

N1M17001KPD2

Silicon Carbide Power MOSFET

N-Channel Enhancement Mode

V_{DS}	1700V
$I_D @ 25^\circ\text{C}$	5A
$R_{DS(ON)}$	1.0 Ω

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Ultra-Low Drain-Gate Capacitance

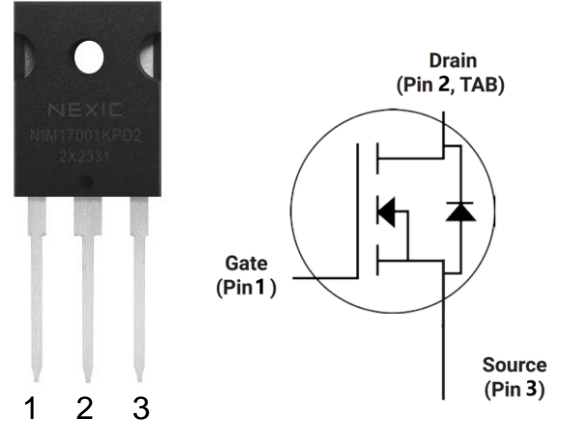
Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency
- Easy to Parallel and Simple to Drive

Applications

- Auxiliary Power Supplies
- Switch Mode Power Supplies

Package



Part Number	Package
N1M17001KPD2	TO-247-3

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain - Source Voltage	1700	V	$V_{GS} = 0\text{ V}, I_D = 100\ \mu\text{A}$	
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	5.0	A	$V_{GS} = 20\text{ V}, T_C = 25^\circ\text{C}$	
		3.5		$V_{GS} = 20\text{ V}, T_C = 100^\circ\text{C}$	
$I_{D(pulse)}$	Pulsed Drain Current	6.0	A	Pulse width t_p limited by T_{jmax}	
P_D	Power Dissipation	69	W	$T_C=25^\circ\text{C}, T_J=150^\circ\text{C}$	
T_J, T_{stg}	Operating Junction and Storage Temperature	-50 to + 150	$^\circ\text{C}$		

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	1700			V	$V_{GS}=0V, I_D=100\mu A$	
$V_{GS(th)}$	Gate Threshold Voltage	2.5	3.0	4.5	V	$V_{DS}=V_{GS}, I_D=1mA$	Fig. 11
			2.2			$V_{DS}=V_{GS}, I_D=1mA, T_J=150^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current		1	100	μA	$V_{DS}=1700V, V_{GS}=0V$	
I_{GSS}	Gate-Source Leakage Current			250	nA	$V_{GS}=20V, V_{DS}=0V$	
$R_{DS(on)}$	Drain-Source On-State Resistance		1.0	1.3	Ω	$V_{GS}=20V, I_D=2A$	Fig. 4, 5, 6
			1.5			$V_{GS}=20V, I_D=2A, T_J=150^\circ\text{C}$	
g_{fs}	Transconductance		1.15		S	$V_{DS}=20V, I_D=2A$	
			1.30			$V_{DS}=20V, I_D=2A, T_J=150^\circ\text{C}$	
C_{iss}	Input Capacitance		186		pF	$V_{GS}=0V, V_{DS}=1000V, f=1MHz, V_{AC}=25mV$	Fig. 17, 18
C_{oss}	Output Capacitance		12				
C_{rss}	Reverse Transfer Capacitance		1.6				
E_{OSS}	C_{OSS} Stored Energy		6.2		μJ		
E_{ON}	Turn-On Switching Energy		48		μJ	$V_{DS}=1200V, V_{GS}=-5/20V, I_D=2A, R_{G(ext)}=2.5\Omega, L=1500\mu H$	
E_{OFF}	Turn-Off Switching Energy		18				
$t_{d(on)}$	Turn-On Delay Time		5.2		ns	$V_{DS}=1200V, V_{GS}=-5/20V, I_D=2A, R_{G(ext)}=2.5\Omega, R_L=600\Omega$	
t_r	Rise Time		9.4				
$t_{d(off)}$	Turn-Off Delay Time		13.2				
t_f	Fall Time		22.0				
$R_{G(int)}$	Internal Gate Resistance		22		Ω	$f = 1 \text{ MHz}$	
Q_{gs}	Gate to Source Charge		5.2		nC	$V_{DS}=1200V, V_{GS}=-5/20V, I_D=2A$	Fig. 12
Q_{gd}	Gate to Drain Charge		7.3				
Q_g	Total Gate Charge		21.8				

