N-Channel SiC Power MOSFET

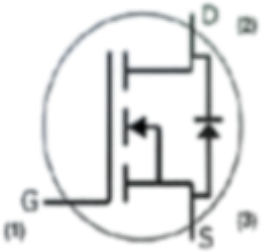
Product Summary

V_{DS}	=	1700 V
$R_{DS(on)}$	=	45 mΩ
I_D@25℃	=	72 A

Package



RoHS



Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Easy to Parallel and Simple to Drive

Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Applications

- Power Supplies
- High Voltage DC/DC Converters
- Motor Drives
- Switch Mode Power Supplies
- Pulsed Power applications

Part Number	Package
TK3M45170D	TO-247-3

Maximum Ratings (T_C=25℃ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Voltage	1700	V	V_{GS}=0V, I_D=100μA	
V_{GSmax}	Gate-Source Voltage	-10/+25	V	Absolute maximum values	
V_{GSop}	Gate-Source Voltage	-5/+20	V	Recommended operational values	
I_D	Continuous Drain Current	72	A	V_{GS}=20V, T_C=25℃	
		48		V_{GS}=20V, T_C=100℃	
$I_{D(pulse)}$	Pulsed Drain Current	160	A	Pulse width t_p limited by T_{Jmax}	
P_D	Power Dissipation	520	W	T_C=25℃, T_J=150℃	
T_J, T_{STG}	Operating Junction and Storage Temperature	-55 to +150	℃		

Electrical Characteristics (T_C=25℃ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1700	/	/	V	V_{GS}=0V, I_D=100μA	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.6	4.0	V	V_{DS}=V_{GS}, I_D=18mA	Fig. 11
		/	1.8	/		V_{DS}=V_{GS}, I_D=18mA, T_J=150℃	
I_{DSS}	Zero Gate Voltage Drain Current	/	1	100	μA	V_{DS}=1700V, V_{GS}=0V	
I_{GSS+}	Gate-Source Leakage Current	/	10	250	nA	V_{DS}=0V, V_{GS}=25V	
I_{GSS-}	Gate-Source Leakage Current	/	10	250	nA	V_{DS}=0V, V_{GS}=-10V	
$R_{DS(on)}$	Drain-Source On-State Resistance	/	45	70	mΩ	V_{GS}=20V, I_D=50A	
		/	90	/		V_{GS}=20V, I_D=50A, T_J=150℃	
g_{fs}	Transconductance	/	25.8	/	S	V_{DS}=20V, I_D=50 A	Fig. 4,5,6
		/	27.0	/		V_{DS}=20V, I_D=50A, T_J=150℃	
C_{iss}	Input Capacitance	/	3550	/	pF	V_{GS}=0V V_{DS}=1000V f=1MHz	Fig. 15,16
C_{oss}	Output Capacitance	/	165	/			
C_{rss}	Reverse Transfer Capacitance	/	6.1	/			
E_{oss}	C_{oss}Stored Energy	/	101	/	μJ	V_{AC}=25mV	
E_{ON}	Turn-On Switching Energy	/	3.1	/	mJ	V_{DS}=1200V, V_{GS}=-5V/20V I_D=30A, $R_{G(ext)}$=2.5Ω, L=100μH	
E_{OFF}	Turn-Off Switching Energy	/	1.1	/			
$t_{d(on)}$	Turn-On Delay Time	/	27	/	ns	V_{DS}=1200V, V_{GS}=-5V/20V, I_D=30A $R_{G(ext)}$=2.5Ω, R_L=20Ω	
t_r	Rise Time	/	32	/			
$t_{d(off)}$	Turn-Off Delay Time	/	36	/			
Q_{GS}	Gate to Source Charge	/	54	/	nC	V_{DS}=1200V V_{GS}=-5V/20V I_D=50A	
Q_{GD}	Gate to Drain Charge	/	25	/			
Q_G	Total Gate Charge	/	193	/			

