

H1M40120P

N-Channel SiC Power MOSFET

V_{DS}	=	1200 V
$R_{DS(on)}$	=	50 m Ω
$I_{DS@25^{\circ}C}$	=	60.5A

Features

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

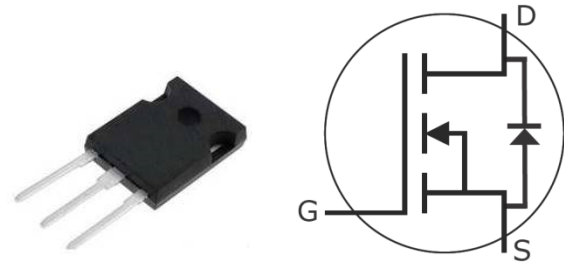
Benefits

- 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

Chip Outline



Part Number	Package
H1M40120P	TO-247-3

Maximum Ratings ($T_c=25^{\circ}C$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions
V_{DSmax}	Drain-Source Voltage	1200	V	$V_{GS}=0V, I_{DS}=100\mu A$
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	60.5	A	$V_{GS}=20V, T_c=25^{\circ}C$
T_J, T_{STG}	Operating Junction and Storage Temperature	-55 to +175	$^{\circ}C$	

Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200	/	/	V	$V_{GS}=0V, I_{DS}=100\mu A$	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.3	4	V	$V_{DS}=V_{GS}, I_{DS}=10mA$	Fig.11
			1.5	/		$V_{DS}=V_{GS}, I_{DS}=10mA, T_J=150^\circ\text{C}$	
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	/	50	62	m Ω	$V_{GS}=20V, I_D=40A$	Fig.4
		/	68			$V_{GS}=20V, I_D=40A, T_J=150^\circ\text{C}$	
C_{iss}	Input Capacitance	/	2770	/	pF	$V_{GS}=0V$ $V_{DS}=1000V$ $f=1MHz$	Fig. 16,17
C_{oss}	Output Capacitance	/	185	/			
C_{rss}	Reverse Transfer Capacitance	/	27	/			
E_{oss}	C_{oss} Stored Energy	/	92	/	μJ	$V_{AC}=25mV$	Fig.15
t_{don}	Turn-On Delay Time	/	19	/	ns	$V_{DS}=800V, V_{GS}=-5V/20V$ $I_D=40A, R_g=2.5\Omega$ $R_L=20\Omega$ (TO-247-3 Package)	
t_r	Rise Time	/	26	/			
t_{doff}	Turn-Off Delay Time	/	32	/			
t_f	Fall Time	/	12	/			
E_{ON}	Turn-On Switching Energy	/	1410	/	μJ	$V_{DS}=800V, V_{GS}=-5V/20V$ $I_D=40A, R_g=2.5\Omega, L=200\mu H$ (TO-247-3 Package)	Fig.20
E_{OFF}	Turn-Off Switching Energy	/	802	/			
R_G	Internal Gate Resistance	/	4.0	/	Ω	$f=1MHz, \text{open drain}$	

Gate Charge Characteristics ($T_J=25^\circ\text{C}$)

Symbol	Parameter	Typ.	Unit	Test Conditions	Note
Q_g	Gate Charge Total	156	nC	$V_{DS}=800V$ $V_{GS}=-5V/20V$ $I_D=40A$	
Q_{gs}	Gate to Source Charge	58			
Q_{gd}	Gate to Drain Charge	27			

