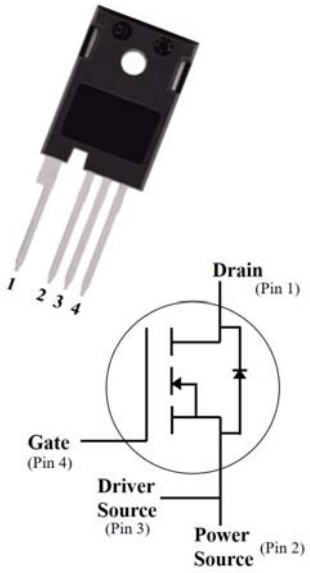
Silicon Carbide Power MOSFET （N-Channel Enhancement）

V_{DS}	650V
$I_{D\ (25°C)}$	115A
$R_{DS(on)}$	25mΩ



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
- AEC-Q101 qualified

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**: TO247-4L
- **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			D206525NCFGH		
Drain source voltage @ T_j=25°C	$V_{DS,max}$	V	650	V_{GS}=0 V, I_D=100uA	
Gate source voltage @ T_j=25°C	$V_{GS,max}$	V	-10/+22	Absolute maximum values (AC f > 1Hz, duty cycle < 1%)	Note1
Gate source voltage @ T_j=25°C	$V_{GS,op}$	V	-4/+18	Recommended operational values	
Continuous drain current @ T_c=25°C	I_D	A	115	V_{GS}=18V, Tc=25℃	Fig.14
Continuous drain current @ T_c=110°C			72	V_{GS}=18V, Tc=110℃	
Pulse Drain Current	$I_{D,\ pulse}$	A	305	Limited by t_{pw}	Fig.15
Avalanche energy, Single Pulse	E_{AS}	J	1	V_{DD}=75V,L=30mH	
Power Dissipation	P_{TOT}	W	375	T_c=25°C , Tj = 175℃	Fig.13
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	1.5	2.5	4.0	V_{DS}=V_{GS}, I_D= 50mA	Fig.4, 11
Drain source breakdown voltage	$V_{(BR)DSS}$	V	650			V_{GS}=0, I_D=100uA	
Zero gate voltage drain current	I_{DSS}	uA		<1	100	V_{DS}=650V, V_{GS}= 0V	
				10	500	V_{DS}=650V, V_{GS}= 0V, Tj= 175℃	
Gate source leakage current	I_{GSS}	nA			250	V_{GS}= 18V, V_{DS}=0V	
Current drain source on-state resistance	$R_{DS\ ON}$	mΩ		25	30	V_{GS}=18V, I_D=50A	Fig.3, 5, 6
				35		V_{GS}=18V, I_D=50A,Tj=175℃	
Transconductance	g_f	S		18.2		V_{DS}=10V,I_D=50A	

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

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Input capacitance	Ciss	pF		4838		V_{DS}=400V, V_{GS}=0V, Tj=25℃, f=1MHz, V_{AC}= 25mV	Fig.10
Output capacitance	Coss			358			
Reverse capacitance	Crss			47			
Coss stored energy	Eoss	uJ		34			Fig.12
Gate source charge	Qgs	nC		80		V_{DS}=400V, V_{GS}=-5/18V, I_D=50A	Fig.16
Gate drain charge	Qgd			75			
Gate charge	Qg			275			
Short-Circuit Withstand Time	t_{sc}	us		1.6		V_{GS}=-4/18V, V_{DS}=400V,I_{sc}=800A R_G=30Ω	
Internal Gate Resistance	$R_{G(int)}$	Ω		1.0	5.0	f =1MHz, V_{AC}= 25mV	

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

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Turn on delay time	$t_{d(on)}$	ns		13.7		V_{DD}=400V, V_{GS}=-4/+18V, I_D=50A, L=100uH, $R_{G(ext)}$= 2.7Ω	
Rise time	t_r			34.8			
Turn off delay time	$t_{d(off)}$			45.2			
Fall time	t_f			17.6			
Turn on switching energy	Eon	uJ		399.4			Fig.17, 18
Turn off switching energy	Eoff			209.2			

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

PARAMTETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Diode forward voltage	V_{SD}	V		4.2		V_{GS}=0V,I_{SD}=25A	Fig.8
Continuous diode forward current	I_S	A		61.5		V_{GS}=0V,Tc=25℃	
Reverse recovery time	trr	nS		48		V_{DS}=400V, V_{GS}=0V, I_{SD}=25A, di/dt=300A/uS	
Reverse recovery charge	Qrr	nC		209			
Peak reverse recovery current	Irrm	A		6.1			

