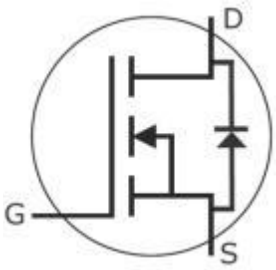
N-Channel SiC Power MOSFET

Product Summary

V_{DS}	=	1200 V
$R_{DS(on)}$	=	160 mΩ
I_{DS}@25℃	=	21A

Chip Outline





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

- Solar Inverters
- High Voltage DC/DC Converters
- Motor Drivers
- Switch Mode Power Supplies
- Pulsed Power applications

Part Number	Package
TK3M160120D	TO-247-3

Maximum Ratings (T_C=25℃ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions
V_{DSmax}	Drain-Source Voltage	1200	V	V_{GS}=0V, I_{DS}=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	21	A	V_{GS}=20V, Tc=25℃
T_J,T_{STG}	Operating Junction and Storage Temperature	-55 to +175	℃	

Electrical Characteristics (T_C=25℃ unless otherwise specifie)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200	/	/	V	V_{GS}=0V, I_{DS}=100μA	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.3	4	V	V_{DS}=V_{GS}, I_{DS}=2.5mA	Fig.11
			1.5	/		V_{DS}=V_{GS},I_{DS}=2.5mA,T_J=150℃	
I_{DSS}	Zero Gate Voltage Drain Current	/	1	100	μA	V_{DS}=1200V, V_{GS}=0V	
I_{GSS}	Gate-Source Leakage Current	/		250	nA	V_{DS}=0V, V_{GS}=20V	
$R_{DS(on)}$	Drain-Source On-State Resistance	/	160	200	mΩ	V_{GS}=20V, I_D=10A	Fig.4
		/	200			V_{GS}=20V, I_D=10A, T_J=150℃	
C_{iss}	Input Capacitance	/	1190	/	pF	V_{GS}=0V V_{DS}=1000V f=1MHz	Fig. 16,17
C_{oss}	Output Capacitance	/	70	/			
C_{rss}	Reverse Transfer Capacitance	/	13	/			
E_{oss}	C_{oss}Stored Energy	/	34	/	μJ	V_{AC}=25mV	Fig.15
t_{don}	Turn-On Delay Time	/	10	/	ns	V_{DS}=800V, V_{GS}=-5V/20V I_D=10A, R_g=2.5Ω R_L=80Ω (TO-247-3 Package)	
t_r	Rise Time	/	11.5	/			
t_{doff}	Turn-Off Delay Time	/	18	/			
t_f	Fall Time	/	11.5	/			
E_{ON}	Turn-On Switching Energy	/	420	/	μJ	V_{DS}=800V, V_{GS}=-5V/20V I_D=10A, R_g=2.5Ω, L=200μH (TO-247-3 Package)	Fig.20
E_{OFF}	Turn-Off Switching Energy	/	72	/			
R_G	Internal Gate Resistance	/	11.5	/	Ω	f=1MHz, open drain	

Gate Charge Characteristics (T_J=25℃)

Symbol	Parameter	Typ.	Unit	Test Conditions	Note
Q_g	Gate Charge Total	66	nC	V_{DS}=800V V_{GS}=-5V/20V I_D=10A	
Q_{gs}	Gate to Source Charge	25			
Q_{gd}	Gate to Drain Charge	15			