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.44	$^\circ\text{C}/W$		

Typical Performance

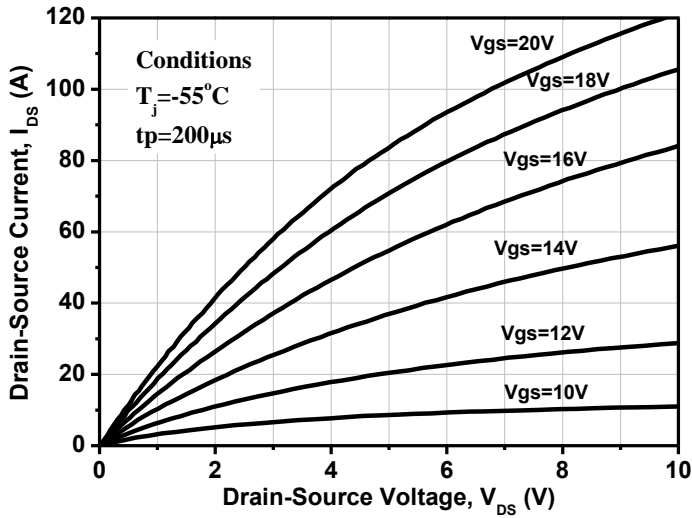


Figure 1. Output Characteristics $T_J = -55^\circ\text{C}$

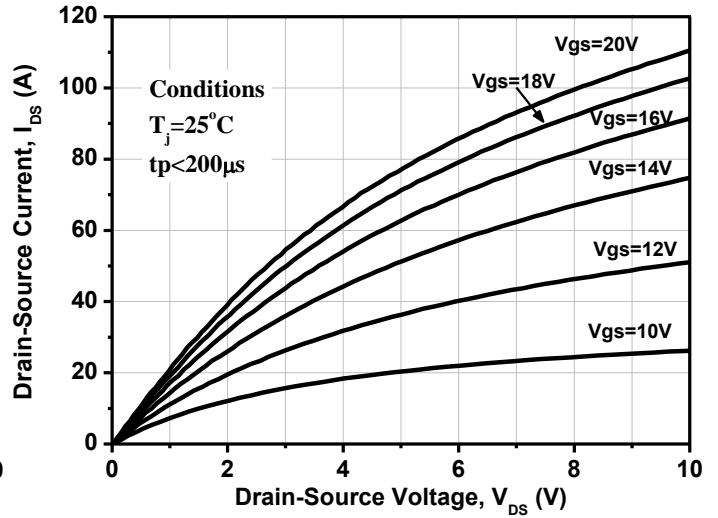


Figure 2. Output Characteristics $T_J = 25^\circ\text{C}$

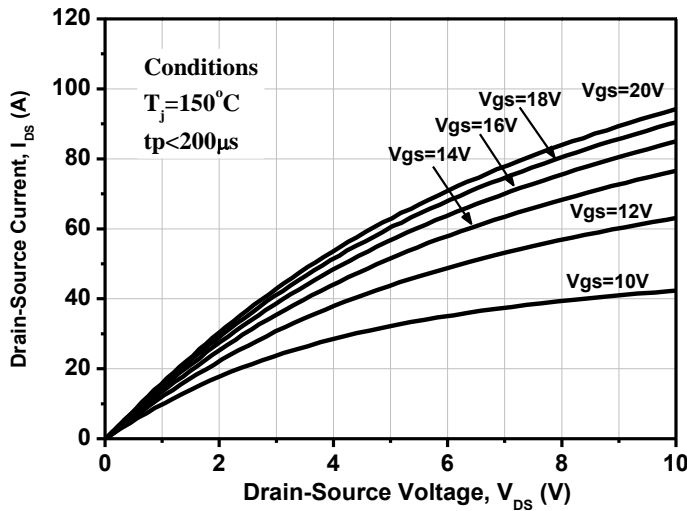