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test conditions	Note
V_{SD}	Diode Forward Voltage	4.2		V	$V_{GS}=-5V, I_{SD}=1A$	Fig. 8, 9, 10
		3.9			$V_{GS}=-5V, I_{SD}=1A, T_J=150^\circ\text{C}$	
I_S	Continuous Diode Forward Current		4.0	A	$T_C=25^\circ\text{C}$	
t_{rr}	Reverse Recovery Time	25		ns	$V_{GS}=-5V, I_{SD}=2A, V_R=1200V$	
Q_{rr}	Reverse Recovery Charge	15		nC		
I_{rrm}	Peak Reverse Recovery Current	2.8		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	1.8	2.0	$^\circ\text{C/W}$		

Typical Performance

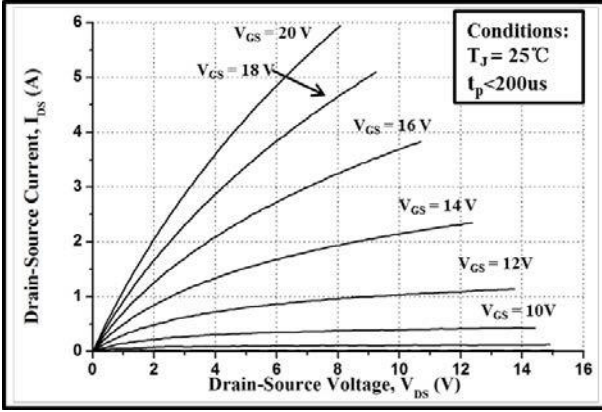


