

M1A025120L

N-Channel SiC Power MOSFET

V_{DS}	=	1200	V
$R_{DS(on)}$	=	25	m Ω
$I_D@25^{\circ}C$	=	65	A

Features

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

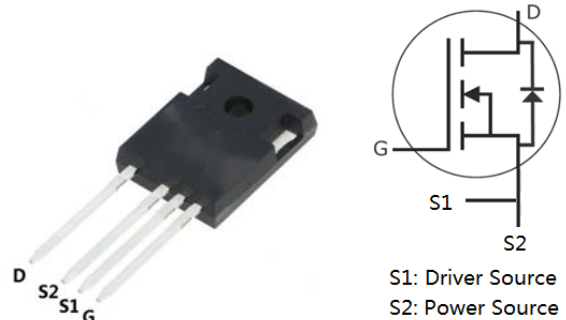
Benefits

- 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

Package



Part Number	Package
M1A025120L	TO-247-4

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Voltage	1200	V	$V_{GS}=0V, I_D=100\mu A$	
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	65	A	$V_{GS}=20V, T_c=25^{\circ}C$	
		43		$V_{GS}=20V, T_c=100^{\circ}C$	
$I_{D(pulse)}$	Pulsed Drain Current	200	A	Pulse width t_p limited by T_{Jmax}	
P_D	Power Dissipation	370	W	$T_c=25^{\circ}C, T_J=150^{\circ}C$	
T_J, T_{STG}	Operating Junction and Storage Temperature	-55 to +150	$^{\circ}C$		

Electrical Characteristics (T_c=25°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 _D =100μA	
V _{GS(th)}	Gate Threshold Voltage	1.9	2.4	4.0	V	V _{DS} =V _{GS} , I _D =15mA	Fig. 11
		/	1.7	/		V _{DS} =V _{GS} , I _D =15mA, T _J =150°C	
I _{DSS}	Zero Gate Voltage Drain Current	/	1	100	μA	V _{DS} =1200V, 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	/	25	34	mΩ	V _{GS} =20V, I _D =50A	Fig. 4,5,6
		/	43	/		V _{GS} =20V, I _D =50A, T _J =150°C	
C _{iss}	Input Capacitance	/	4200	/	pF	V _{GS} =0V	Fig. 15,16
C _{oss}	Output Capacitance	/	250	/		V _{DS} =1000V	
C _{rss}	Reverse Transfer Capacitance	/	16	/		f=1MHz	
E _{oss}	C _{oss} Stored Energy	/	126	/	μJ	V _{AC} =25mV	
E _{ON}	Turn-On Switching Energy	/	1.8	/	mJ	V _{DS} =800V, V _{GS} =-5V/20V	
E _{OFF}	Turn-Off Switching Energy	/	0.6	/		I _D =50A, R _{G(ext)} =2.5Ω, L=412μH	
t _{d(on)}	Turn-On Delay Time	/	15	/	ns	V _{DS} =800V, V _{GS} =-5V/20V, I _D =50A R _{G(ext)} =2.5Ω, R _L =16Ω	
t _r	Rise Time	/	12	/			
t _{d(off)}	Turn-Off Delay Time	/	34	/			
t _f	Fall Time	/	7	/			
R _{G(int)}	Internal Gate Resistance	/	2.1	/	Ω	f=1MHz, V _{AC} =25mV	
Q _{GS}	Gate to Source Charge	/	54	/	nC	V _{DS} =800V	
Q _{GD}	Gate to Drain Charge	/	29	/		V _{GS} =-5V/20V	
Q _G	Total Gate Charge	/	195	/		I _D =50A	

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V _{SD}	Diode Forward Voltage	3.5	/	V	V _{GS} =-5V, I _{SD} =25A	Fig. 8,9,10
		3.3	/		V _{GS} =-5V, I _{SD} =25A, T _J =150°C	
I _S	Continuous Diode Forward Current	/	98	A	T _C =25°C	
t _{rr}	Reverse Recover Time	50	/	ns	V _R =800V, I _{SD} =50A	
Q _{rr}	Reverse Recovery Charge	216	/	nC		
I _{rrm}	Peak Reverse Recovery Current	7.2	/	A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
R _{θJC}	Thermal Resistance from Junction to Case	0.25	/	°C/W		
R _{θJA}	Thermal Resistance from Junction to Ambient	/	40			