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

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

PARAMETER	SYMBOL	UNIT	Value
Thermal resistance	$R_{\theta J-C}$	°C /W	0.4

■Typical Characteristics

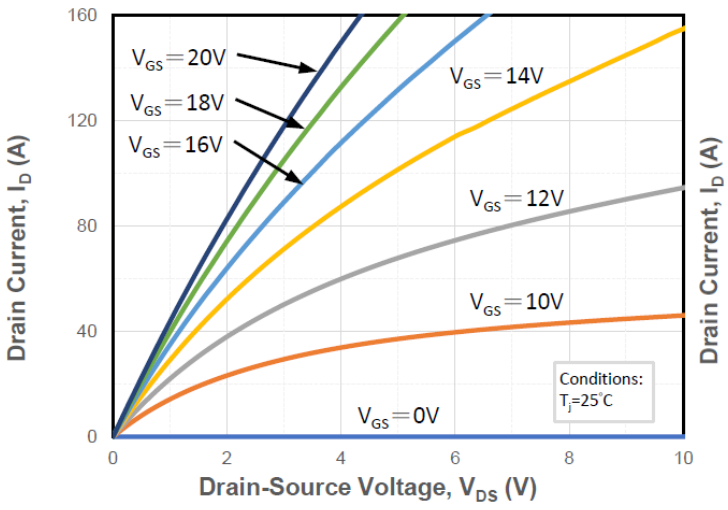


Figure 1. Output Characteristics Tj = 25℃

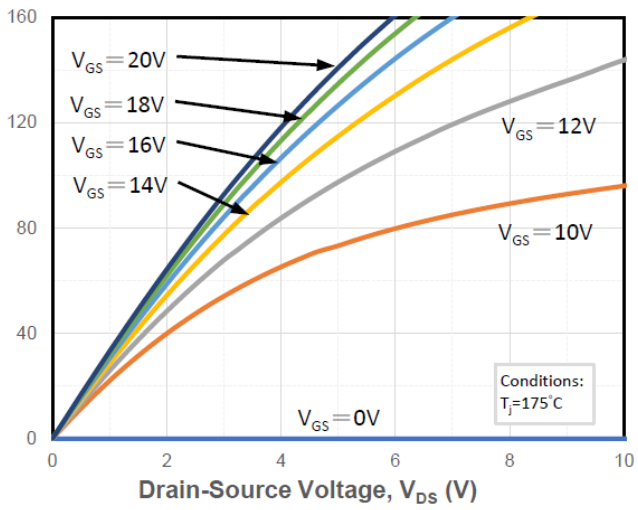


Figure2. Output Characteristics Tj = 175℃