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.5	/	V	V_{GS}=-5V, I_{SD}=25A	Fig. 8,9,10
		4.2	/		V_{GS}=-5V, I_{SD}=25A, T_J=150℃	
I_S	Continuous Diode Forward Current	/	72	A	T_C=25℃	
t_{rr}	Reverse Recover Time	55	/	ns	V_R=1200V, I_{SD}=50A	
Q_{rr}	Reverse Recovery Charge	220	/	nC		
I_{rrm}	Peak Reverse Recovery Current	6.7	/	A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{θJC}$	Thermal Resistance from Junction to Case	0.24	/	℃/W		
$R_{θJA}$	Thermal Resistance from Junction to Ambient	/	40			

Typical Performance

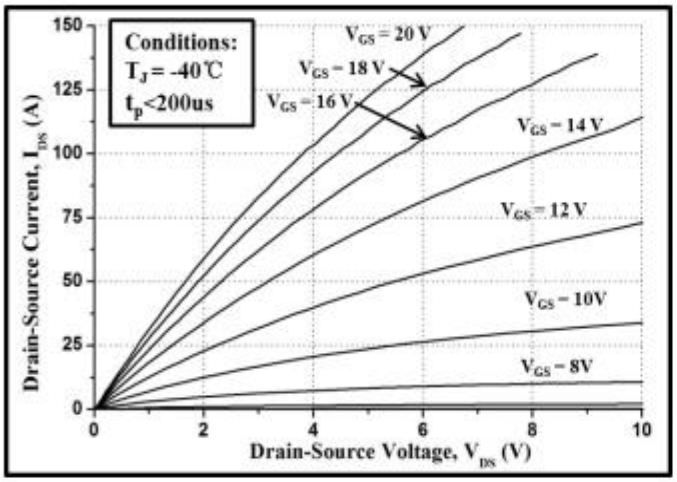


Figure 1. Output Characteristics T_J = -40 °C

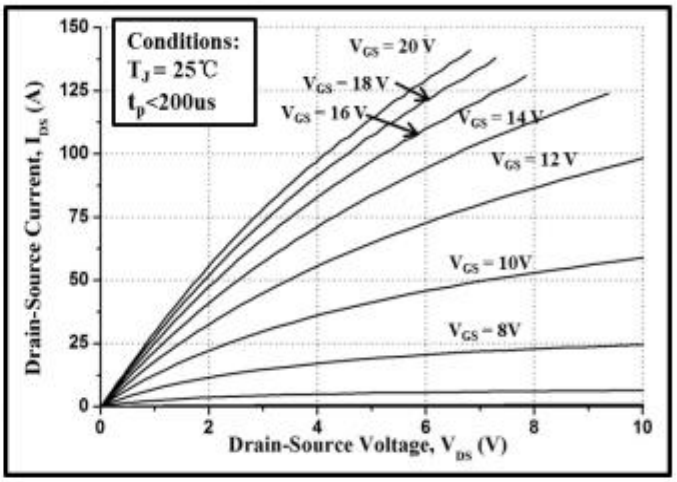


Figure 2. Output Characteristics T_J = 25 °C

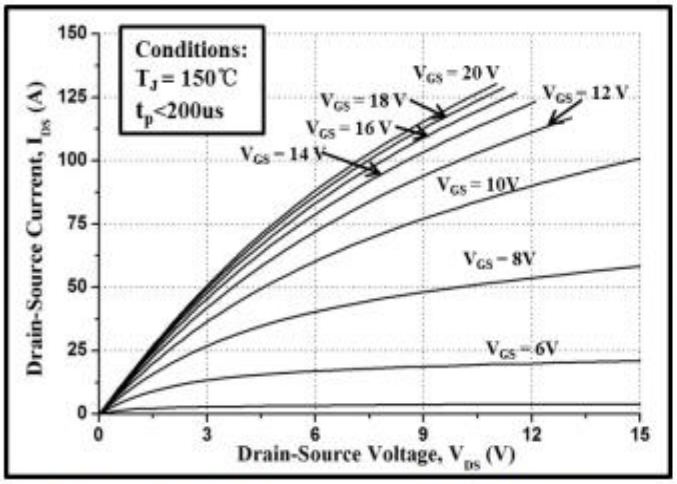


Figure 3. Output Characteristics T_J = 150 °C

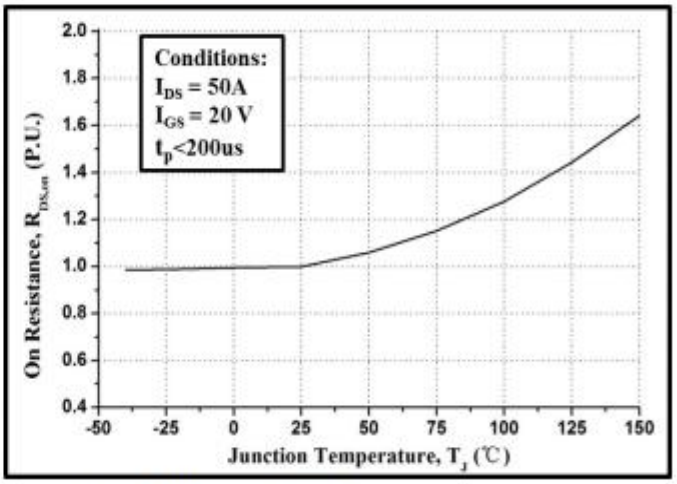