Figure 1. Output Characteristics $T_J = 25\text{ }^\circ\text{C}$

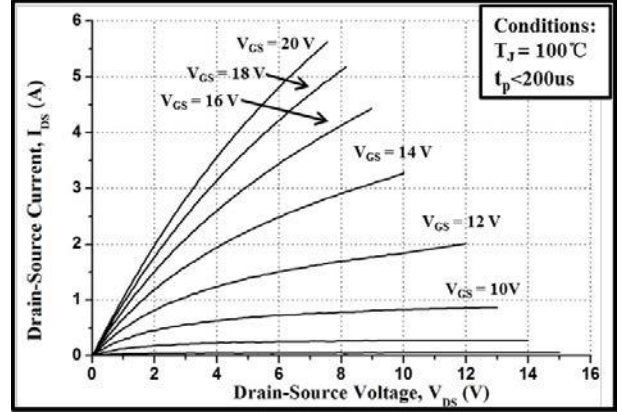


Figure 2. Output Characteristics $T_J = 100\text{ }^\circ\text{C}$

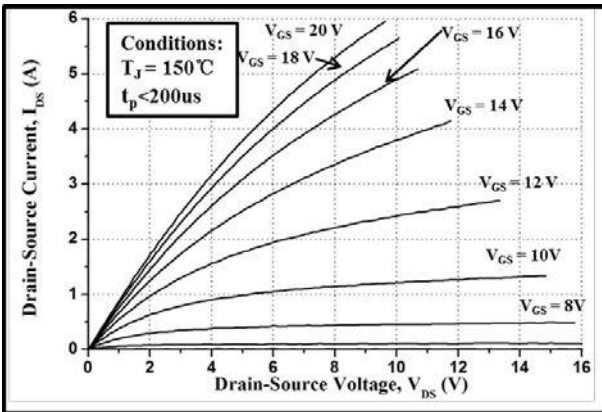


Figure 3. Output Characteristics $T_J = 150\text{ }^\circ\text{C}$

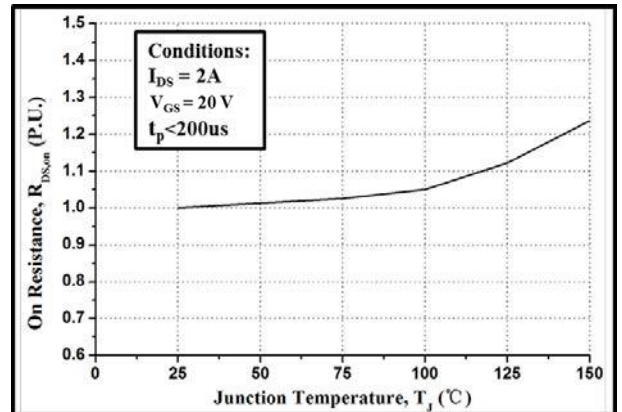


Figure 4. Normalized On-Resistance vs. Temperature

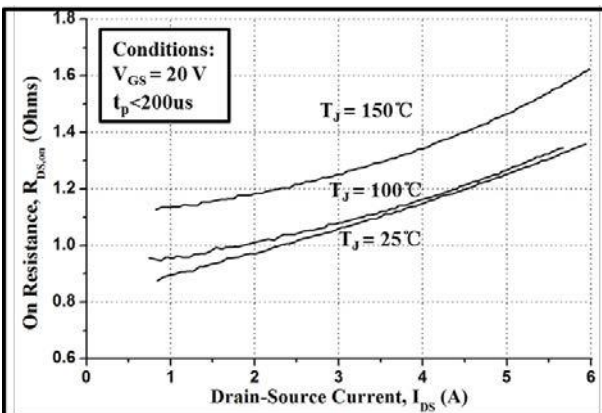


Figure 5. On-Resistance vs. Drain Current for Various Temperatures

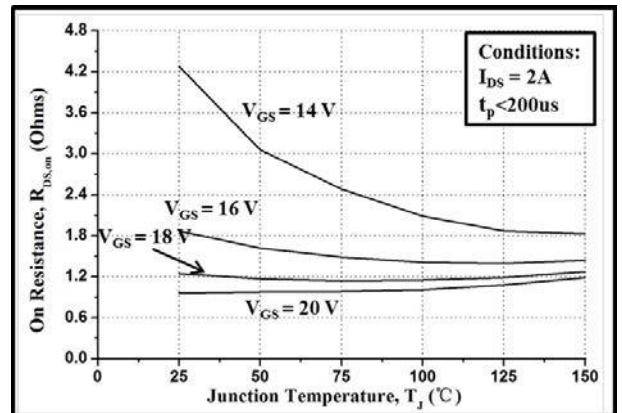