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	1.25	℃/W		

Typical Performance

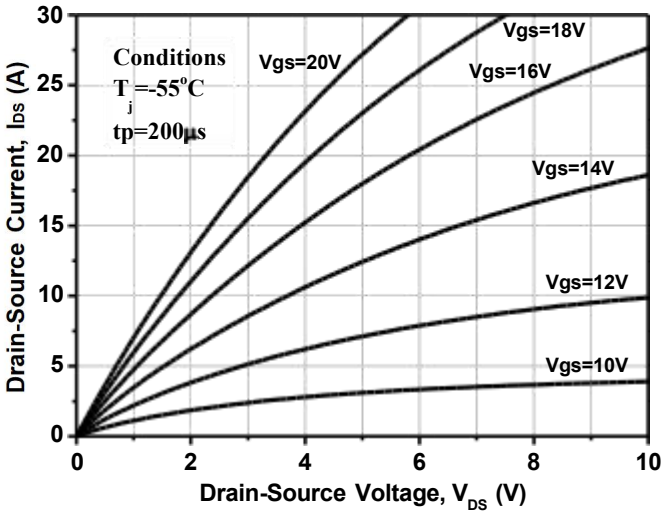


Figure 1. Output Characteristics T_J = -55℃

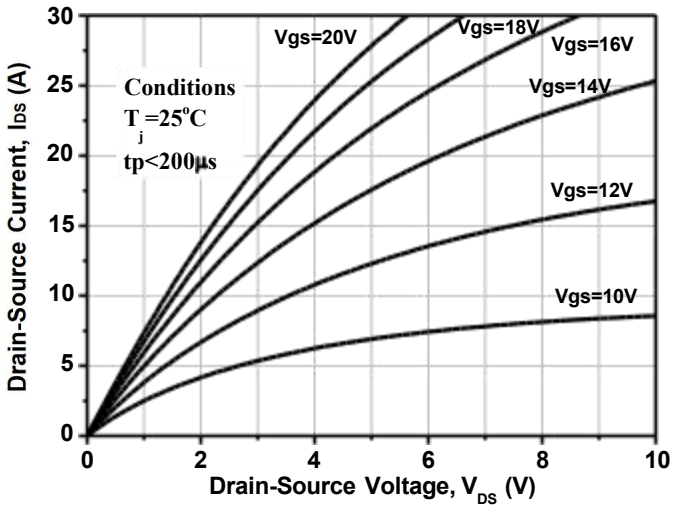


Figure 2. Output Characteristics T_J = 25℃

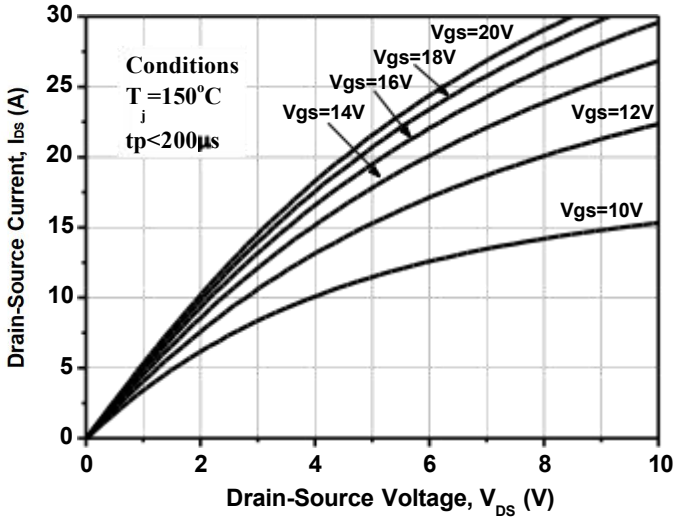


Figure 3. Output Characteristics T_J = 150℃

