

SCD212080TLG1

Silicon Carbide Power MOSFET (N-Channel Enhancement)

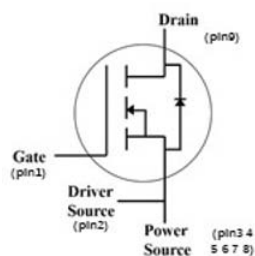
V_{DS}	1200V
I_D (25°C)	39.5A
$R_{DS(on)}$	80 mohm



Top View



Bottom View



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:** TOLL
- **Terminals:** Tin plated leads
- **Polarity:** As marked

■Maximum Ratings ($T_C=25^\circ\text{C}$ Unless otherwise specified)

PARAMETER	SYMBOL	UNIT	VALUE	TEST CONDITIONS	NOTE
Device marking code			D212080TLG1		
Drain source voltage @ $T_J=25^\circ\text{C}$	$V_{DS,max}$	V	1200	$V_{GS}=0\text{ V}$, $I_D=100\mu\text{A}$	
Gate source voltage @ $T_J=25^\circ\text{C}$	$V_{GS,max}$	V	-8/+22	Absolute maximum values (AC f > 1Hz, duty cycle < 1%)	
Gate source voltage @ $T_J=25^\circ\text{C}$	$V_{GS,op}$	V	-4/+18	Recommended operational values	
Continuous drain current @ $T_C=25^\circ\text{C}$	I_D	A	39.5	$V_{GS}=18\text{V}$, $T_C=25^\circ\text{C}$	Fig.16
Continuous drain current @ $T_C=110^\circ\text{C}$			28	$V_{GS}=18\text{V}$, $T_C=110^\circ\text{C}$	
Pulse Drain Current	$I_{D,pulse}$	A	148	Limited by t_{pw}	Fig.6
Power Dissipation	P_{TOT}	W	208.3	$T_C=25^\circ\text{C}$, $T_J = 175^\circ\text{C}$	Fig.15
Operating junction and Storage temperature range	T_J, T_{stg}	$^\circ\text{C}$	-55 to +175		
Soldering temperature	T_L	$^\circ\text{C}$	260	1.6mm (0.063") from case for 10s	

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■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	2.3	2.9	3.6	$V_{DS}=V_{GS}$, $I_D=5mA$	Fig.9
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	10	$V_{DS}=1200V$, $V_{GS}=0V$	
				10		$V_{DS}=1200V$, $V_{GS}=0V$, $T_J=175^\circ C$	
Gate source leakage current	I_{GSS}	nA			100	$V_{GS}=18V$, $V_{DS}=0V$	
Current drain source on-state resistance	$R_{DS(on)}$	m Ω		80	85	$V_{GS}=18V$, $I_D=20A$	Fig.5.7.8
				126		$V_{GS}=18V$, $I_D=20A$, $T_J=175^\circ C$	
Transconductance	g_f	S		12.6		$V_{DS}=16V$, $I_D=20A$	Fig.4

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

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Input capacitance	C_{iss}	pF		924		$V_{DS}=1000V$, $V_{GS}=0V$, $T_J=25^\circ C$, $f=1MHz$, $V_{AC}=25mV$	Fig.14
Output capacitance	C_{oss}			56.3			
Reverse capacitance	C_{rss}			3.4			
Coss stored energy	E_{oss}	μJ		33.5			Fig.13
Gate source charge	Q_{gs}	nC		11.8		$V_{DS}=800V$, $V_{GS}=-4/18V$, $I_D=20A$	Fig.17
Gate drain charge	Q_{gd}			23.2			
Gate charge	Q_g			48			
Internal Gate Resistance	$R_{G(int)}$	Ω		3.1		$f=1MHz$, $V_{AC}=25mV$	

■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		13.83		$V_{DD}=800V$, $V_{GS}=-4/+18V$, $I_D=20A$, $L=200\mu H$, $R_{G(ext)}=2.7\Omega$	Fig.18 Fig.19 Fig.22
Rise time	t_r			7.68			
Turn off delay time	$t_{d(off)}$			5.92			
Fall time	t_f			9.33			
Turn on switching energy	E_{on}	μJ		147.8			
Turn off switching energy	E_{off}			11.27			

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

PARAMETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Diode forward voltage	V _{SD}	V		3.6		V _{GS} =-4V, I _{SD} =10A	Fig.10
Continuous diode forward current	I _s	A		49		V _{GS} =-4V, T _c =25°C	
Reverse recovery time	t _{rr}	nS		17.1		V _{DS} =800V, V _{GS} =-4V, I _{SD} =10A, di/dt=700A/uS	
Reverse recovery charge	Q _{rr}	nC		70.4			
Peak reverse recovery current	I _{rrm}	A		7.51			