Figure 3. Output Characteristics $T_J = 150^\circ\text{C}$

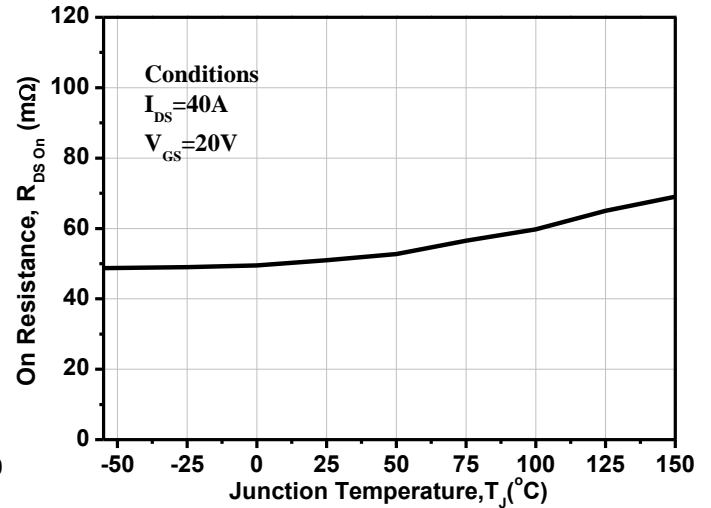


Figure 4. On-Resistance vs. Temperature

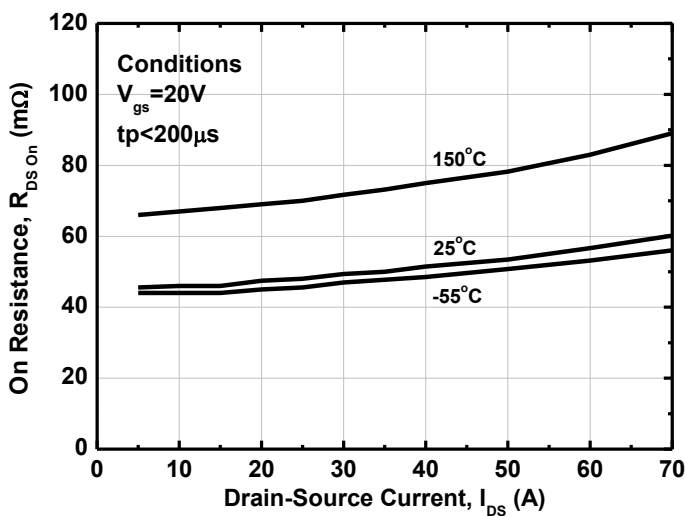


Figure 5. On-Resistance vs. Drain Current for Various Temperatures

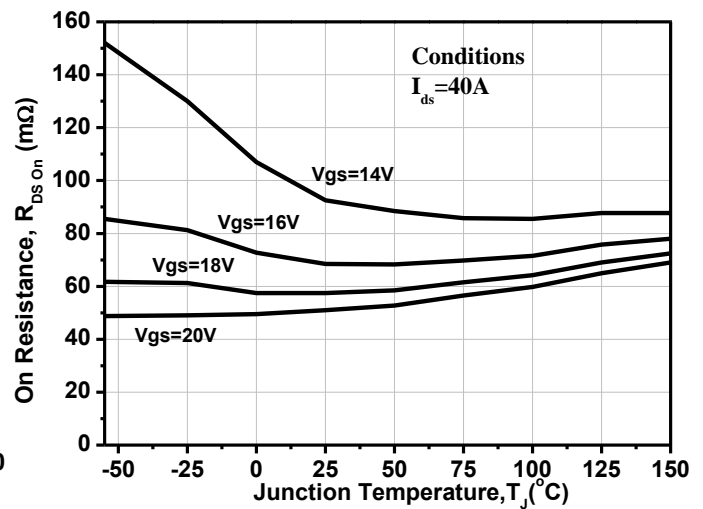


Figure 6. On-Resistance vs. Temperature for Various Gate Voltage