Figure 4. Normalized On-Resistance vs. Temperature

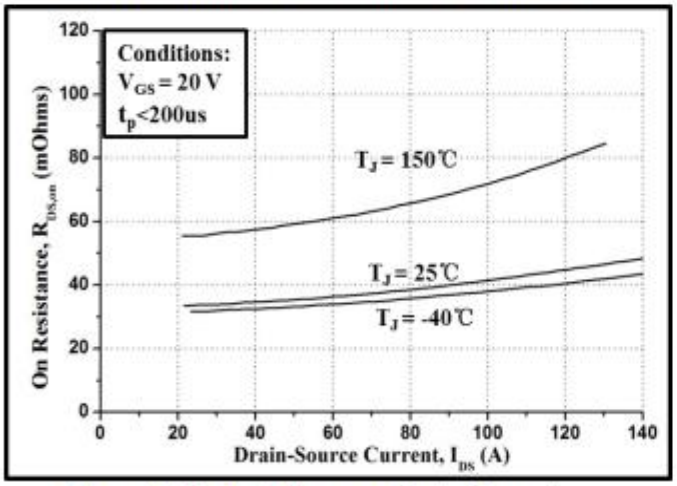


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

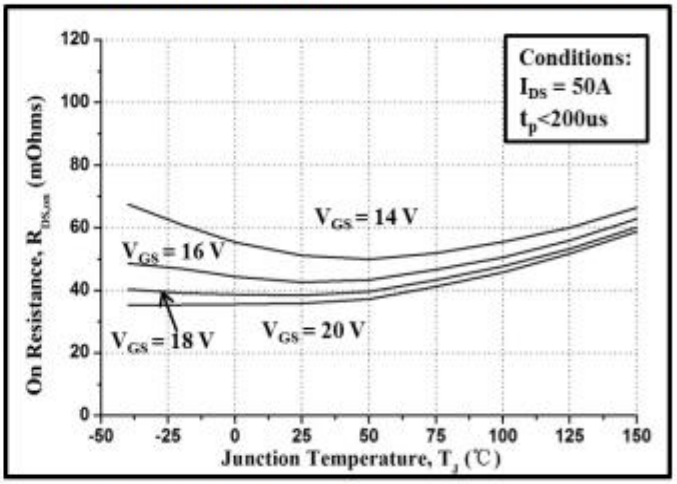


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

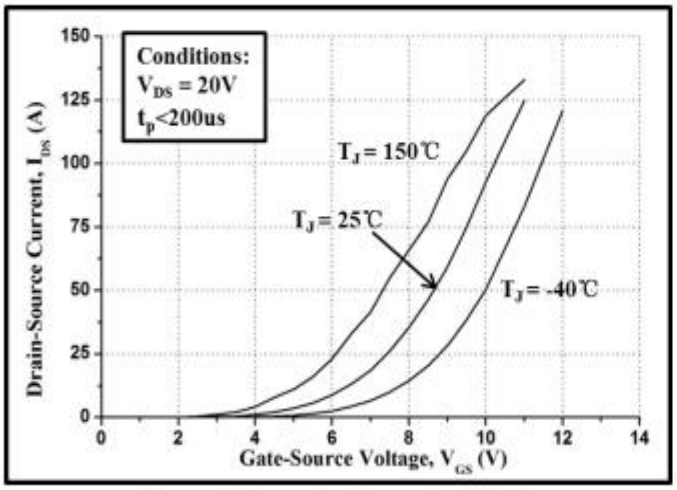


Figure 7. Transfer Characteristic for Various Junction Temperatures

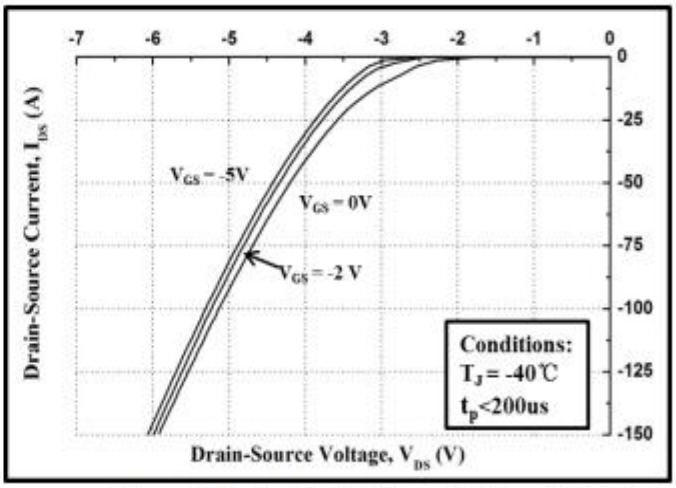