Figure 6. On-Resistance vs. Temperature for Various Gate Voltages

Typical Performance

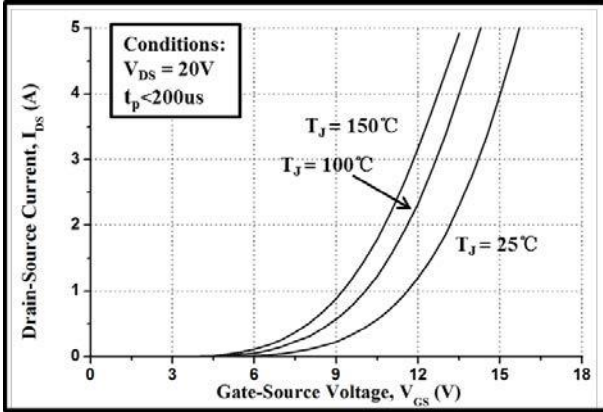


Figure 7. Transfer Characteristics for Various Junction Temperatures

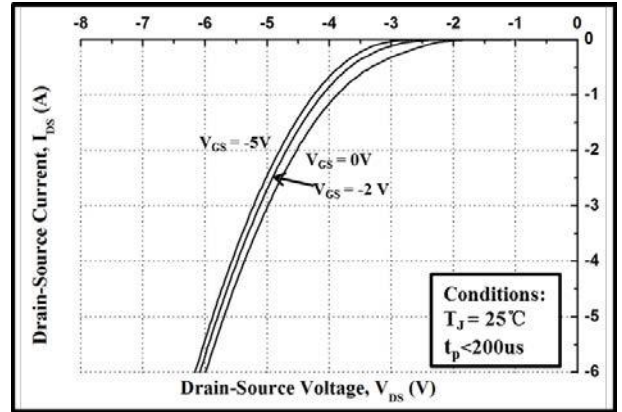


Figure 8. Body Diode Characteristics at 25 °C

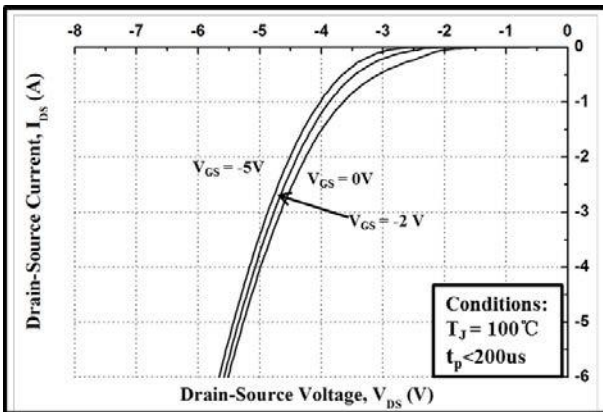


Figure 9. Body Diode Characteristics at 100 °C

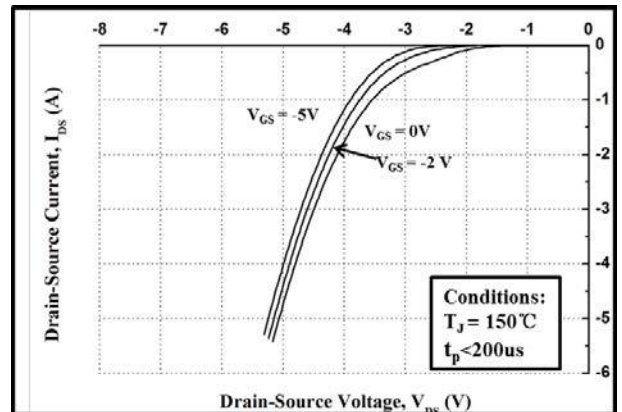


Figure 10. Body Diode Characteristics at 150 °C

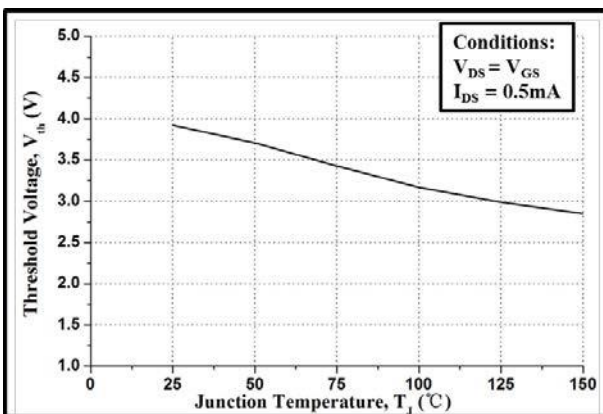


Figure 11. Threshold Voltage vs. Temperature

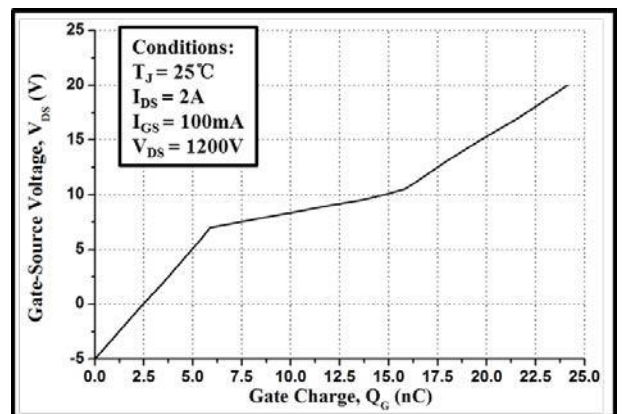