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 _{θJ-C}	°C/W	0.72

■Typical Characteristics

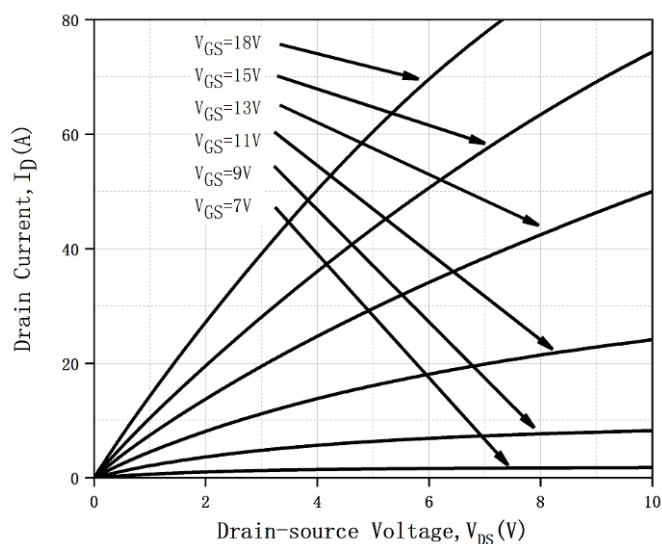


Figure 1. Output Characteristics T_j = -40°C

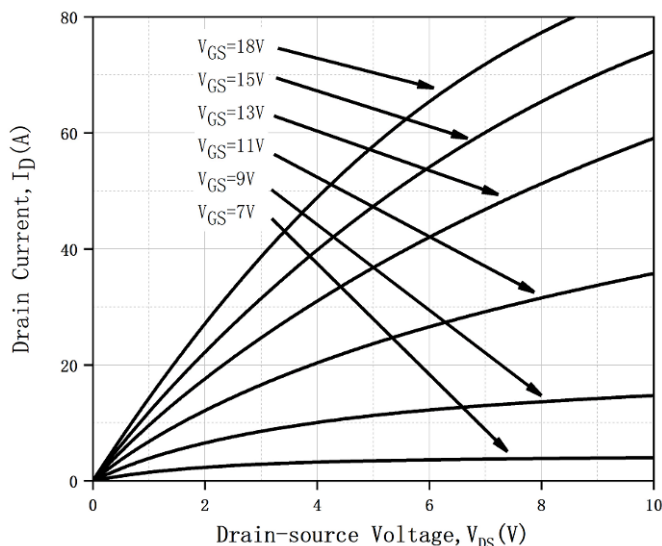


Figure2. Output Characteristics T_j = 25°C

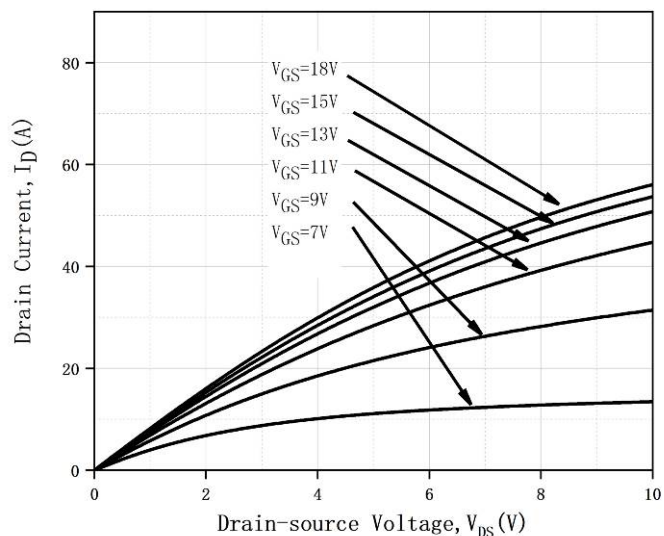