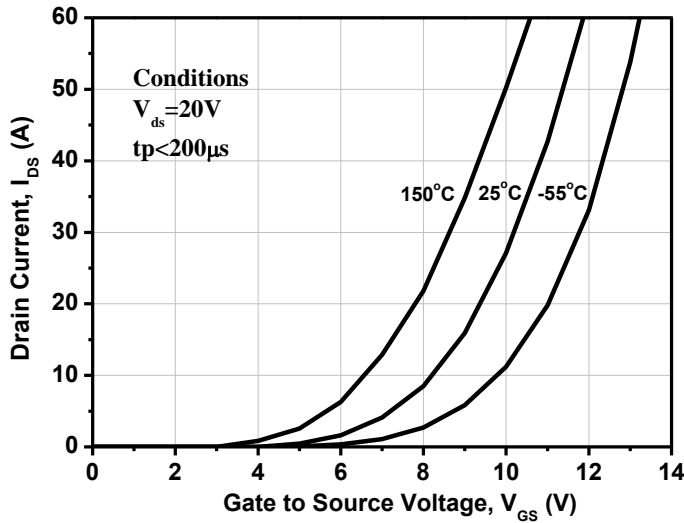


Figure 7. Transfer Characteristic for Various Junction Temperatures

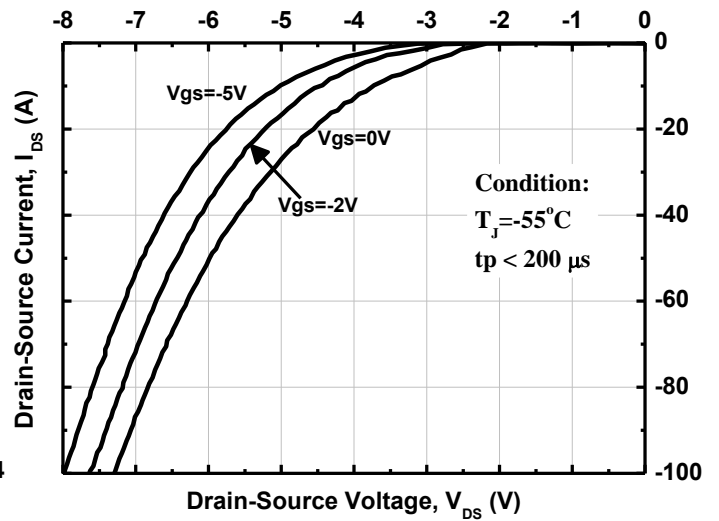


Figure 8. Body Diode Characteristic at -55°C

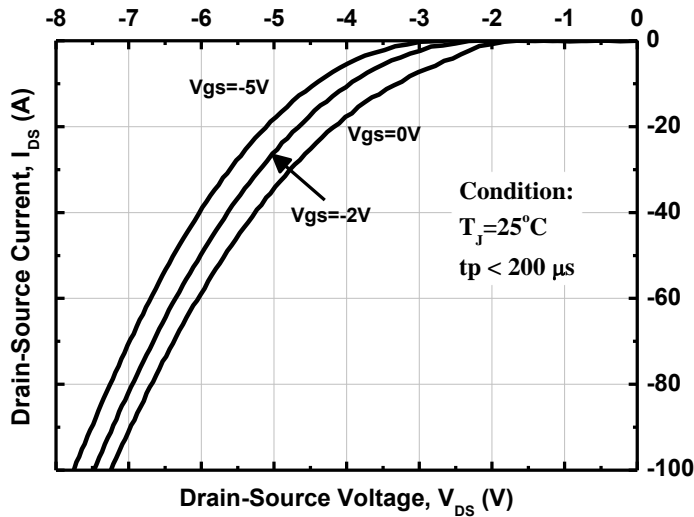


Figure 9. Body Diode Characteristic at 25°C

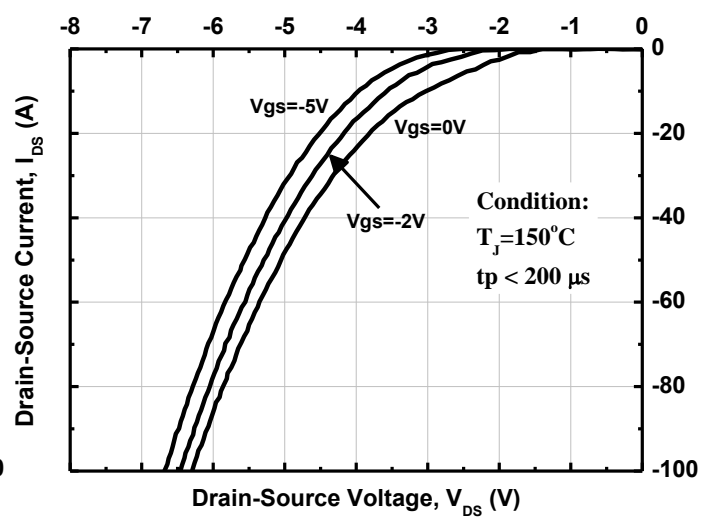