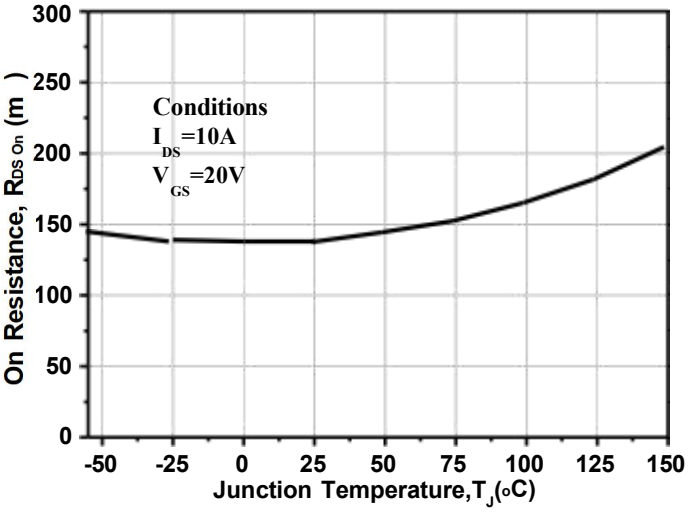


Figure 4. On-Resistance vs. Temperature

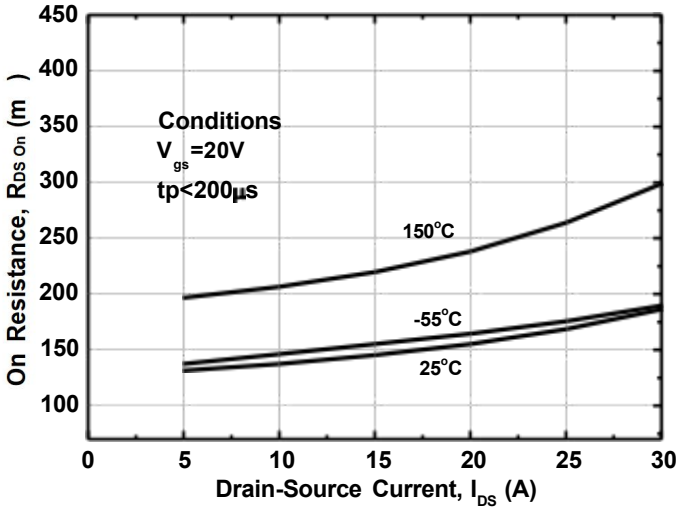


Figure 5. On-Resistance vs. Drain Current for Various Temperatures

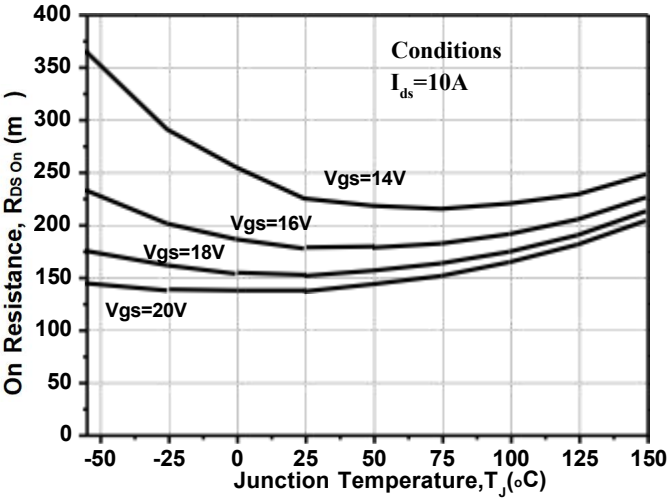


Figure 6. On-Resistance vs. Temperature for Various Gate Voltage

Typical Performance