Figure 12. Gate Charge Characteristics

Typical Performance

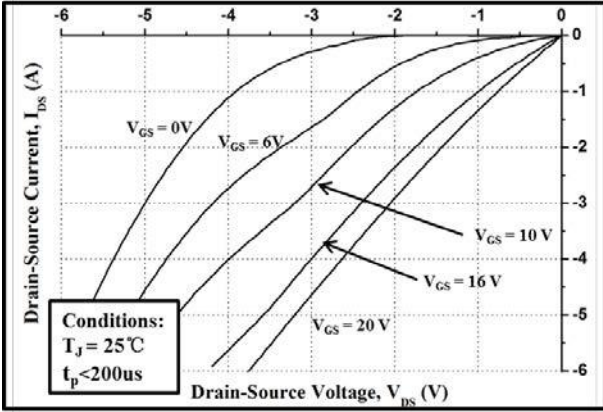


Figure 13. 3rd Quadrant Characteristics at 25 °C

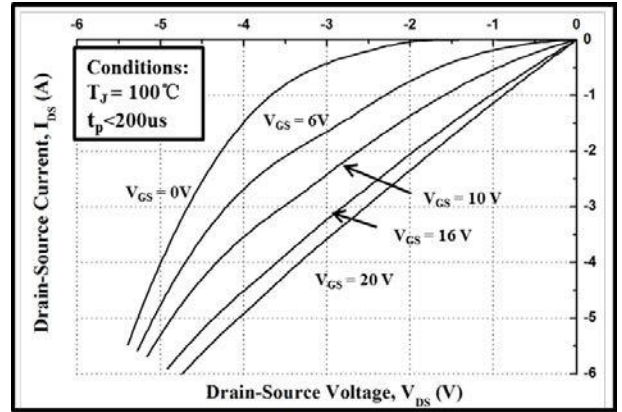


Figure 14. 3rd Quadrant Characteristics at 100 °C

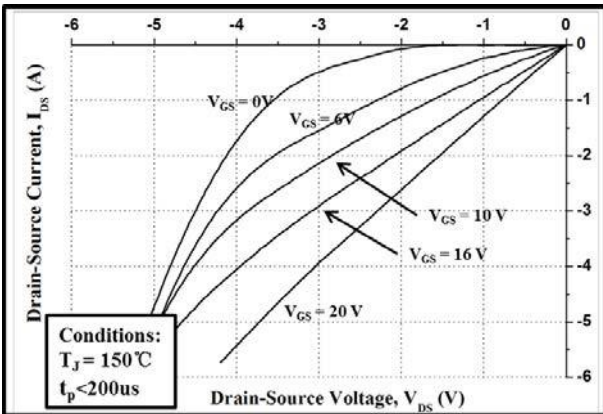


Figure 15. 3rd Quadrant Characteristics at 150 °C

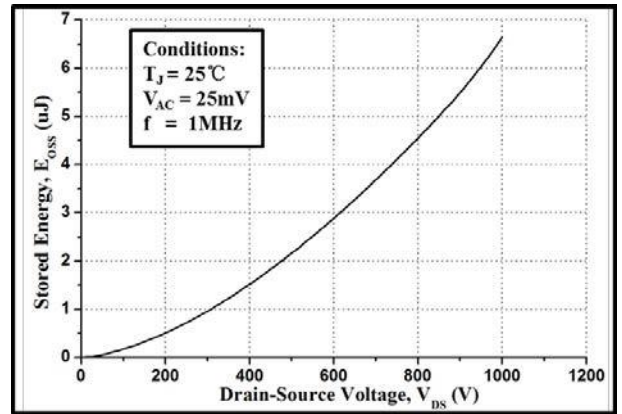


Figure 16. Output Capacitor Stored Energy

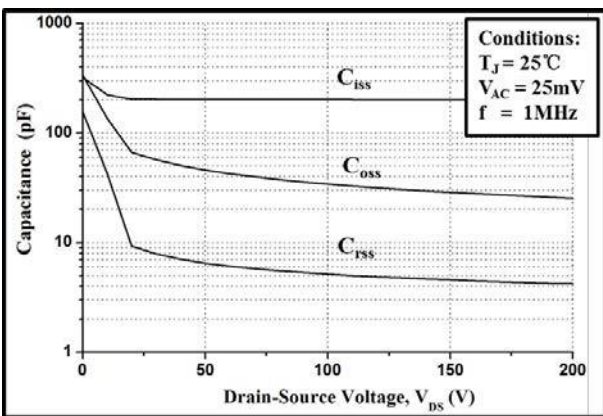


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

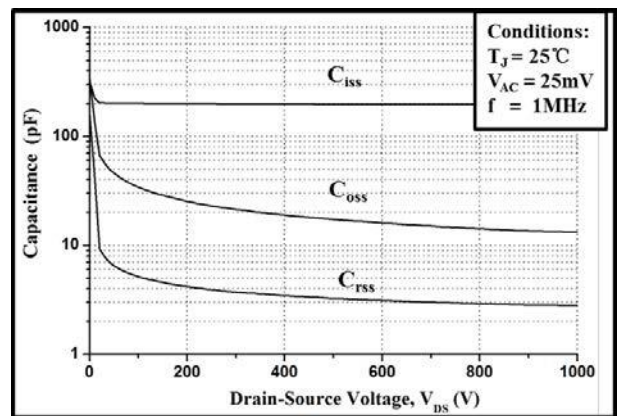
