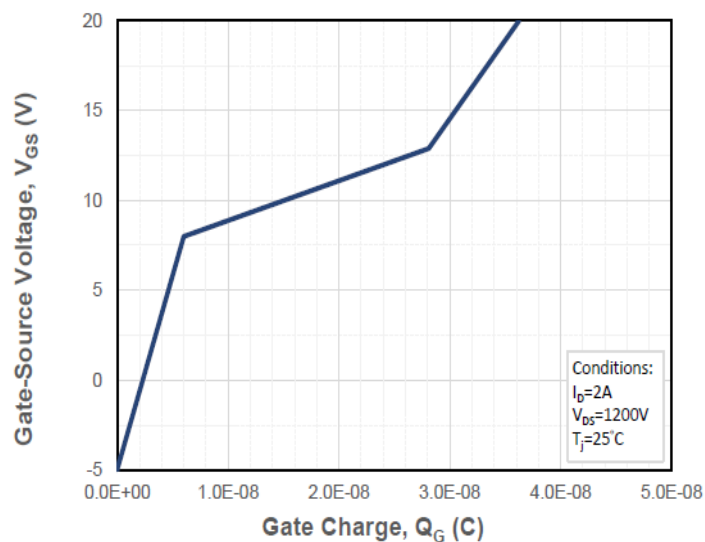


Figure 18. Gate Charge Characteristics

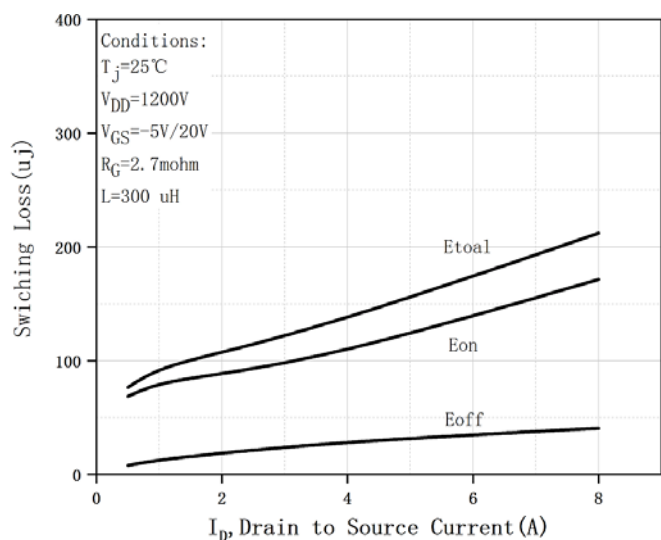


Figure 19. Clamped Inductive Switching Energy vs. Drain Current

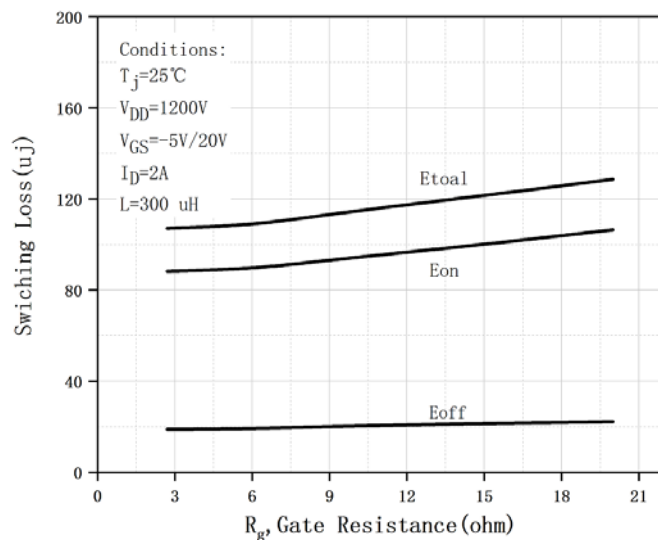


Figure 20. Clamped Inductive Switching Energy vs. External Gate Resistor ($R_{G(ext.)}$)