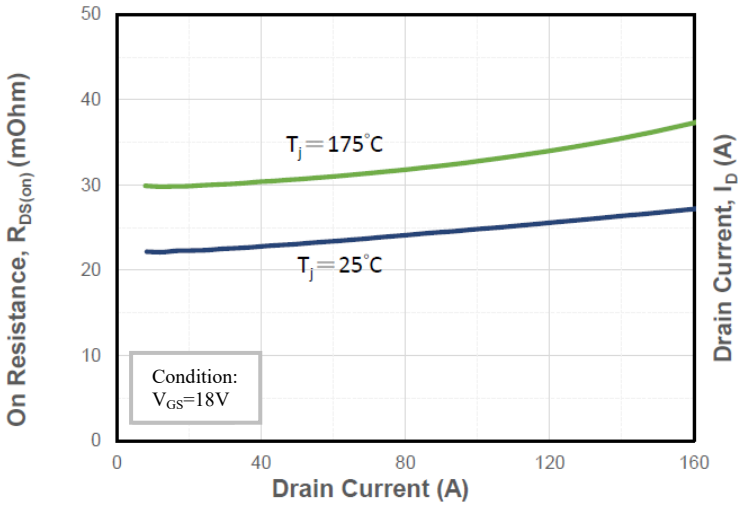


Figure 3. On-resistance vs. drain current

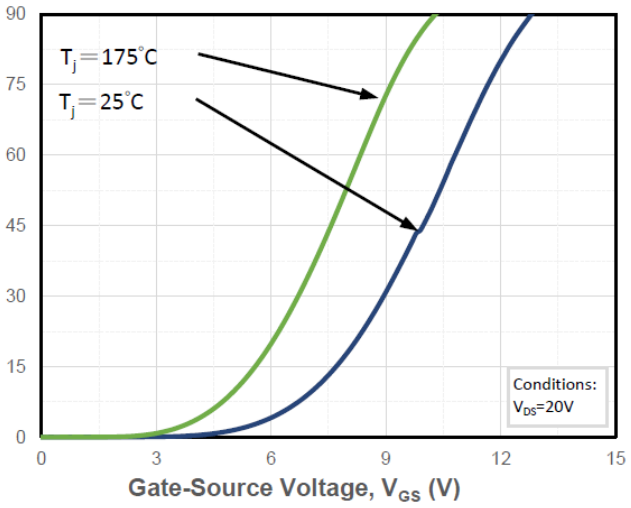


Figure 4. Transfer Characteristics for various Tj

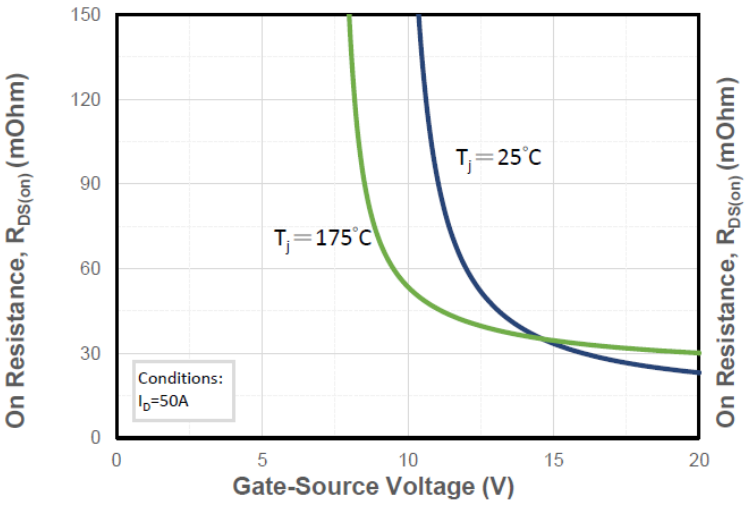


Figure 5. On-resistance vs. gate voltage for various Tj

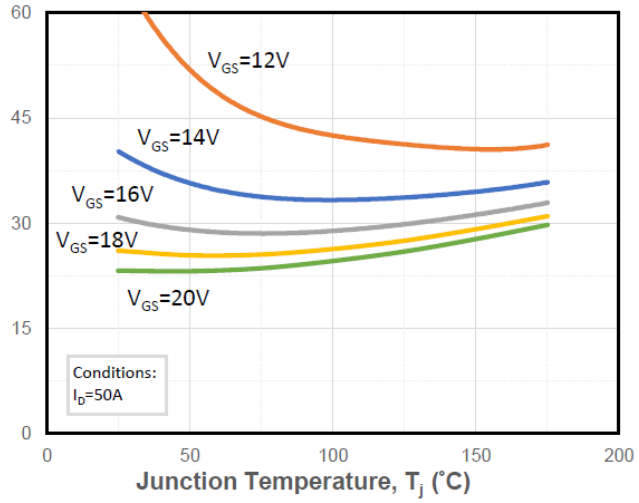


Figure 6. On-resistance vs. Temperature for various Gate voltage