Figure 3. Output Characteristics $T_j = 175^\circ\text{C}$

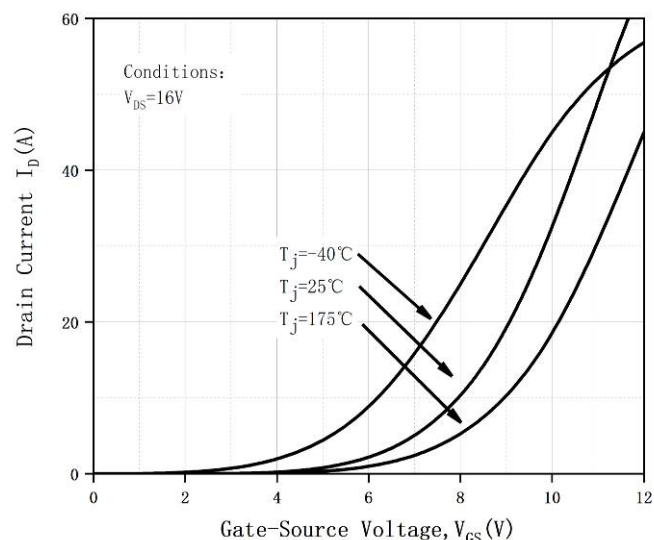


Figure 4. Transfer Characteristics for various T_j

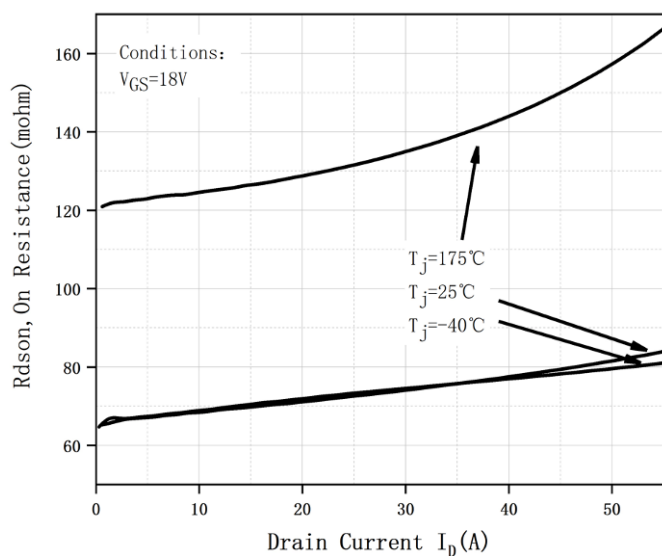


Figure 5. On-resistance vs. drain current

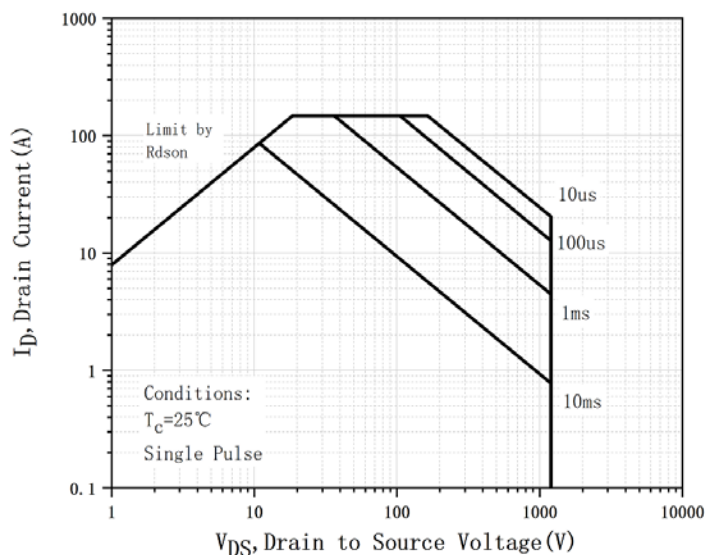


Figure 6. Safe operating area