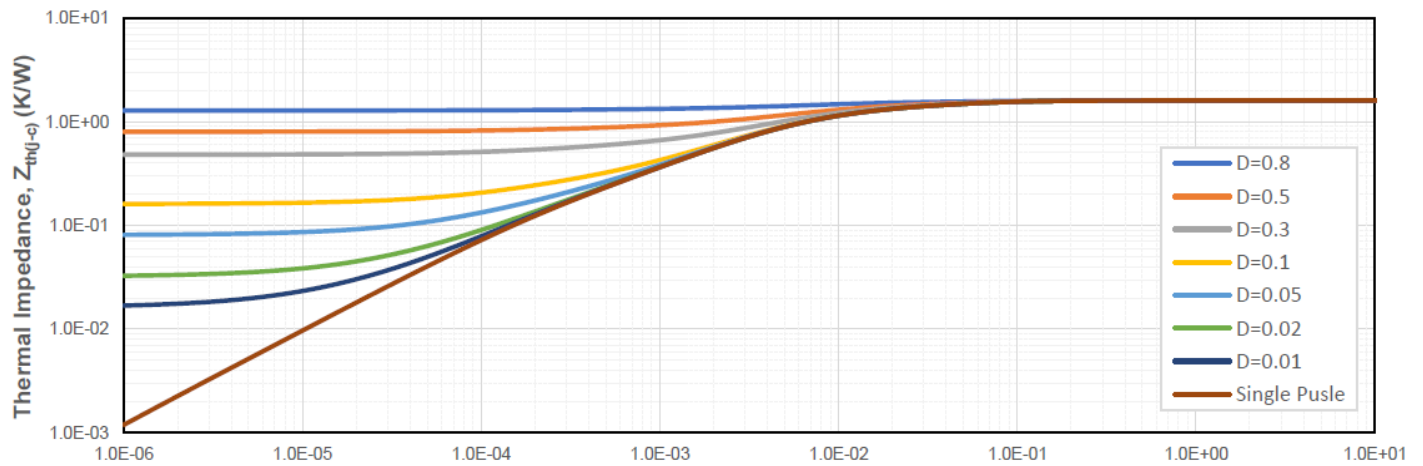


Figure 21. Transient Junction to Case Thermal Impedance

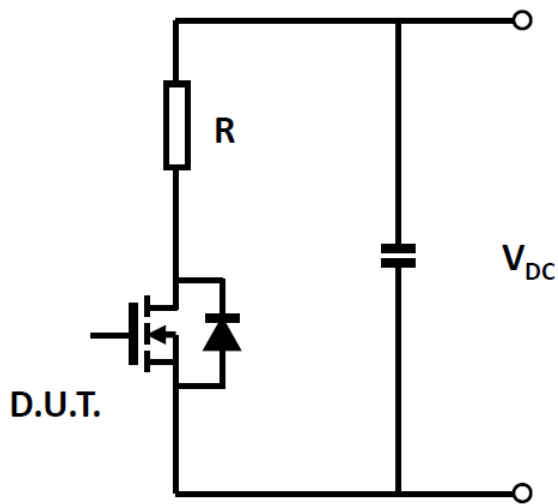


Figure 22. Schematic of Resistive Switching

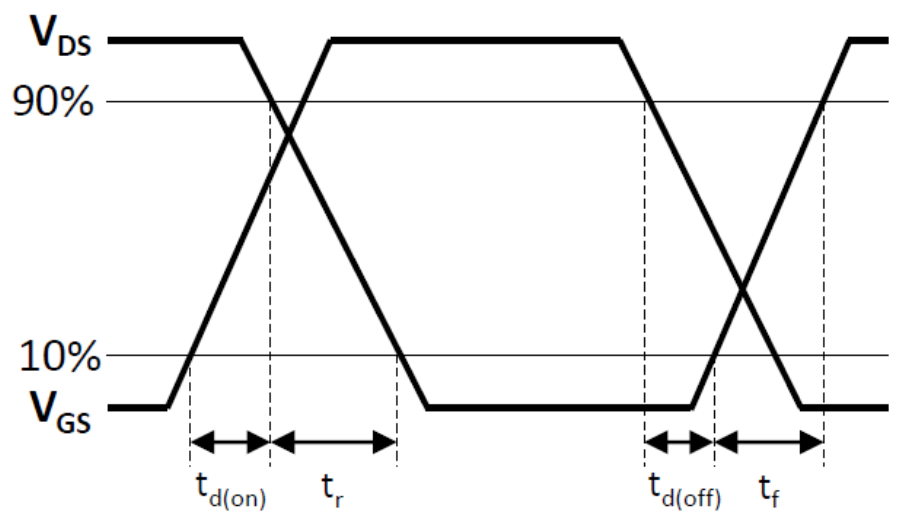
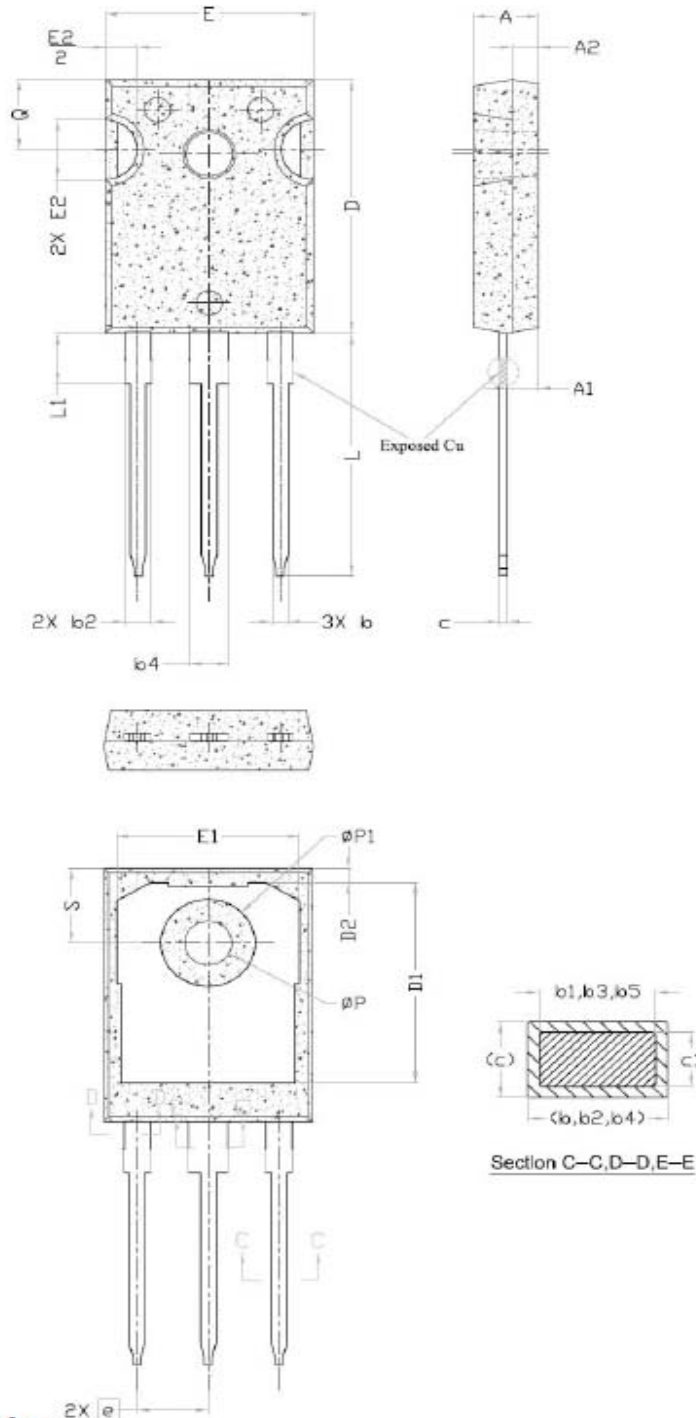


Figure 23. Switching Times Definition

■Outline Dimensions



SYMBOL	DIMENSIONS			Note
	Min.	Typ.	Max.	
A	4.83	5.02	5.21	
A1	2.29	2.41	2.55	
A2	1.50	2.00	2.49	
b	1.12	1.20	1.33	
b1	1.12	1.20	1.28	
b2	1.91	2.00	2.39	6
b3	1.91	2.00	2.34	
b4	2.87	3.00	3.22	6, 8
b5	2.87	3.00	3.18	
c	0.55	0.60	0.69	6
c1	0.55	0.60	0.65	
D	20.80	20.95	21.10	4
D1	16.25	16.55	17.65	5
D2	0.51	1.19	1.35	
E	15.75	15.94	16.13	4
E1	13.46	14.02	14.16	5
E2	4.32	4.91	5.49	3
e	5.44 BSC			
L	19.81	20.07	20.32	
L1	4.10	4.19	4.40	6
ϕP	3.56	3.61	3.65	7
$\phi P1$	7.19 REF.			
Q	5.39	5.79	6.20	
S	6.04	6.17	6.30	

Note:

1. Package Reference: JEDEC TO247, Variation AD.
2. All Dimensions Are In mm.
3. Slot Required, Notch May Be Rounded
4. Dimension D & E Do Not Include Mold Flash. Mold Flash Shall Not Exceed 0.127mm Per Side. These Dimensions Are Measured At The Outmost Extreme Of The Plastic Body.
5. Thermal Pad Contour Optional Within Dimension D1 & E1.
6. Lead Finish Uncontrolled In L1.
7. ϕP To Have A Maximum Draft Angle Of 1.5° To The Top Of The Part With A Maximum Hole Diameter Of 3.91mm.
8. Dimension "b2" And "b4" Does Not Include Dambar Protrusion. Allowable Dambar Protrusion Shall Be 0.10mm Total In Excess Of "b2" And "b4" Dimension At Maximum Material Condition.

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