Figure 10. Body Diode Characteristic at 150°C

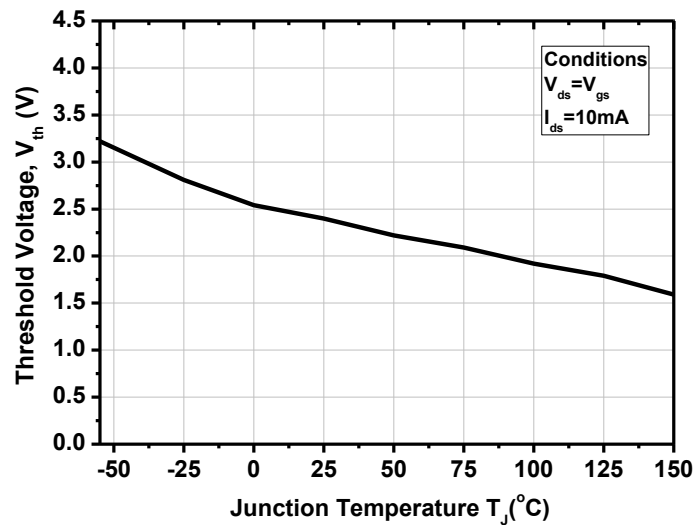


Figure 11. Threshold Voltage vs. Temperature

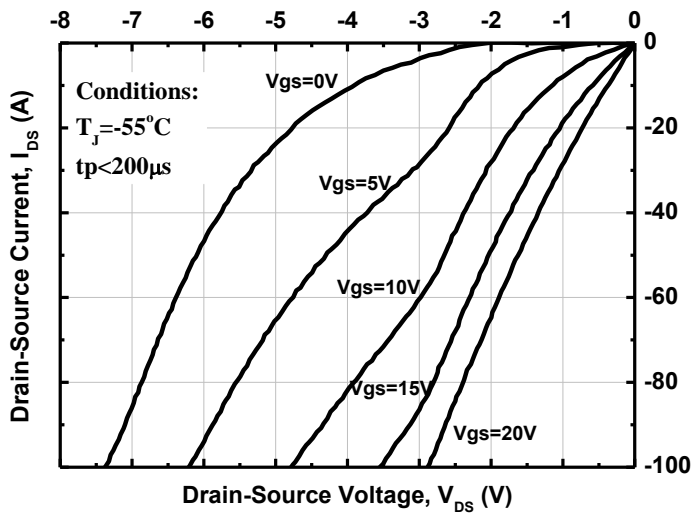


Figure 12. 3rd Quadrant Characteristic at -55°C

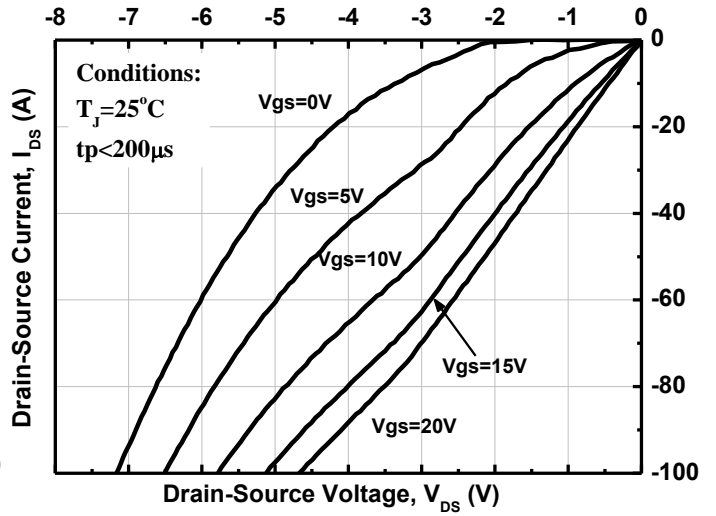


Figure 13. 3rd Quadrant Characteristic at 25°C

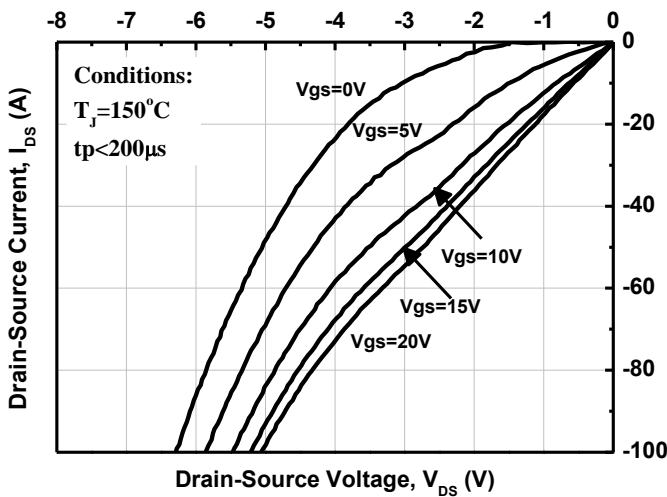