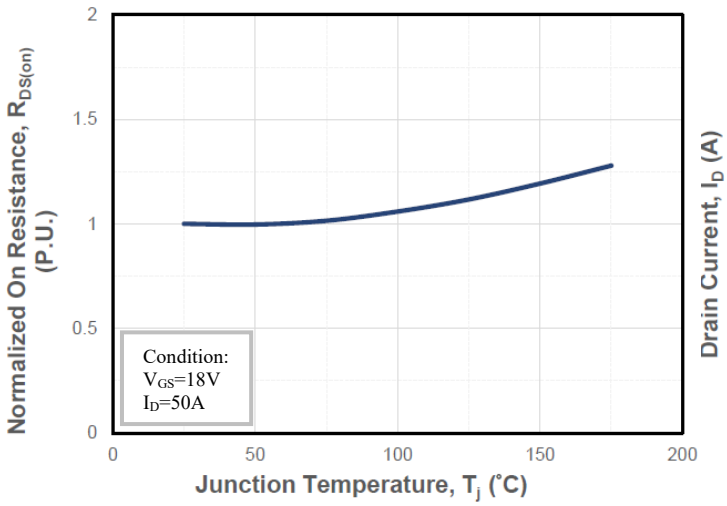


Figure 7. Normalized On-Resistance vs.Temperature

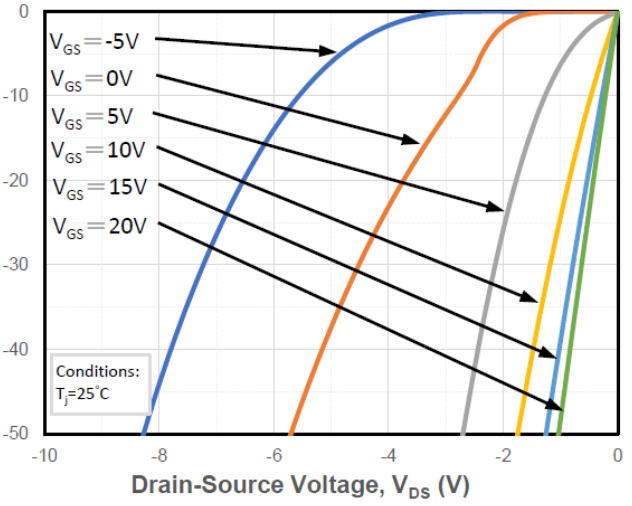


Figure 8. Reverse Output Characteristics at Tj = 25°C

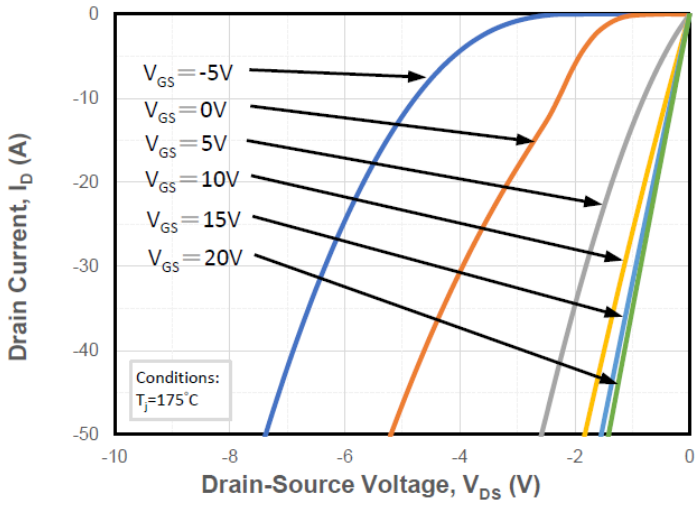


Figure 9. Reverse Output Characteristics at Tj = 175°C

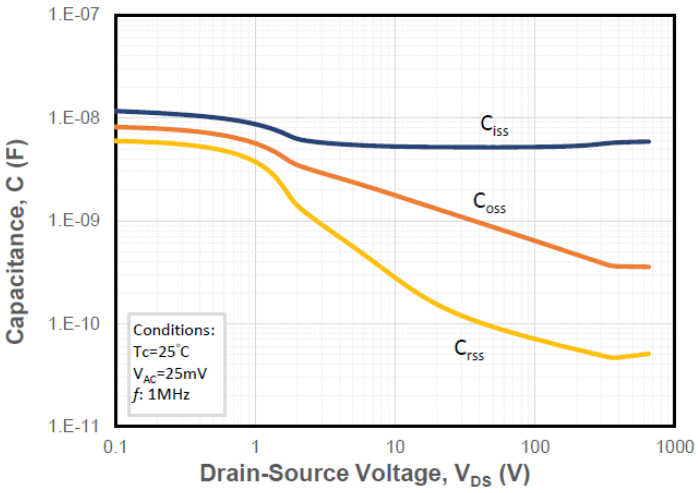


Figure 10. Capacitances vs. Drain to Source Voltage