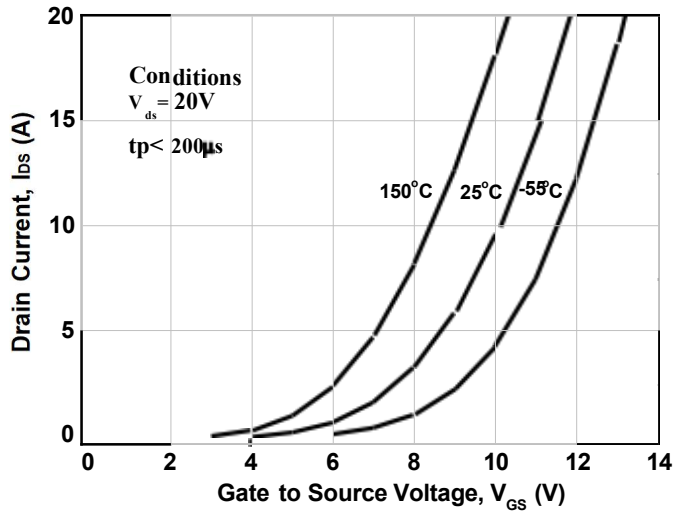


Figure 7. Transfer Characteristic for Various Junction Temperatures

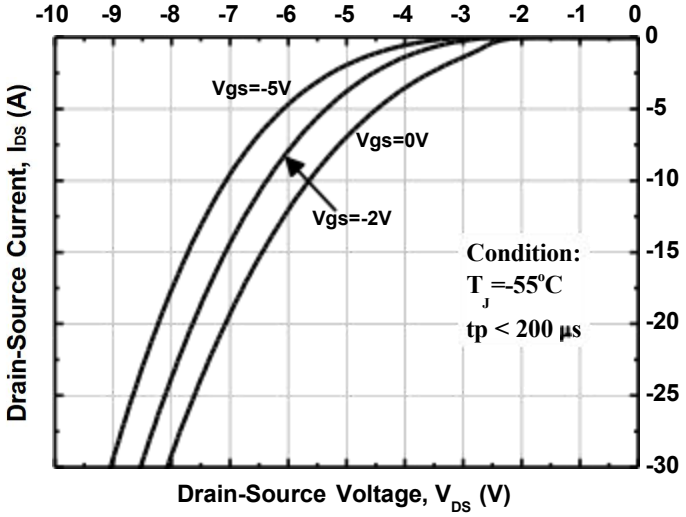


Figure 8. Body Diode Characteristic at -55℃

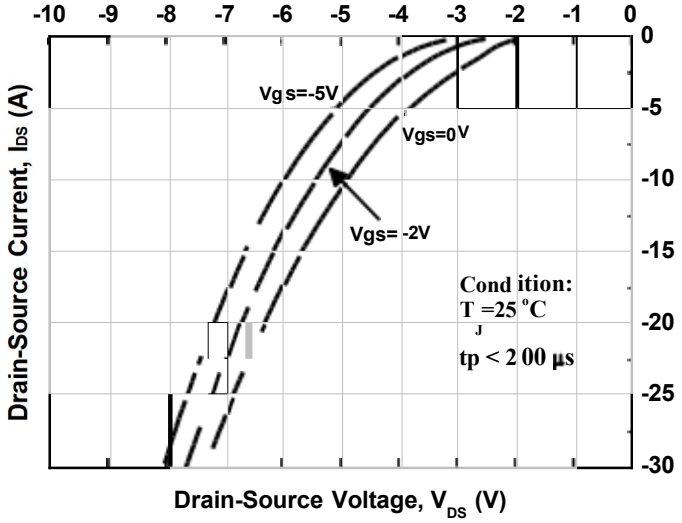


Figure 9. Body Diode Characteristic at 25℃

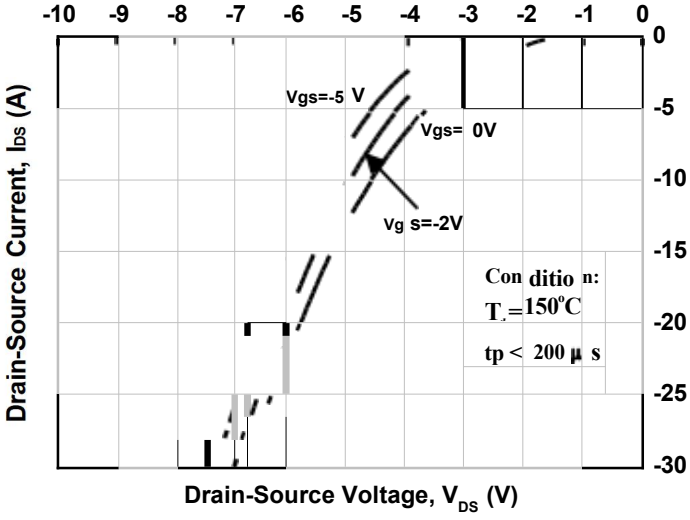


Figure 10. Body Diode Characteristic at 150℃