Figure 14. 3rd Quadrant Characteristic at 150°C

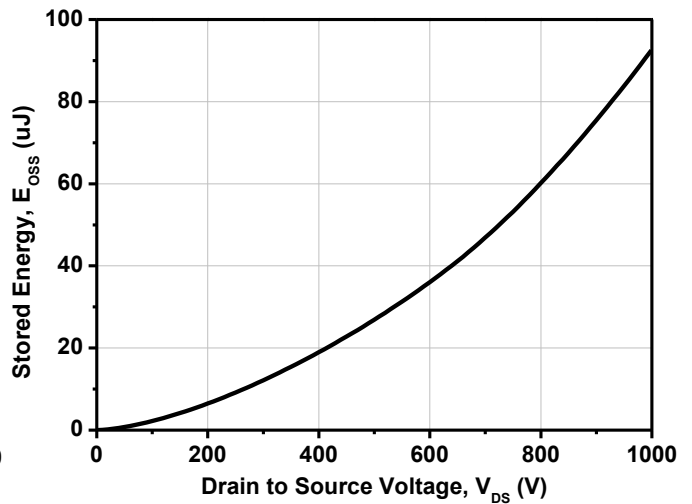


Figure 15. Output Capacitor Stored Energy

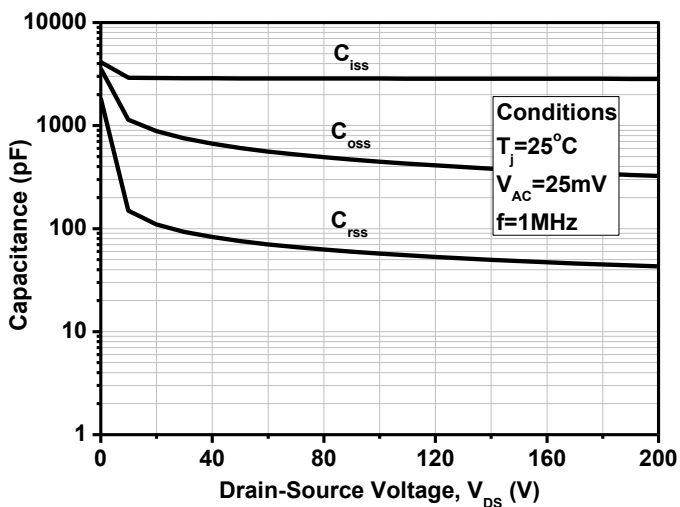


Figure 16. Capacitances vs. Drain-Source Voltage (0 - 200V)

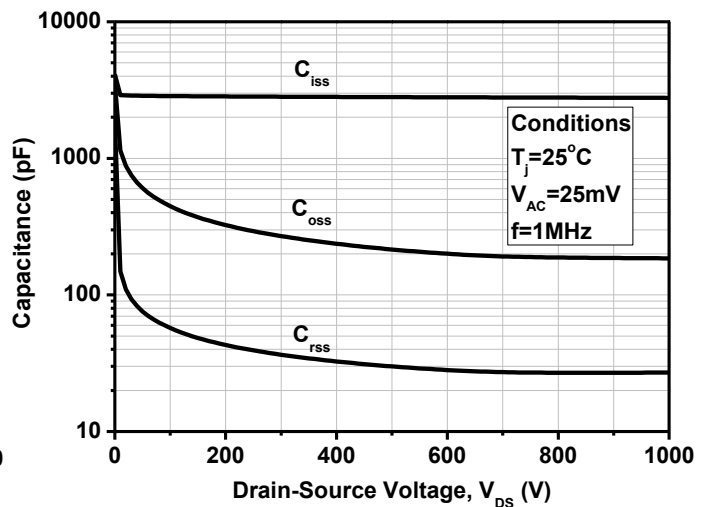


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 1000V)