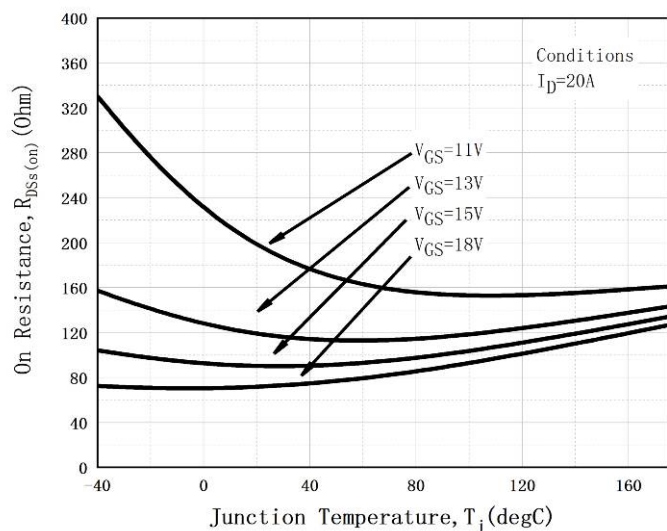


Figure 7. On-Resistance vs. Temperature for various V_{GS}

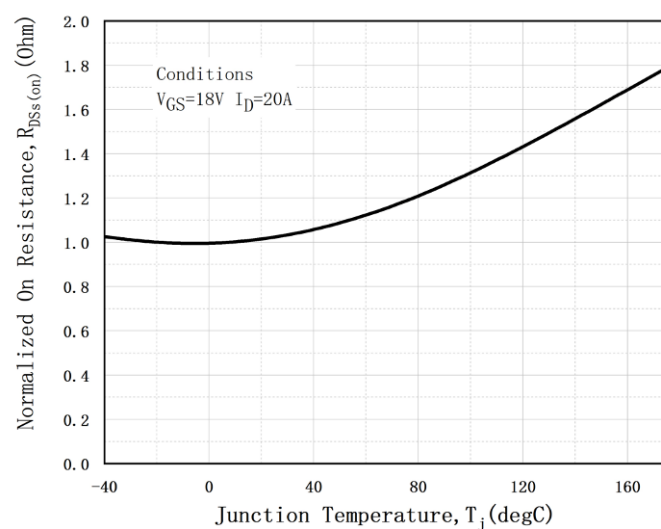


Figure 8. Normalized On-Resistance vs. Temperature

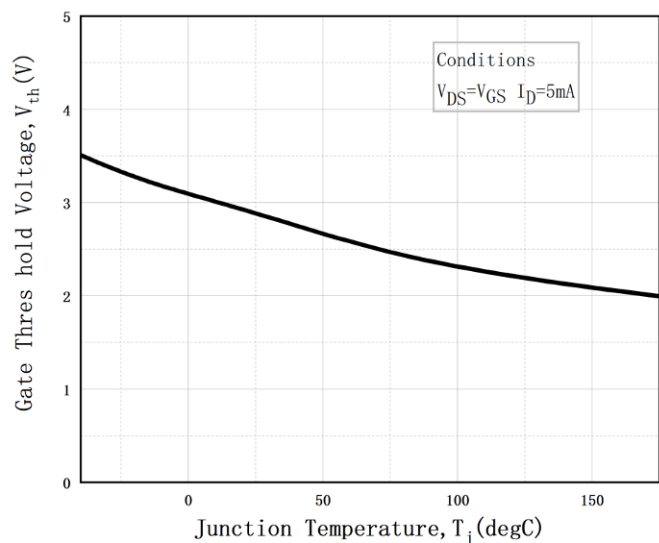


Figure 9. Threshold voltage vs. temperature

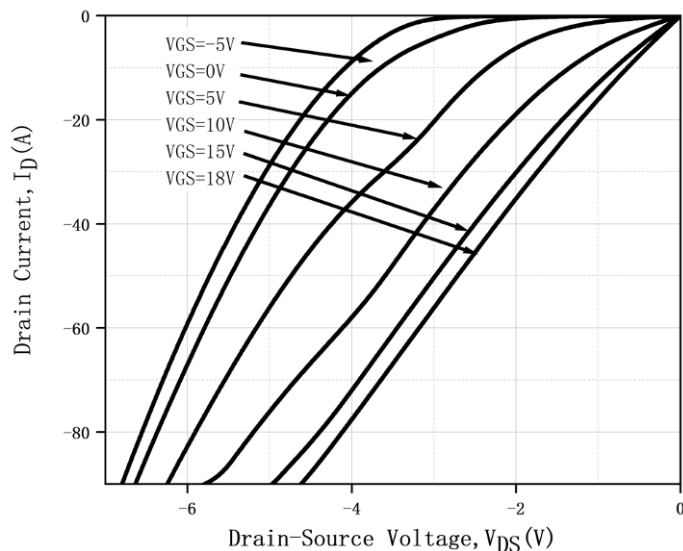