Typical Performance

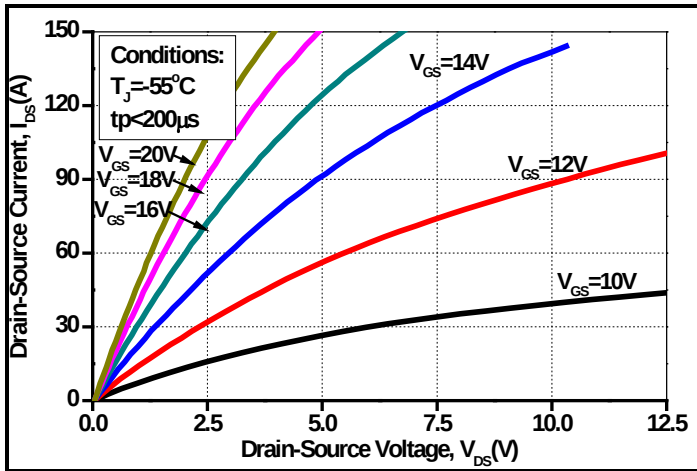


Figure 1. Output Characteristics $T_j = -55^\circ\text{C}$

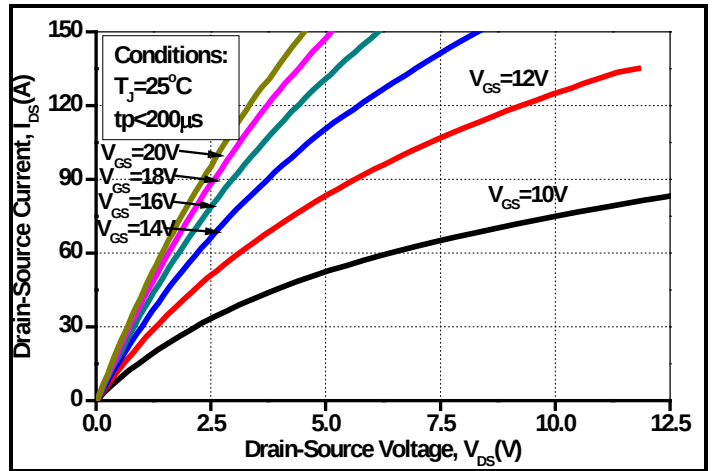


Figure 2. Output Characteristics $T_j = 25^\circ\text{C}$

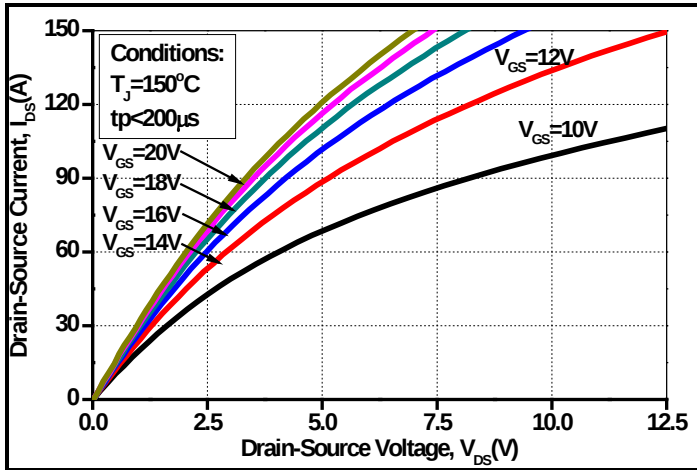


Figure 3. Output Characteristics $T_j = 150^\circ\text{C}$

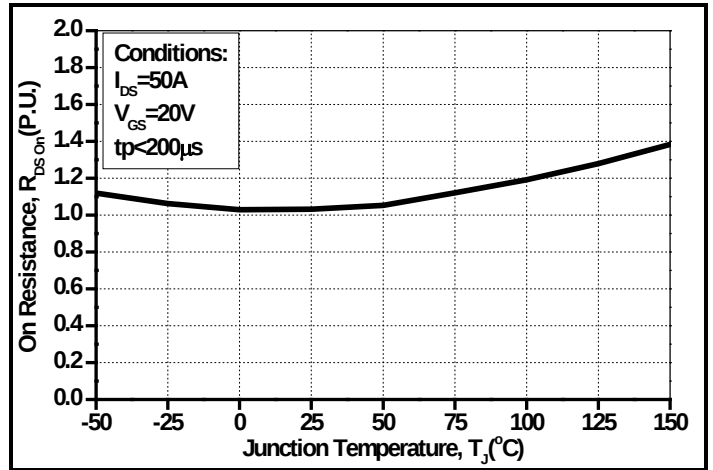