Figure 8. Body Diode Characteristic at -40 °C

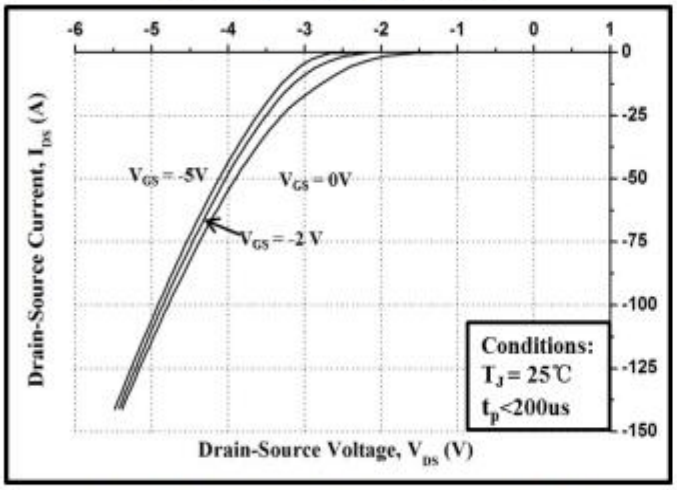


Figure 9. Body Diode Characteristic at 25 °C

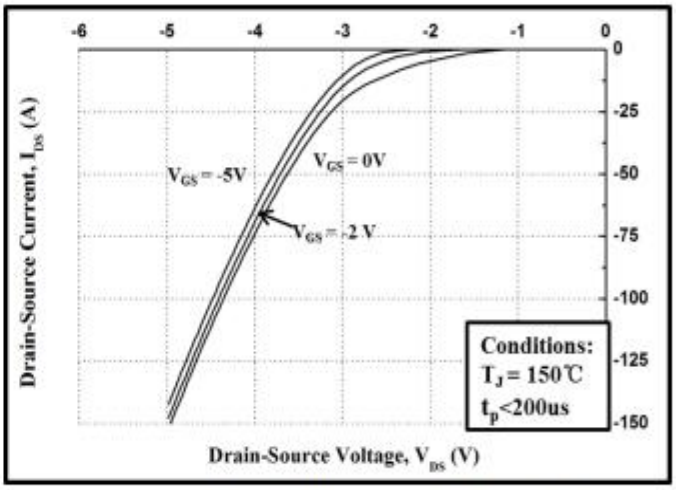


Figure 10. Body Diode Characteristic at 150 °C

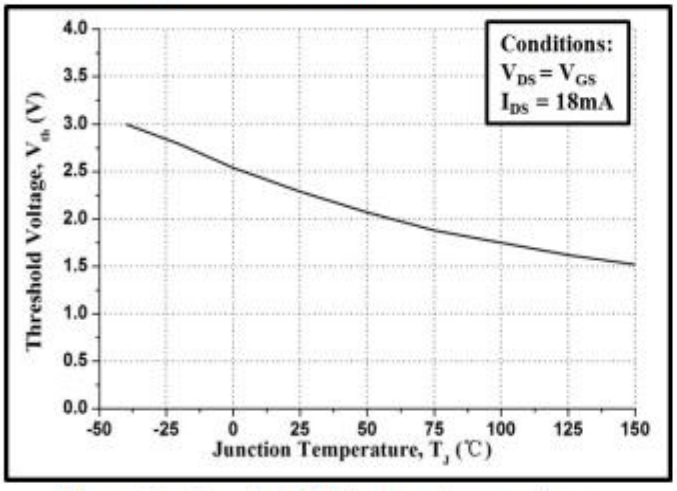


Figure 11. Threshold Voltage vs. Temperature

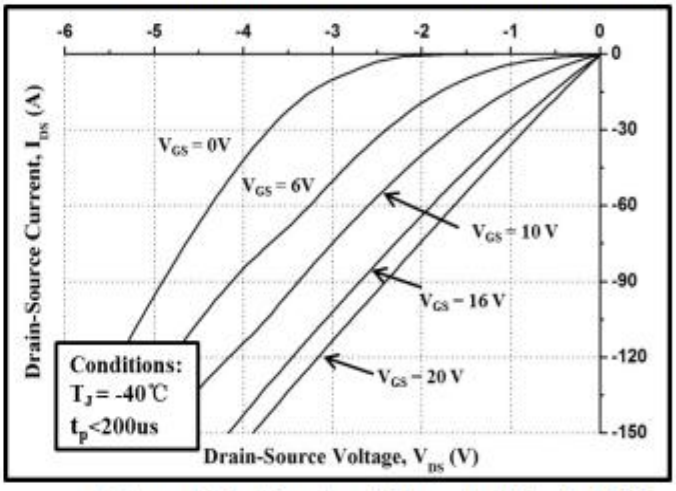


Figure 12. 3rd Quadrant Characteristic at -40 °C