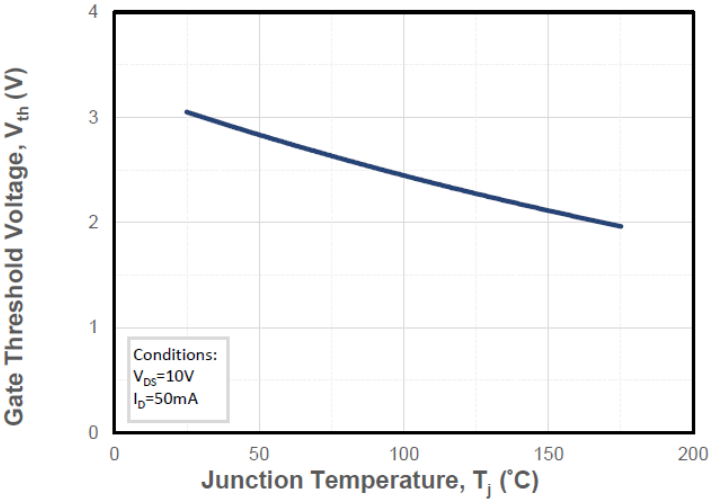


Figure 11. Threshold voltage vs.temperature

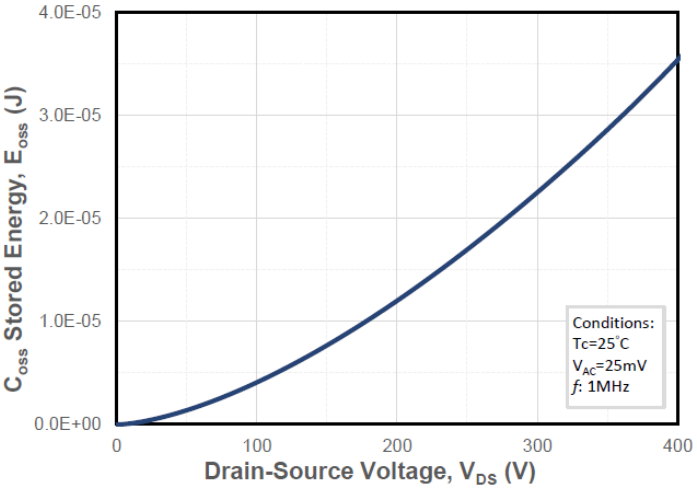


Figure 12. Output Capacitor Stored Energy

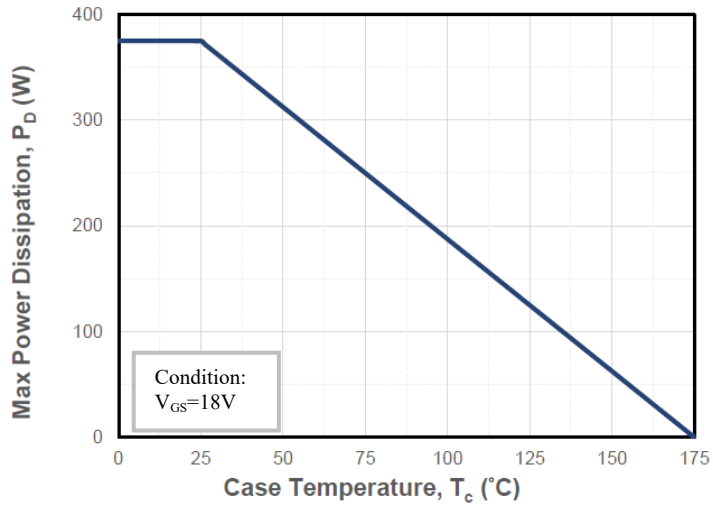


Figure 13. Maximum Power Dissipation Derating vs. Case Temperature

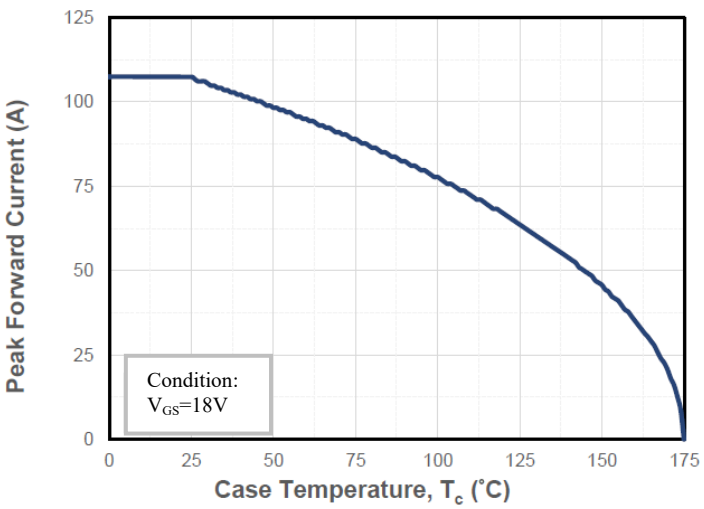


Figure 14. Drain Current Derating vs. Case Temperature