Figure 4. Normalized On-Resistance vs. Temperature

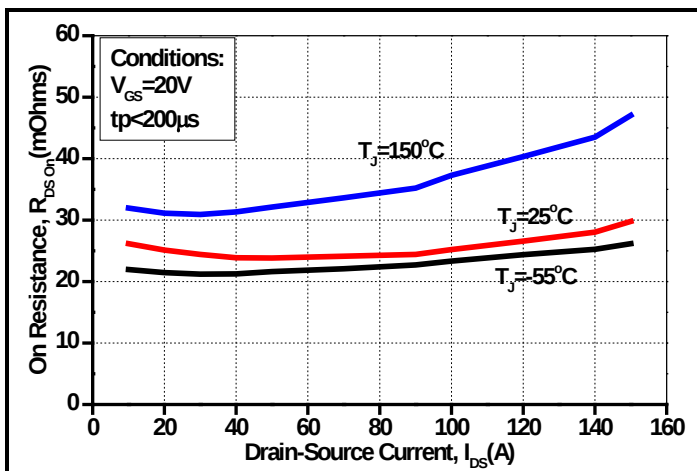


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

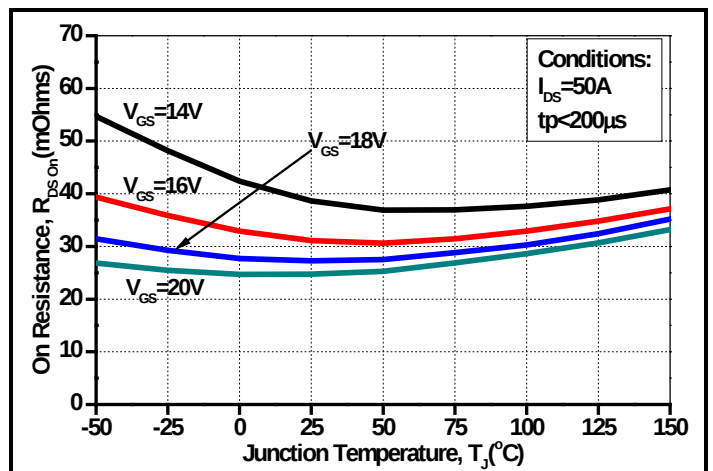


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

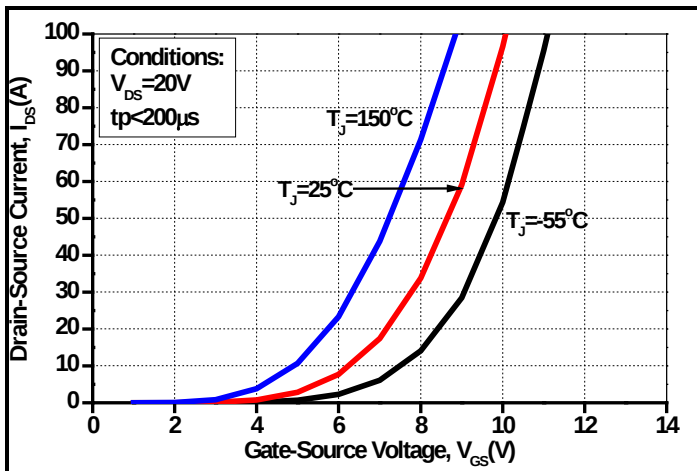


Figure 7. Transfer Characteristic for Various Junction Temperatures