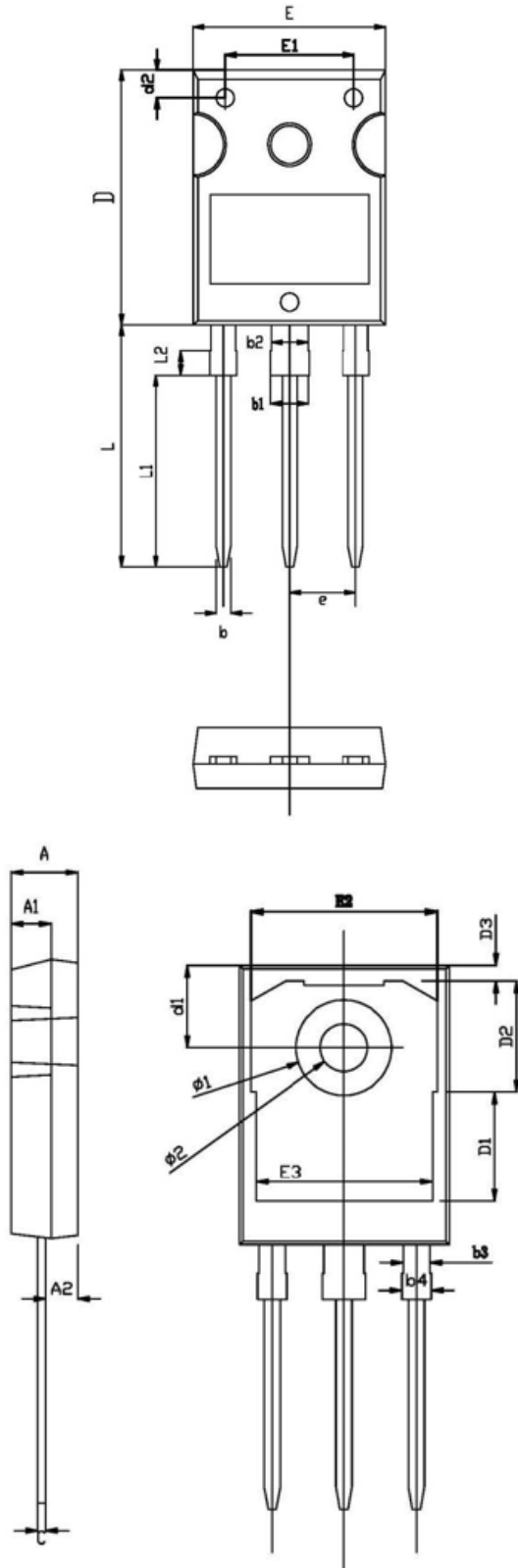


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

Package TO-247-3

RECOMMENDED LAND PATTERN



	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.80	3.00	3.20
A2	2.26	2.41	2.56
b	1.10	1.20	1.30
b1	2.90	/	3.20
b2	2.90	3.00	3.10
b3	1.90	2.00	2.10
b4	2.00	/	2.20
c	0.50	0.60	0.70
D	20.80	21.00	21.20
D1	/	8.23	/
D2	/	8.32	/
D3	/	1.17	/
d1	6.00	6.15	6.30
d2	2.20	2.30	2.40
E	15.60	15.80	16.00
E1	/	10.50	/
E2	/	14.02	/
E3	/	13.50	/
e	5.34	5.44	5.54
L	19.72	19.92	20.12
L1	/	15.79	/
L2	/	1.98	/
φ1	7.10	7.19	7.30
φ2	3.50	3.60	3.70