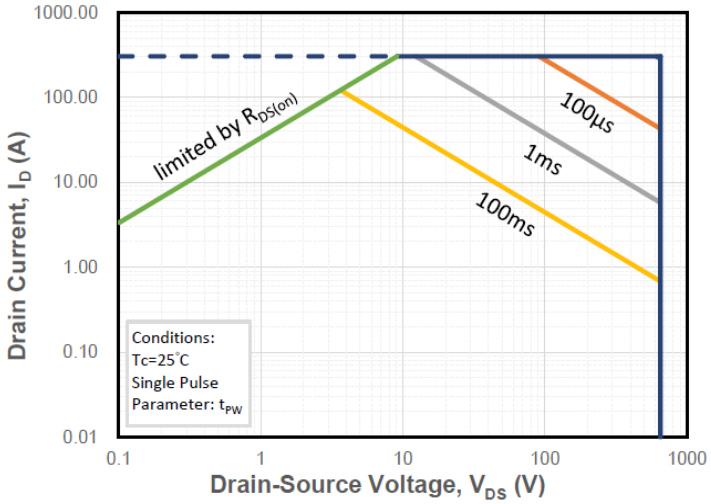


Figure 15. Safe Operating Area

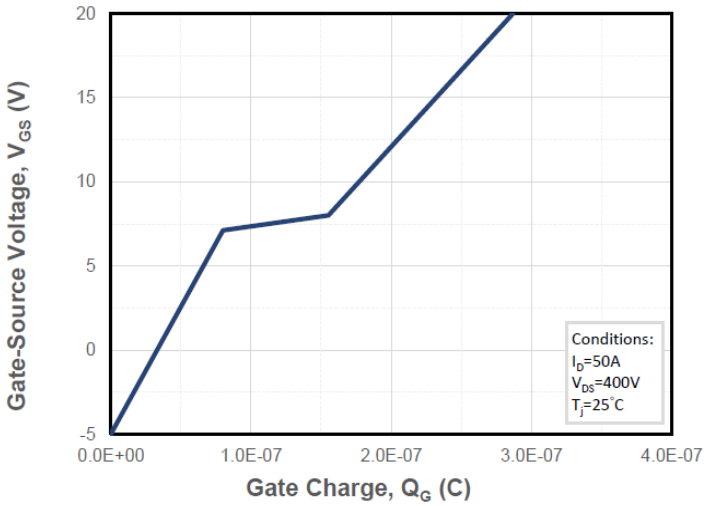


Figure 16. Gate Charge Characteristics

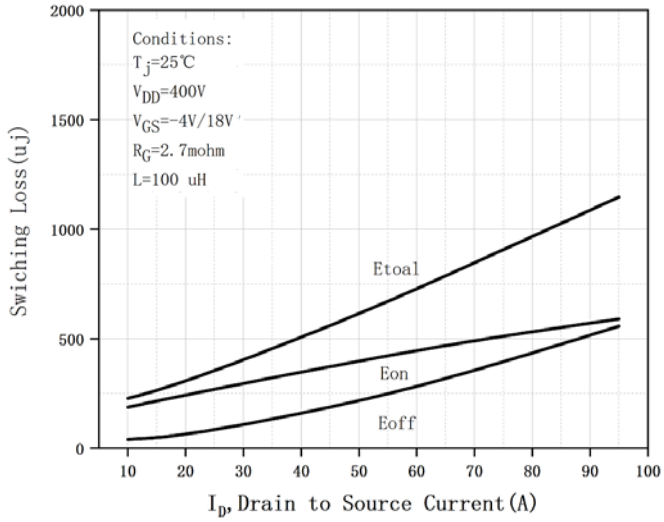


Figure 17. Clamped Inductive Switching Energy vs. Drain Current

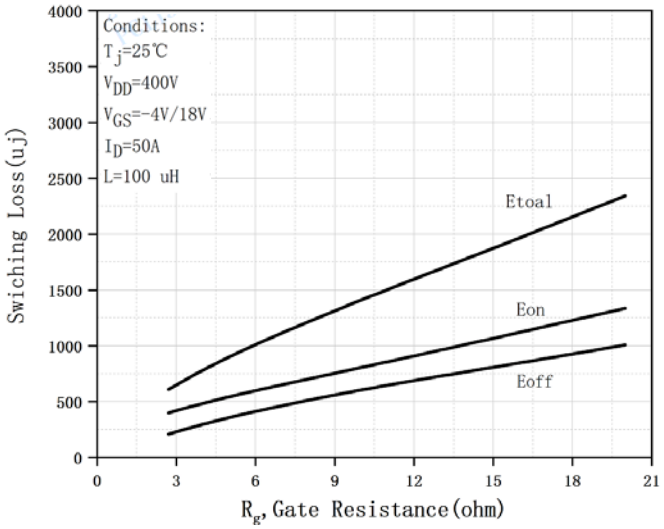


Figure 18. Clamped Inductive Switching Energy vs. External Gate Resistor (R_G(ext.))