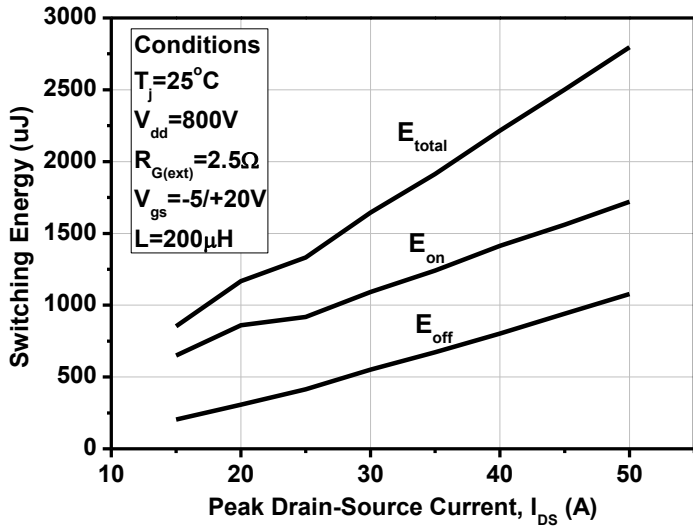


Figure 18. Switching Energy vs. Drain Current ($V_{DD}=800\text{V}$)

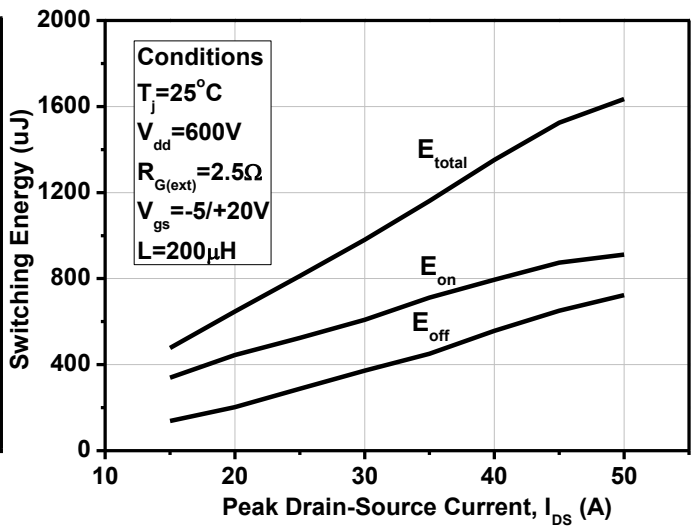


Figure 19. Switching Energy vs. Drain Current ($V_{DD}=600\text{V}$)

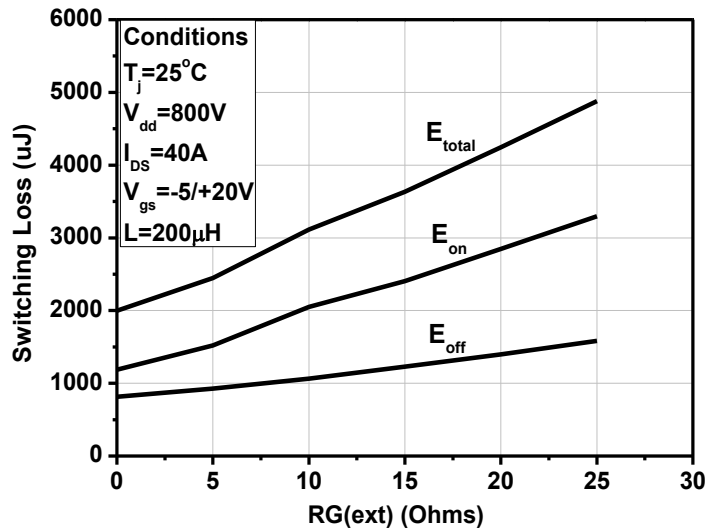


Figure 20. Switching Energy vs. External Gate Resistor $R_{G(\text{ext})}$ (Ohms)