Figure 10. Reverse Output Characteristics at $T_j = -40^\circ\text{C}$

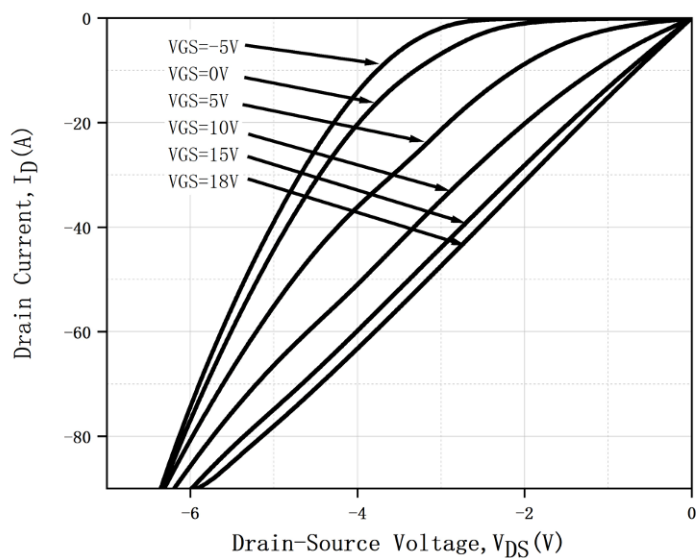


Figure 11. Reverse Output Characteristics at $T_j = 25^\circ\text{C}$

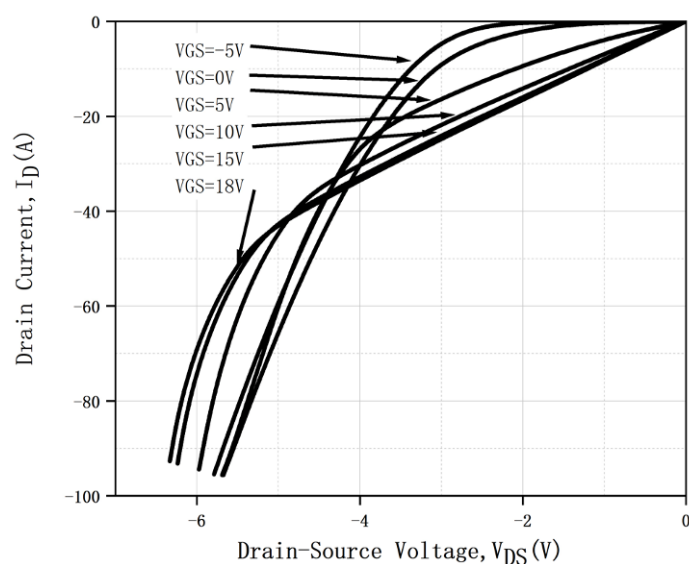
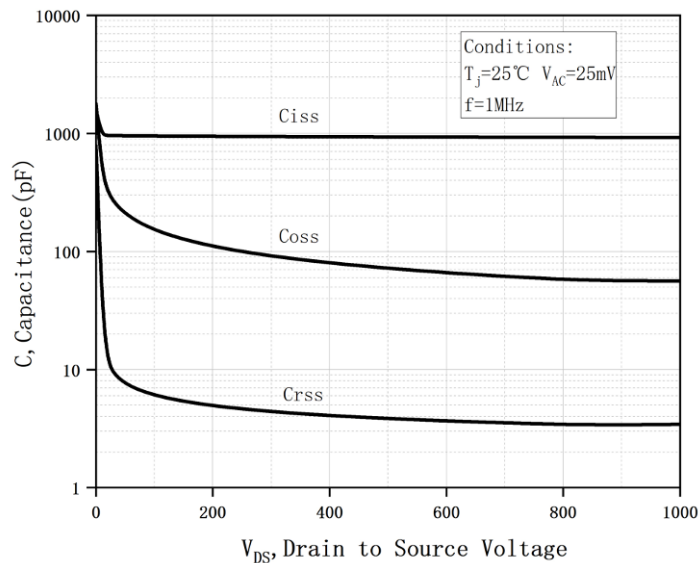
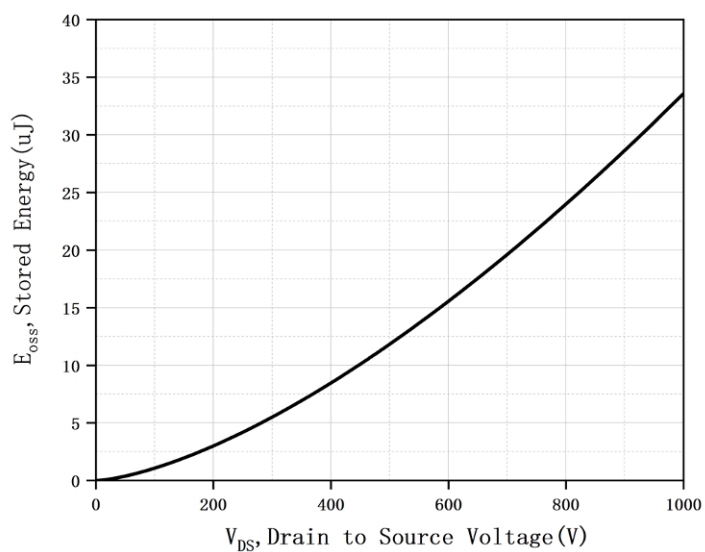