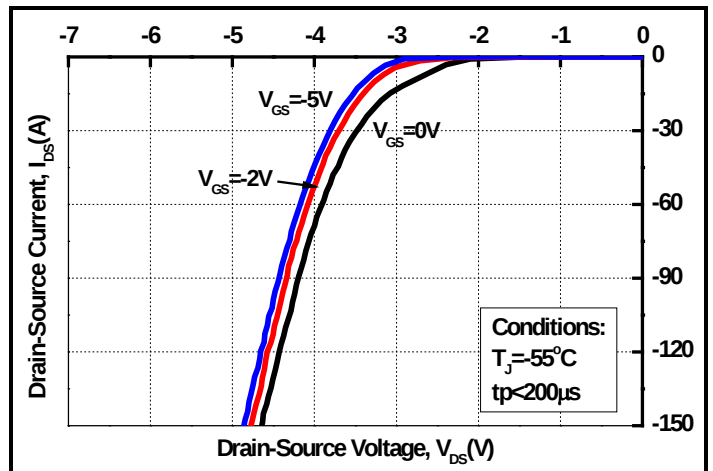


Figure 8. Body Diode Characteristic at -55°C

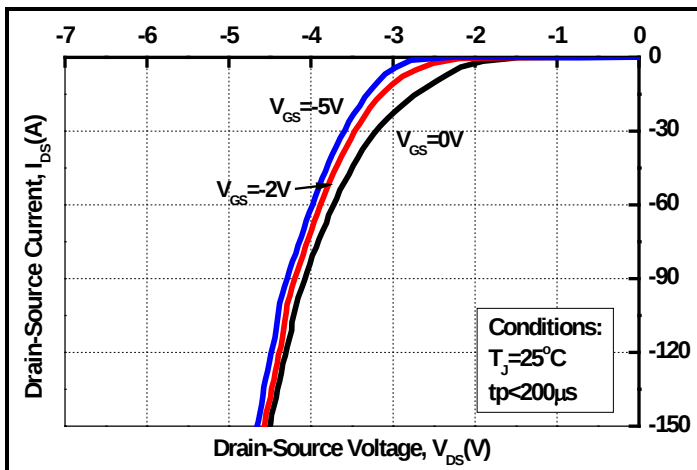


Figure 9. Body Diode Characteristic at 25°C

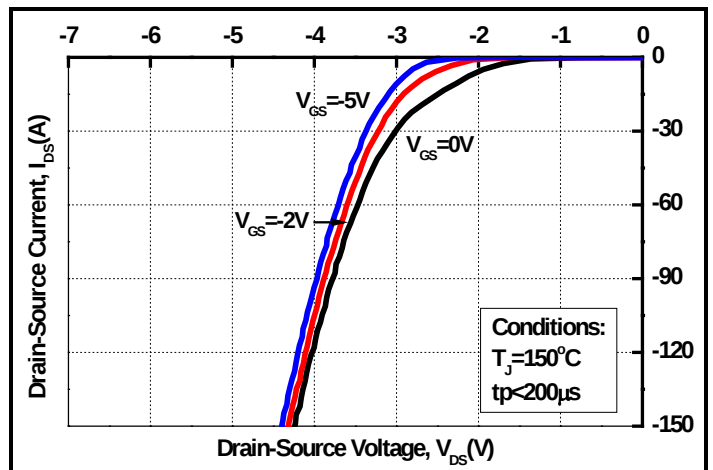


Figure 10. Body Diode Characteristic at 150°C

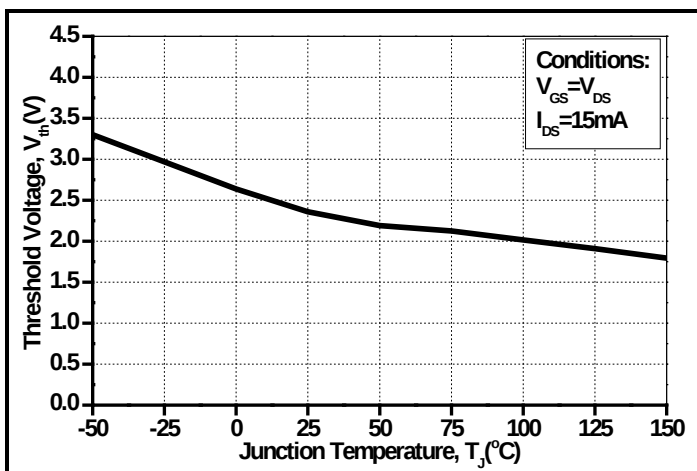


Figure 11. Threshold Voltage vs. Temperature

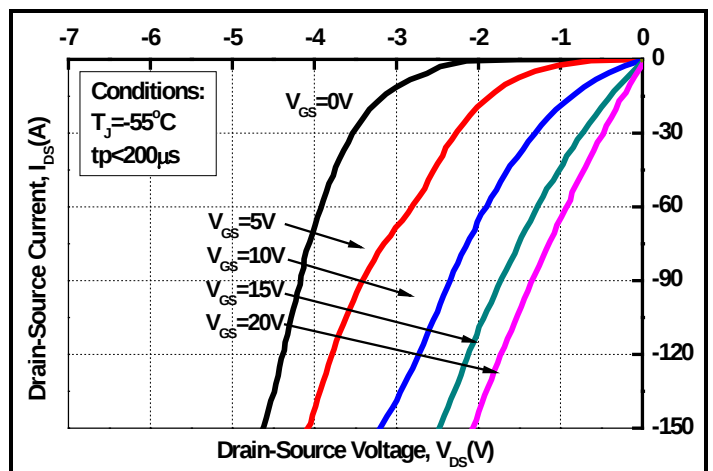