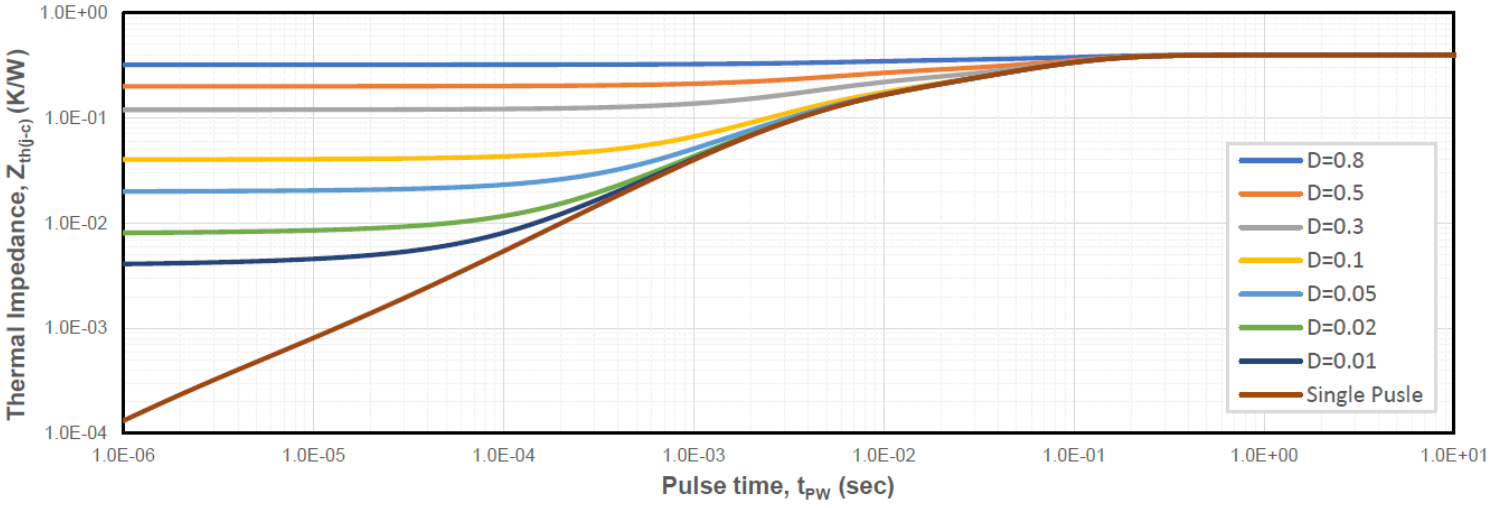


Figure 19. Transient Junction to Case Thermal Impedance

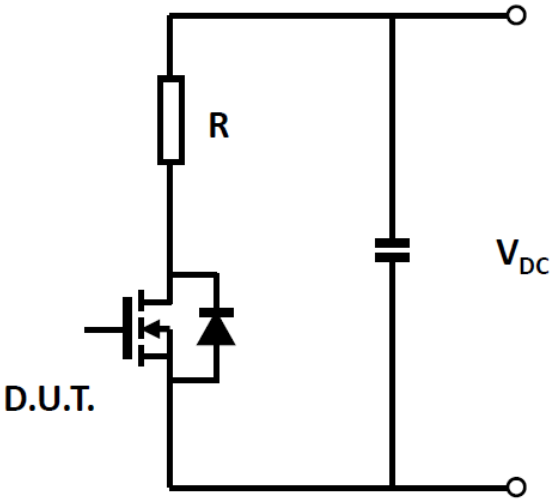


Figure 20. Schematic of Resistive Switching

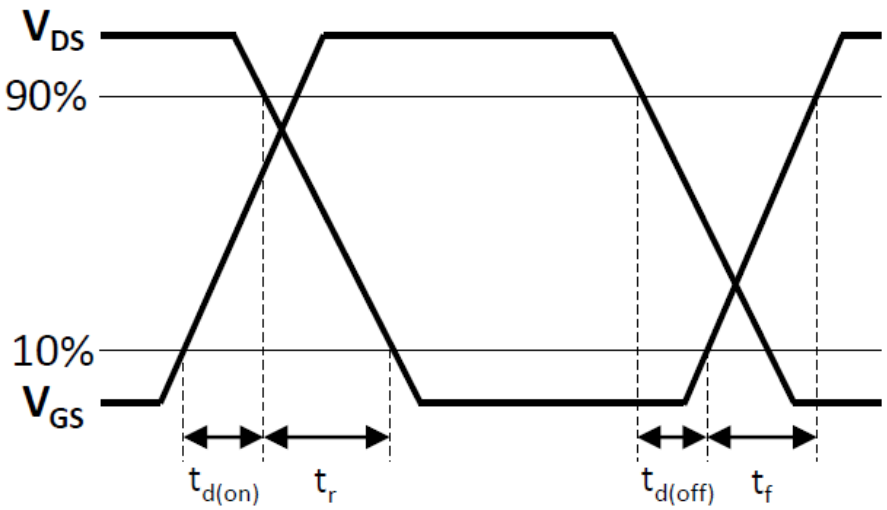
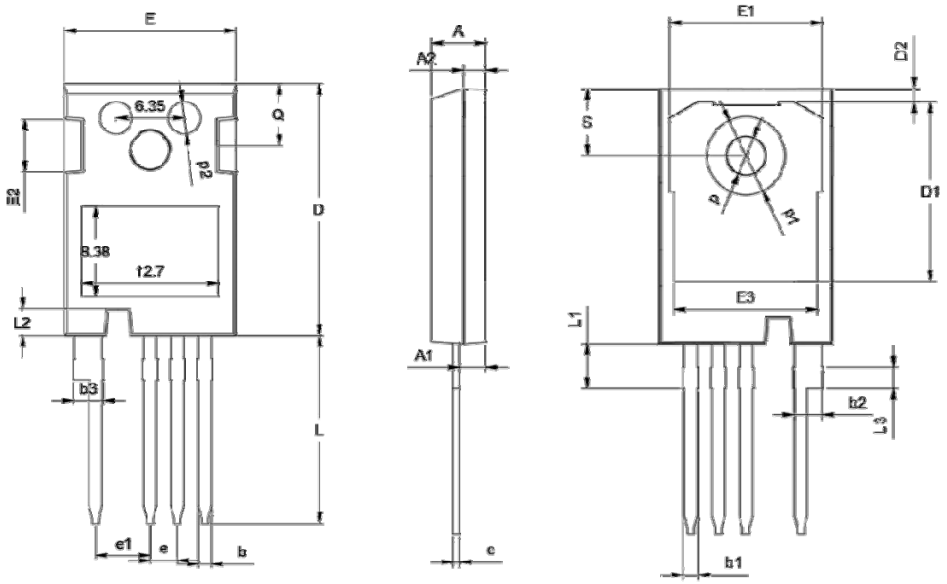


Figure 21. Switching Times Definition

■Outline Dimensions



TO247-4L			
Dim	Min	Norm	Max
A	4.80	5.00	5.20
A1	2.30	2.40	2.50
A2	1.88	1.98	2.08
b	1.10	1.20	1.30
b1	1.20	/	1.50
b2	2.35	2.55	2.75
b3	2.45	/	2.85
c	0.55	0.60	0.65
D	23.3	23.45	23.6
D1	16.25	16.55	16.85
D2	1.00	/	1.30
e	TYP2.54		
e1	TYP5.06		
E	15.75	15.90	16.05
E1	13.80	/	14.20
E2	4.40	4.75	5.10
E3	13.00	/	13.45
L	17.34	17.49	17.64
L1	4.00	/	4.30
L2	2.35	/	2.65
L3	TYP1.98		
Q	5.60	5.80	6.00
S	6.05	/	6.30
p	TYP3.58		
p1	TYP7.18		
p2	TYP3.00		

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