Figure 12. Reverse Output Characteristics at $T_j = 175^\circ\text{C}$



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Figure 13. Output Capacitor Stored Energy

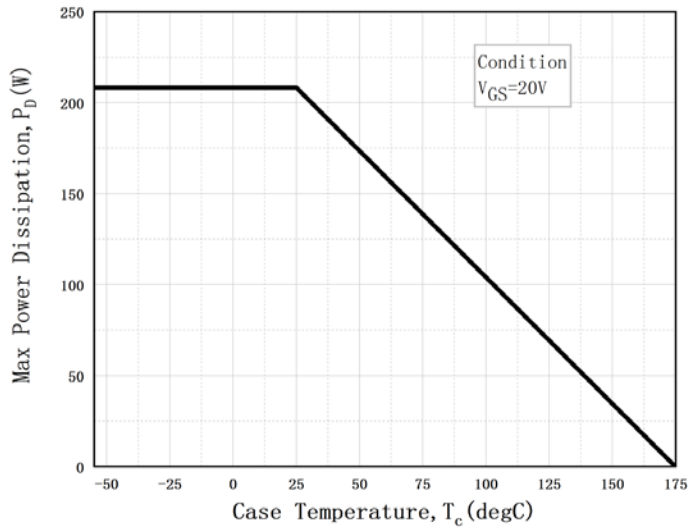


Figure 14. Capacitances vs. Drain to Source Voltage

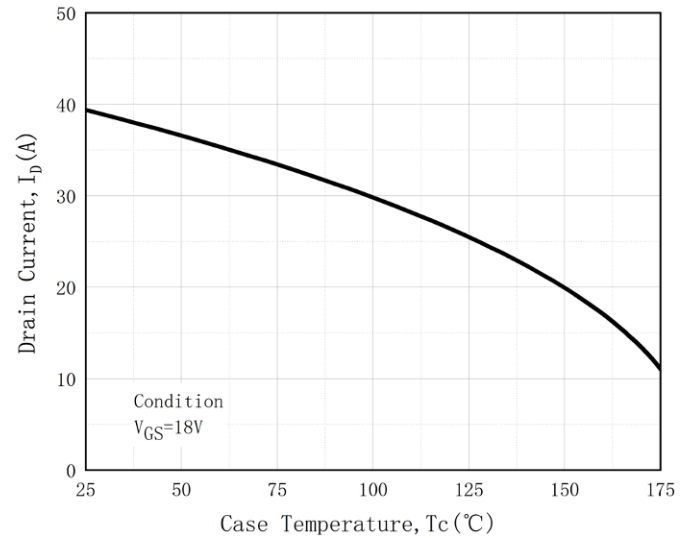


Figure 15. Maximum Power Dissipation Derating vs. Case Temperature

Figure 16. Drain Current Derating vs. Case Temperature

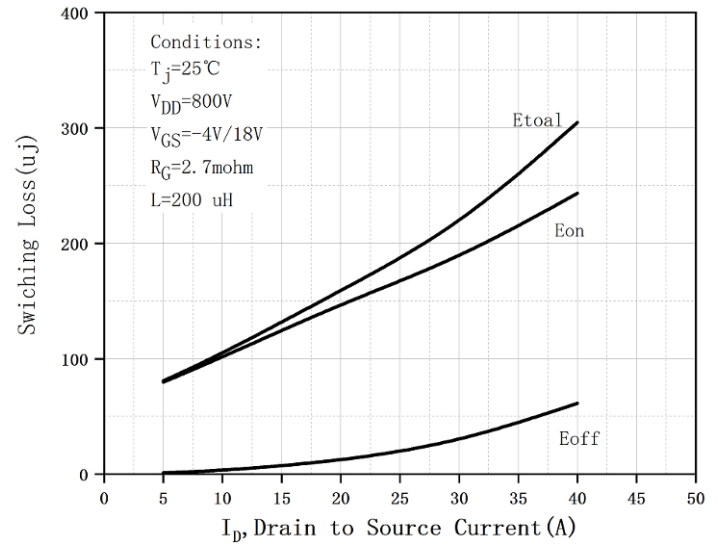
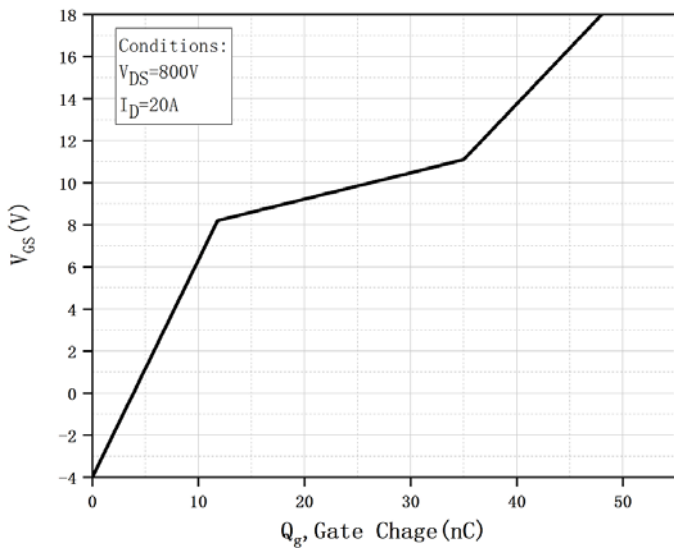