Typical Performance

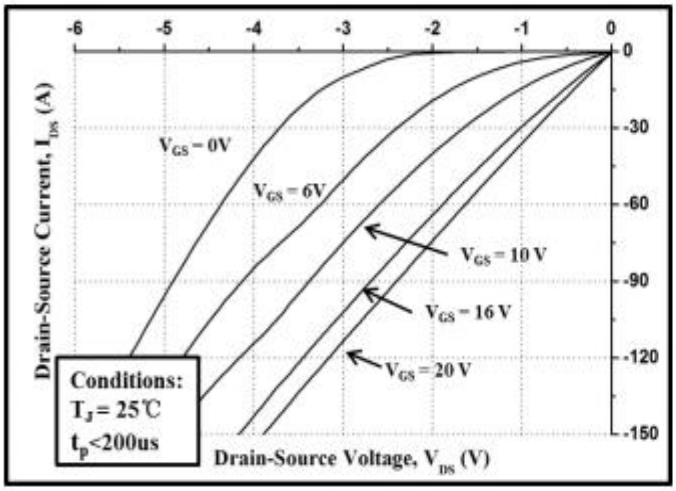


Figure 13. 3rd Quadrant Characteristic at 25 °C

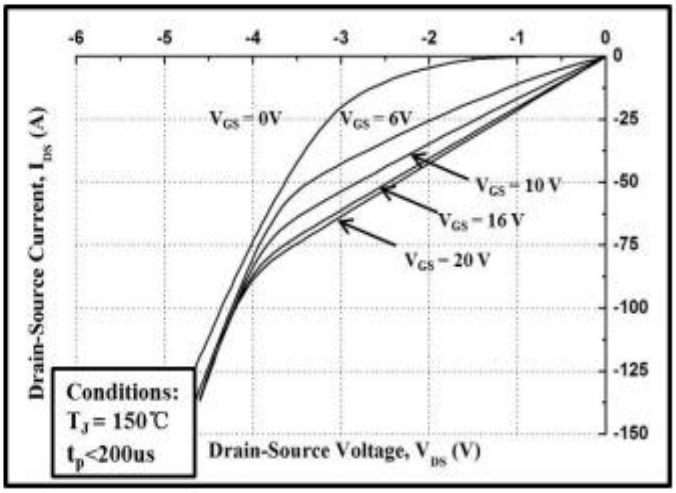


Figure 14. 3rd Quadrant Characteristic at 150 °C

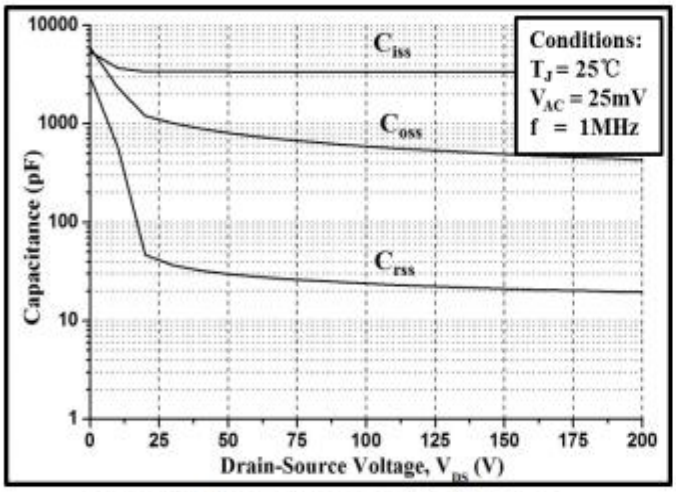


Figure 15. Capacitances vs. Drain-Source Voltage (0 - 200V)

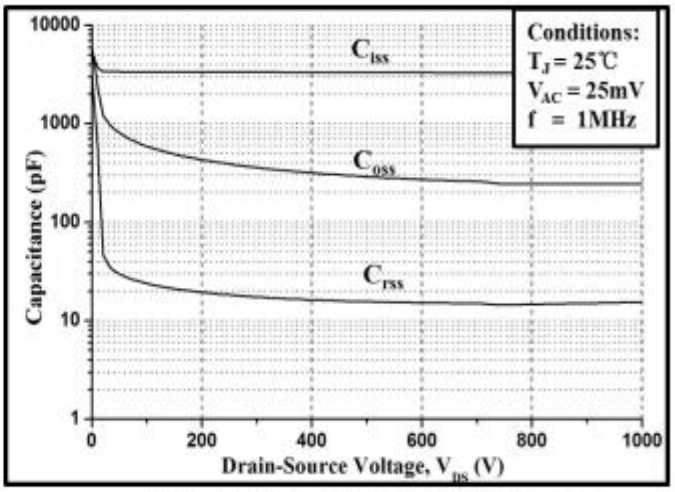


Figure 16. Capacitances vs. Drain-Source Voltage (0 - 1000V)