Figure 12. 3rd Quadrant Characteristic at -55°C

Typical Performance

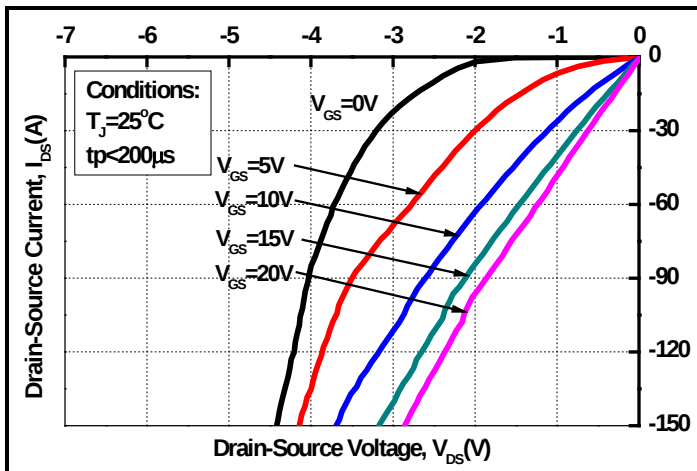


Figure 13. 3rd Quadrant Characteristic at 25°C

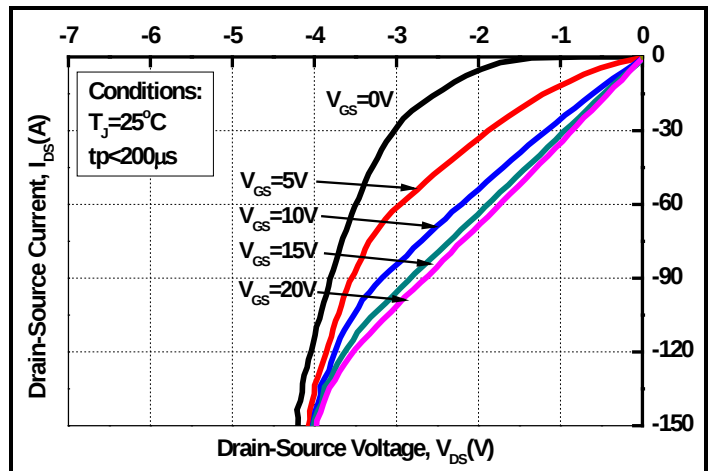


Figure 14. 3rd Quadrant Characteristic at 150°C

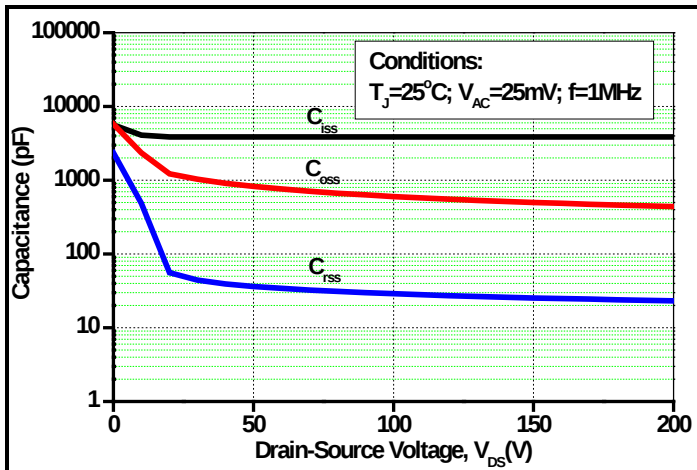


Figure 15. Capacitances vs. Drain-Source Voltage (0 - 200V)