Figure 17. Gate Charge Characteristics

Figure 18. Clamped Inductive Switching Energy vs. Drain Current

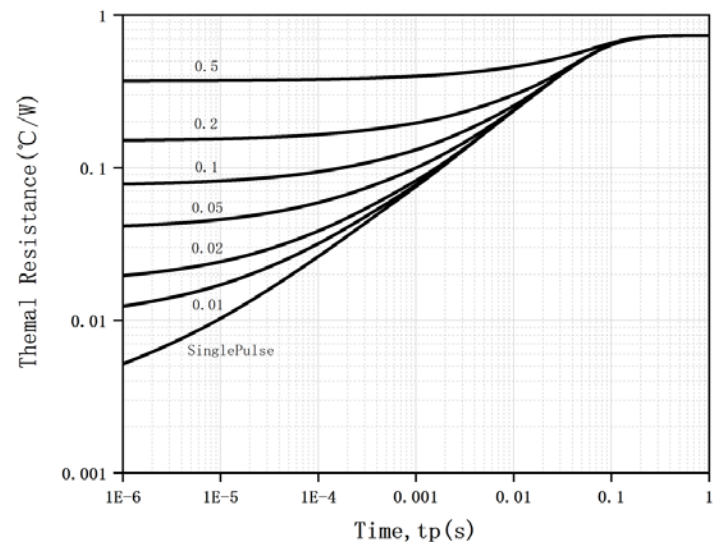
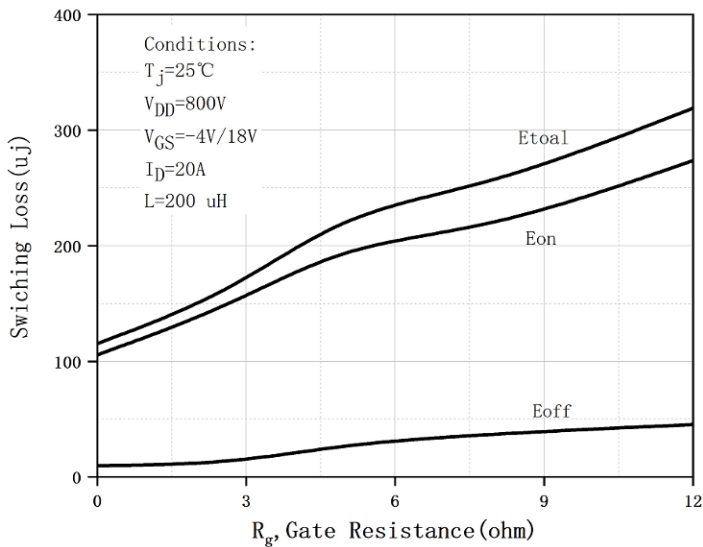


Figure 19. Clamped Inductive Switching Energy vs. External Gate Resistor ($R_{G(ext.)}$)