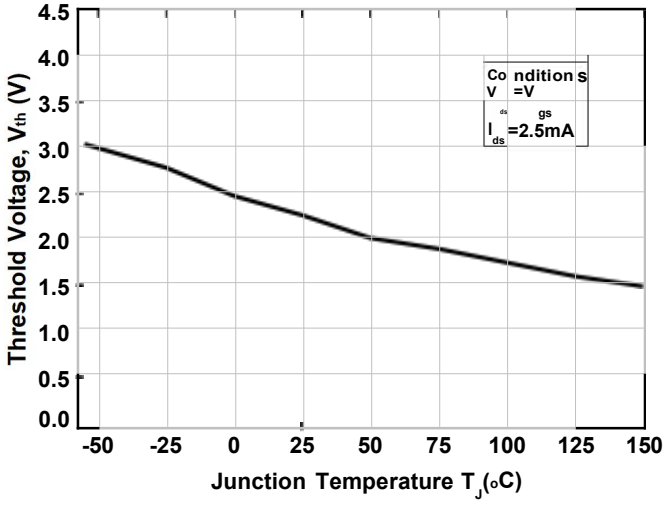


Figure 11. Threshold Voltage vs. Temperature

Typical Performance

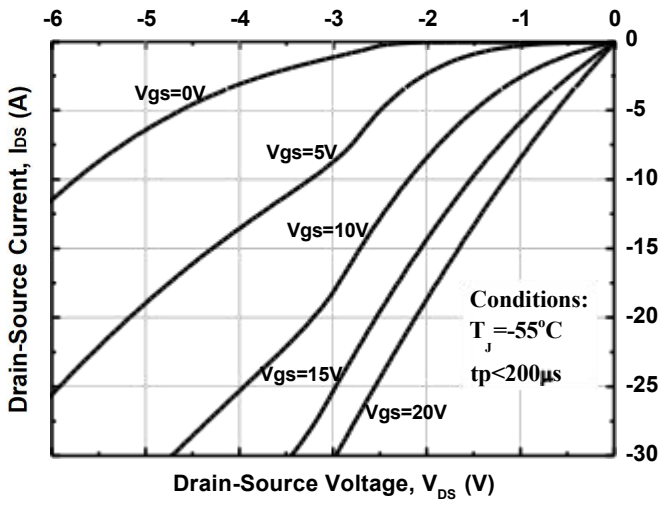


Figure 12. 3rd Quadrant Characteristic at -55℃

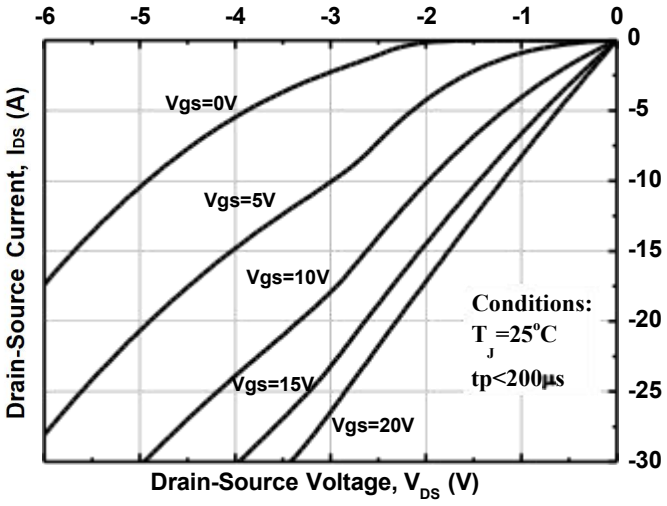


Figure 13. 3rd Quadrant Characteristic at 25℃

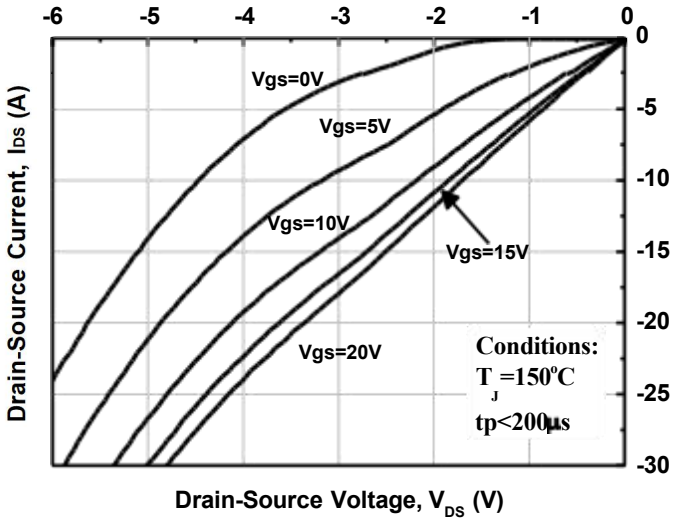