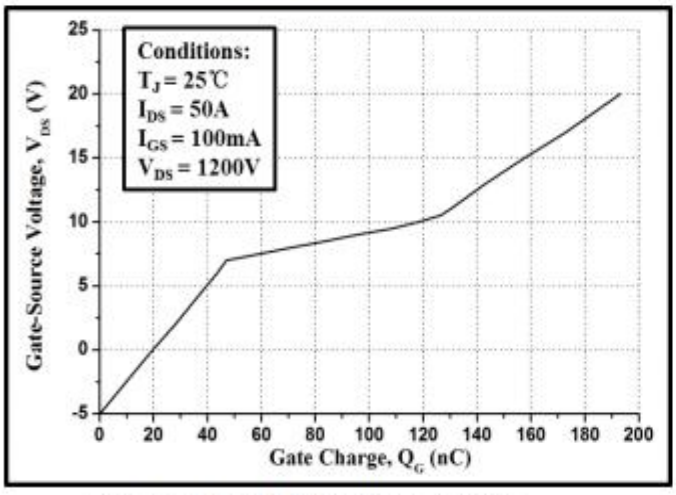


Figure 17. Gate Charge Characteristic

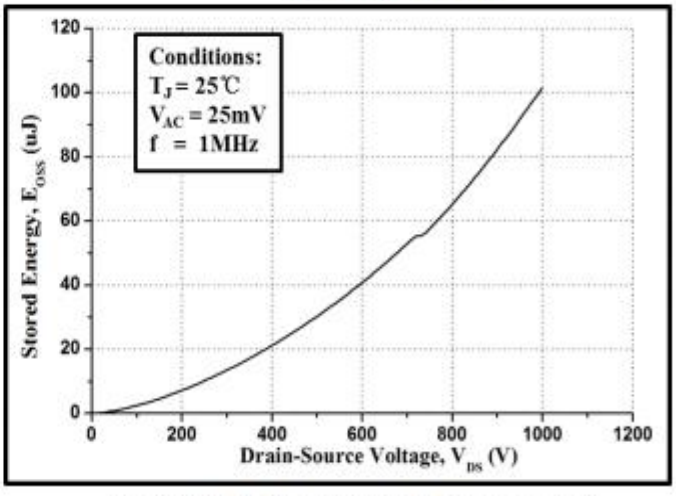
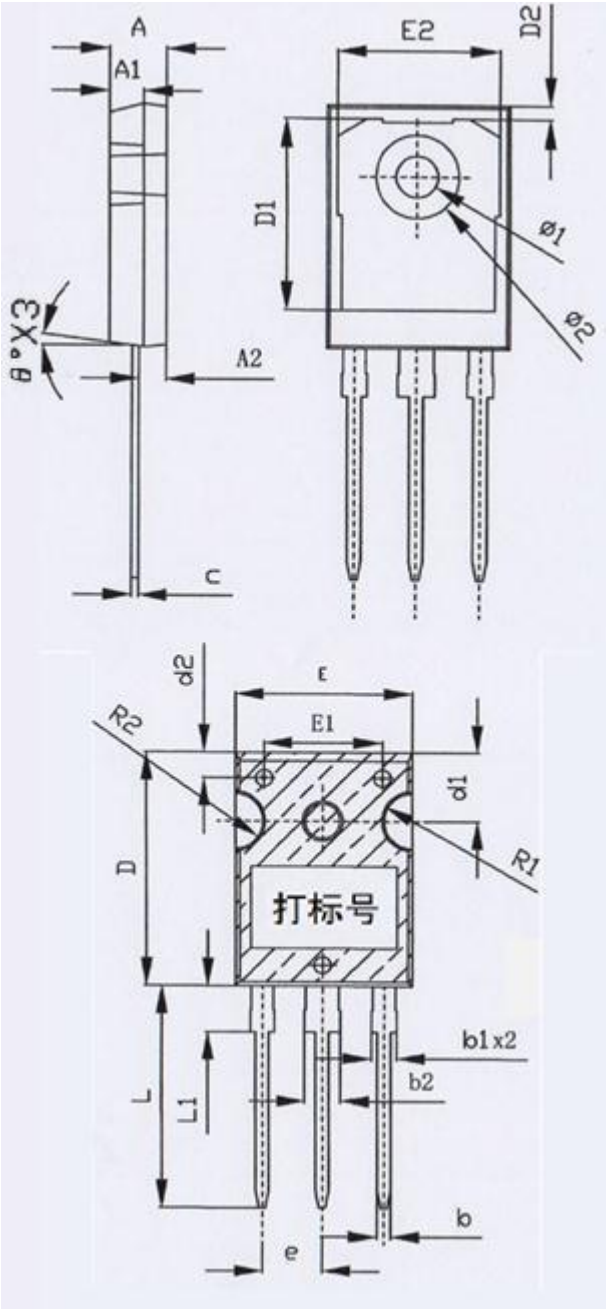


Figure 18. Output Capacitor Stored Energy

Package Dimensions

Package TO-247-3



SYMBOLS	DIMENSIONS IN MILLMETERS		
	MIN	NOM	MAX
A	4.9	5	5.1
A1	2.9	3	3.1
A2	2.31	2.36	2.41
b	1.16	1.2	1.26
b1	2.05	-	2.2
b2	3.05	-	3.2
c	0.58	0.6	0.66
D	20.9	21	21.1
D1	16.46	16.56	16.76
D2		1.17	
d1	6.05	6.15	6.25
d2	2.2	2.3	2.4
E	15.7	15.8	15.9
E1		10.5	
E2		14.02	
e	-	1.27bcs	-
L	19.82	19.92	20.02
L1	1.88	1.98	2.08
θ	0°	7°	8°
R1	-	2.7	-
R2	-	2.5	-
Φ1		3.6	
Φ2	-	7.19	-