Figure 20. Transient Junction to Case Thermal Impedance

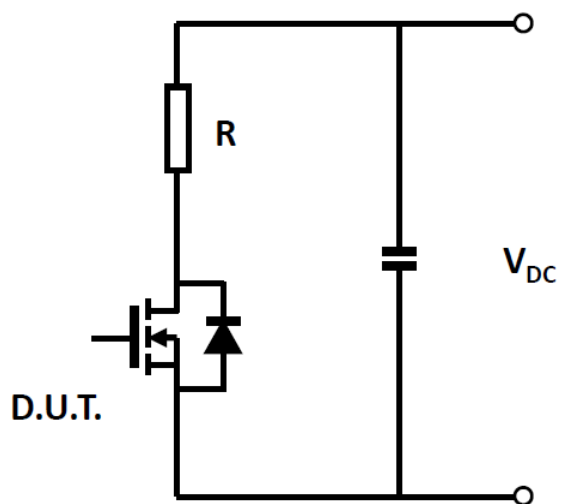


Figure 21. Schematic of Resistive Switching

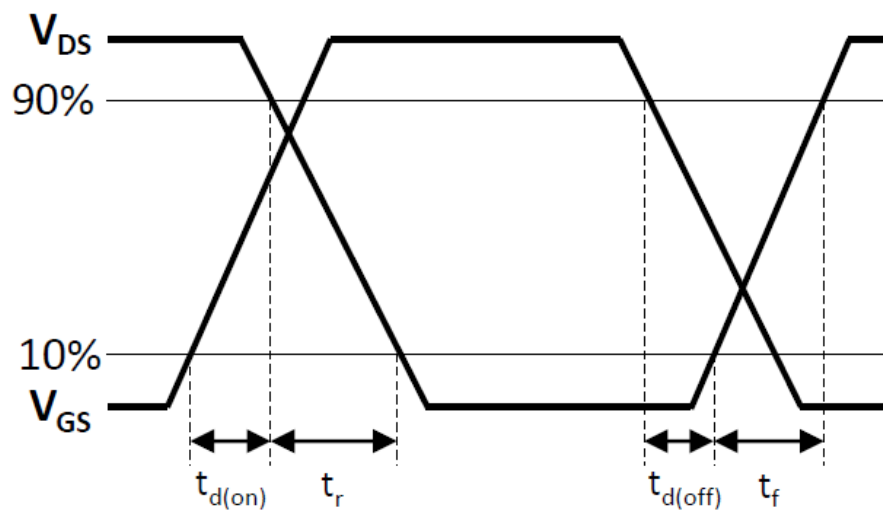
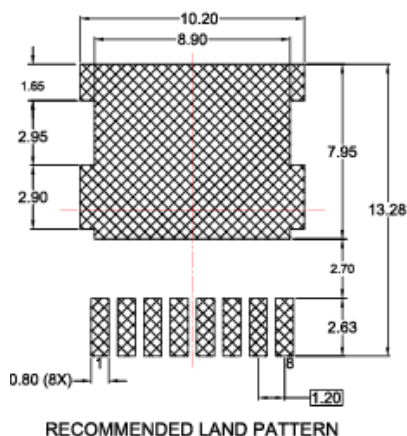
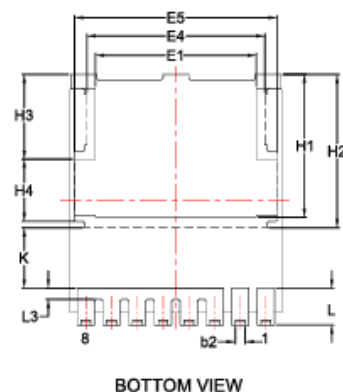
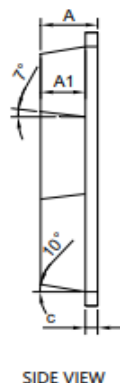
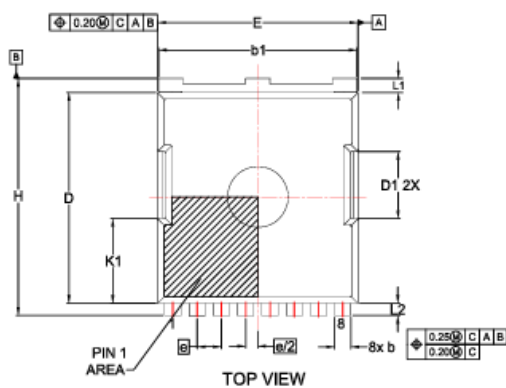


Figure 22. Switching Times Definition

■Outline Dimensions



DIM	MILLIMETERS		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	1.70	1.80	1.90
b	0.70	0.80	0.90
b1	0.70	0.80	0.90
b2	0.36	0.46	0.56
c	0.40	0.50	0.60
D	10.28	10.38	10.48
D1	3.30		
E	9.80	9.90	10.00
E1	8.0	8.10	8.20
E4	8.40		
E5	9.40		
e	1.20 BSC		
e2	0.60 BSC		
H	11.58	11.68	11.78
H1	6.56	6.66	6.76
H2	7.05	7.15	7.25
H3	3.50		
H4	3.25		
K	2.70	2.80	2.90
K1	4.18		
L	1.63	1.73	1.83
L1	0.60	0.70	0.80
L2	0.50	0.60	0.70
L3	0.30	0.40	0.50
E	8 REF		

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