Figure 14. 3rd Quadrant Characteristic at 150℃

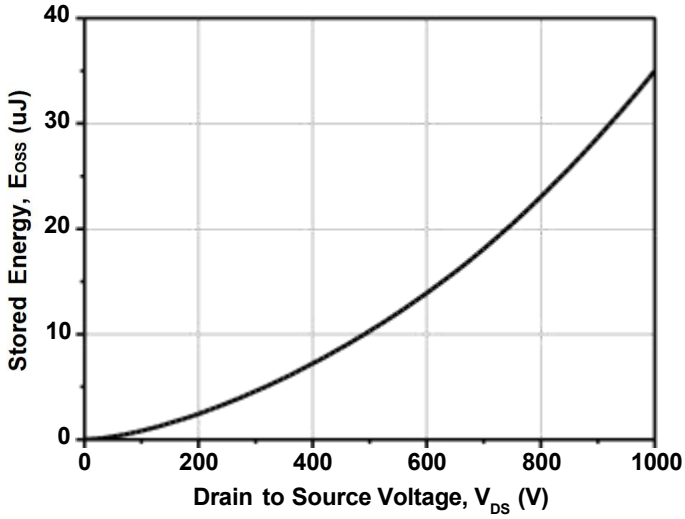


Figure 15. Output Capacitor Stored Energy

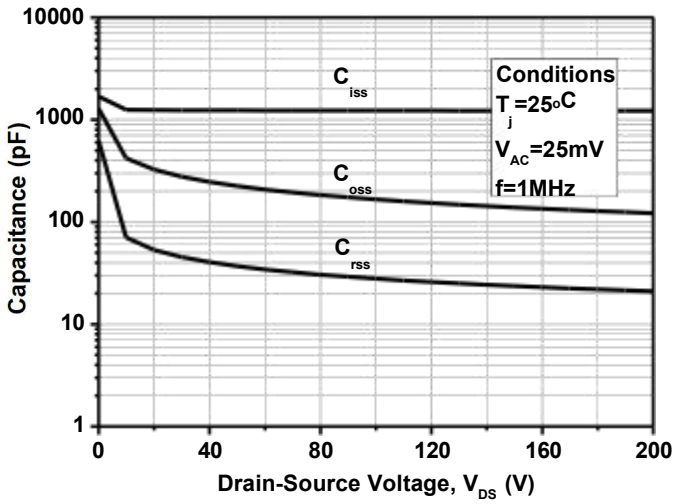


Figure 16. Capacitances vs. Drain-Source Voltage (0 - 200V)

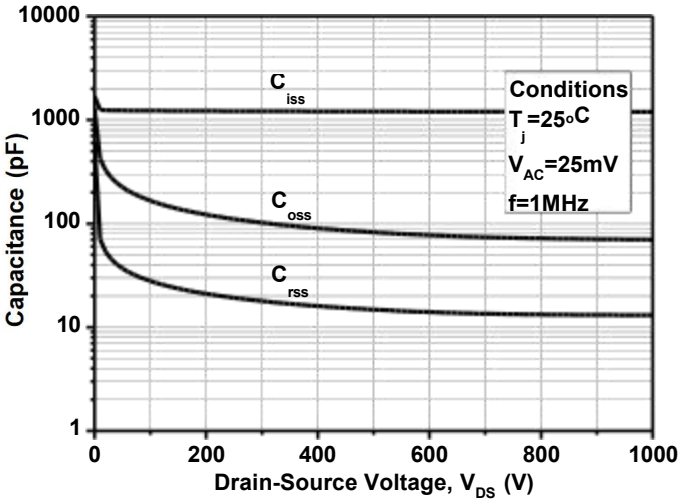


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 1000V)