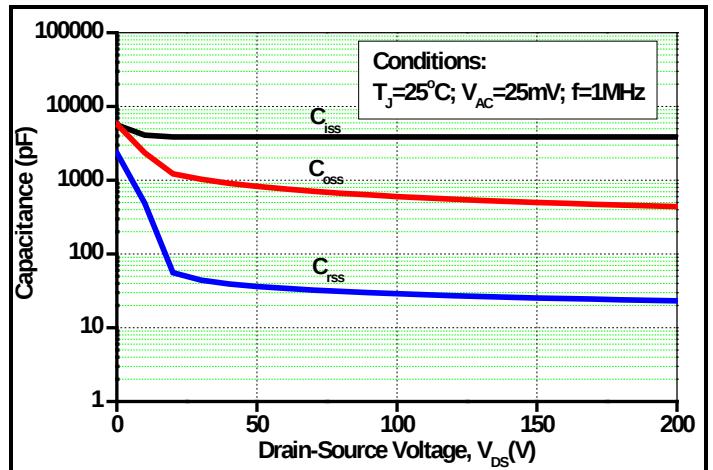
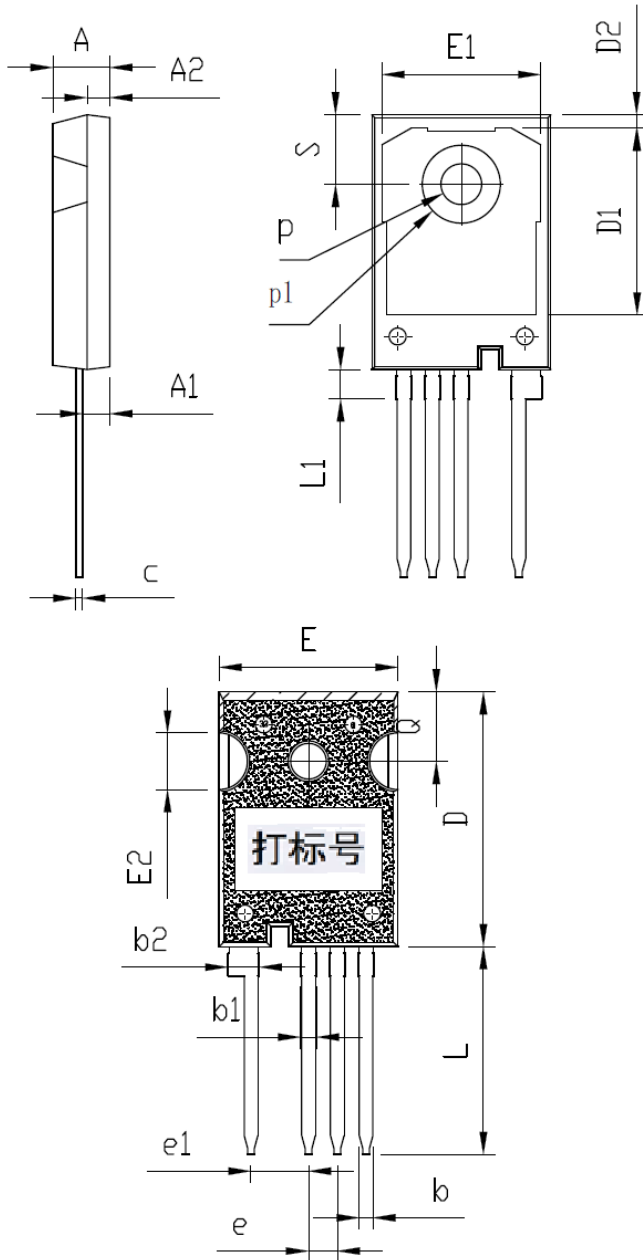


Figure 16. Capacitances vs. Drain-Source Voltage (0 - 1000V)

Package Dimensions

Package TO-247-4



SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A		5.00	
A1		2.40	
A2		2.00	
b		1.20	
b1		1.30	
b2		2.65	
c		0.6	
D		22.54	
D1		16.50	
D2		1.17	
e		2.54	
e1		5.08	
E		15.80	
E1		14.00	
E2		5.00	
L		18.38	
L1		2.58	
p		3.60	
p1		6.80	
Q		6.15	
S		6.15	