Typical Performance

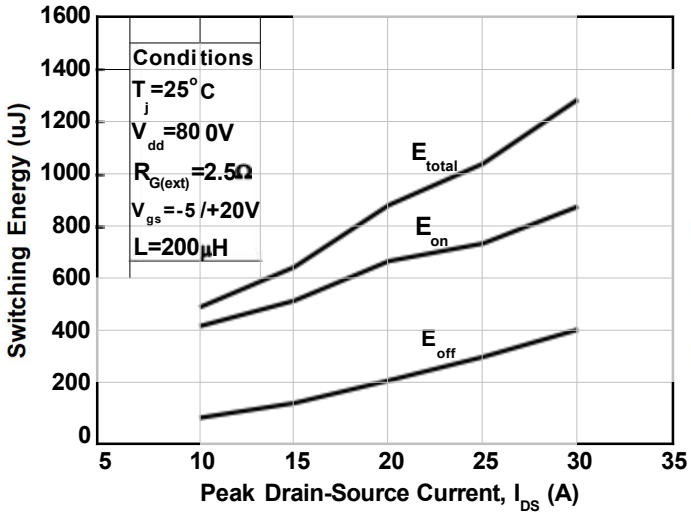


Figure 18. Switching Energy vs. Drain Current（V_{DD}=800V）

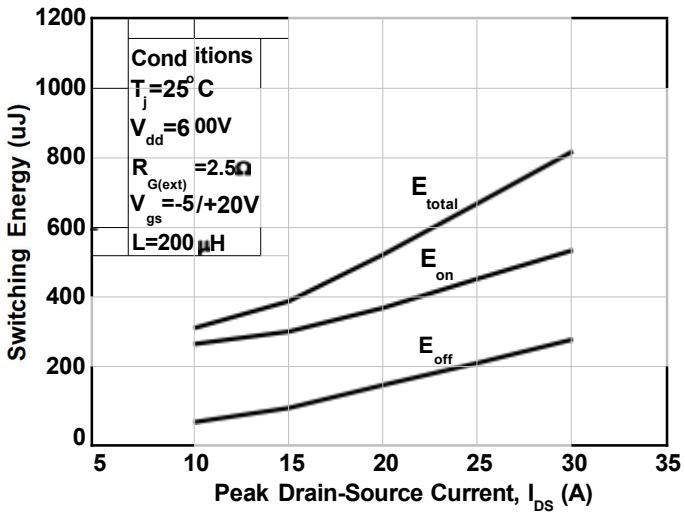


Figure 19. Switching Energy vs. Drain Current（V_{DD}=600V）

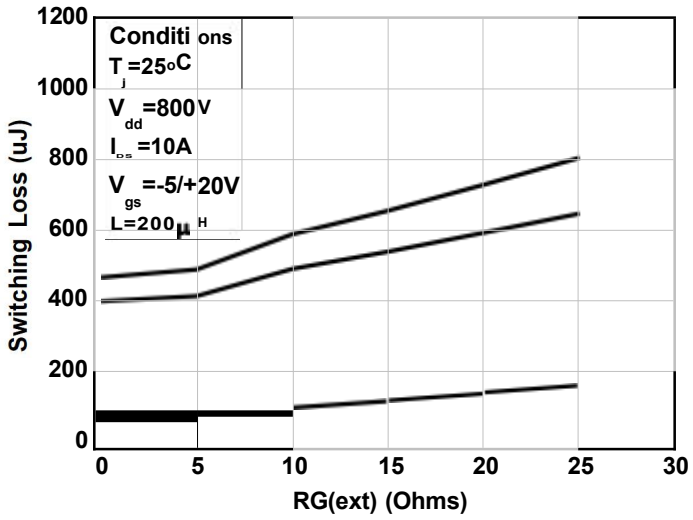


Figure 20. Switching Energy vs. External Gate Resistor $R_{G(ext)}$(Ohms)