

N1M065060PK2

Silicon Carbide Power MOSFET

N-Channel Enhancement Mode

V_{DS}	650V
$I_D @ 25^\circ\text{C}$	29A
$R_{DS(ON)}$	60m Ω

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Fast Intrinsic Diode with Low Reverse Recovery

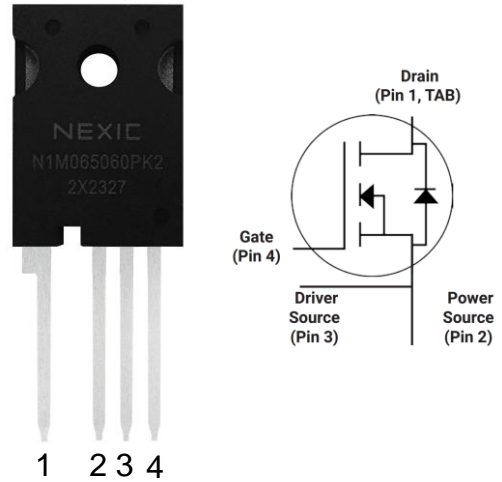
Benefits

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

Applications

- EV Charging
- Server Power Supplies
- Solar PV Inverters
- UPS
- DC/DC Converters

Package



Part Number	Package
N1M065060PK2	TO-247-4

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain - Source Voltage	650	V	$V_{GS} = 0\text{ V}, I_D = 100\ \mu\text{A}$	
V_{GSmax}	Gate - Source Voltage	-8/+22	V	Absolute maximum values	
V_{GSop}	Gate - Source Voltage	-4/+18	V	Recommended operational values	
I_D	Continuous Drain Current	29	A	$V_{GS} = 18\text{ V}, T_C = 25^\circ\text{C}$	
		20		$V_{GS} = 18\text{ V}, T_C = 100^\circ\text{C}$	
$I_{D(pulse)}$	Pulsed Drain Current	99	A	Pulse width t_p limited by T_{jmax}	
P_D	Power Dissipation	150	W	$T_C=25^\circ\text{C}, T_J=175^\circ\text{C}$	
T_J, T_{stg}	Operating Junction and Storage Temperature	-40 to + 175	$^\circ\text{C}$		
T_L	Solder Temperature	260	$^\circ\text{C}$		

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	650			V	$V_{GS}=0V, I_D=100\mu A$	
$V_{GS(th)}$	Gate Threshold Voltage	1.8	2.6	4.0	V	$V_{DS}=V_{GS}, I_D=5mA$	
			1.8			$V_{DS}=V_{GS}, I_D=5mA, T_J=175^{\circ}\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current		1	50	μA	$V_{DS}=650V, V_{GS}=0V$	
I_{GSS}	Gate-Source Leakage Current		10	250	nA	$V_{GS}=18V, V_{DS}=0V$	
$R_{DS(on)}$	Drain-Source On-State Resistance	42	60	79	m Ω	$V_{GS}=18V, I_D=13.2A$	
			75			$V_{GS}=18V, I_D=13.2A, T_J=175^{\circ}\text{C}$	
C_{iss}	Input Capacitance		830		pF	$V_{GS}=0V, V_{DS}=600V,$ $f=1MHz, V_{AC}=25mV$	
C_{oss}	Output Capacitance		82				
C_{rss}	Reverse Transfer Capacitance		14				
E_{ON}	Turn-On Switching Energy		140		μJ	$V_{DS}=400V, V_{GS}=-4/18V, I_D=13.2A,$ $R_{G(ext)}=2.5\Omega, L=200\mu H$	
E_{OFF}	Turn-Off Switching Energy		52				
$t_{d(on)}$	Turn-On Delay Time		8		ns	$V_{DS}=400V, V_{GS}=-4/18V, I_D=13.2A,$ $R_{G(ext)}=2.5\Omega, R_L=30\Omega$	
t_r	Rise Time		9				
$t_{d(off)}$	Turn-Off Delay Time		21				
t_f	Fall Time		8				
$R_{G(int)}$	Internal Gate Resistance		6		Ω	$f=1MHz, V_{AC}=25mV$	
Q_{gs}	Gate to Source Charge		13		nC	$V_{DS}=400V, V_{GS}=-4/18V,$ $I_D=13.2A$	
Q_{gd}	Gate to Drain Charge		12				
Q_g	Total Gate Charge		50				

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test conditions	Note
V_{SD}	Diode Forward Voltage	4.2		V	$V_{GS}=-4V, I_{SD}=6.6A$	
		3.8			$V_{GS}=-4V, I_{SD}=6.6A, T_J=175^{\circ}\text{C}$	
I_S	Continuous Diode Forward Current		23	A	$V_{GS}=-4V, T_C=25^{\circ}\text{C}$	
t_{rr}	Reverse Recovery Time	28		ns	$I_{SD}=13.2A, V_R=400V$	
Q_{rr}	Reverse Recovery Charge	47		nC		
I_{rrm}	Peak Reverse Recovery Current	3		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.99		$^{\circ}\text{C/W}$		
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	40				

Typical Performance

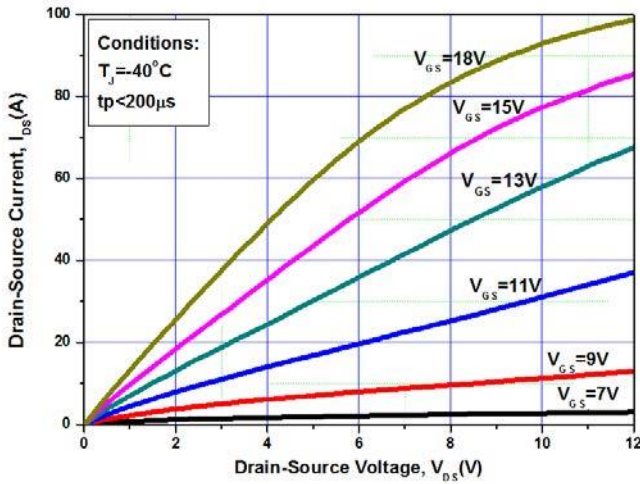


Figure 1. Output Characteristics $T_j = -40^\circ\text{C}$

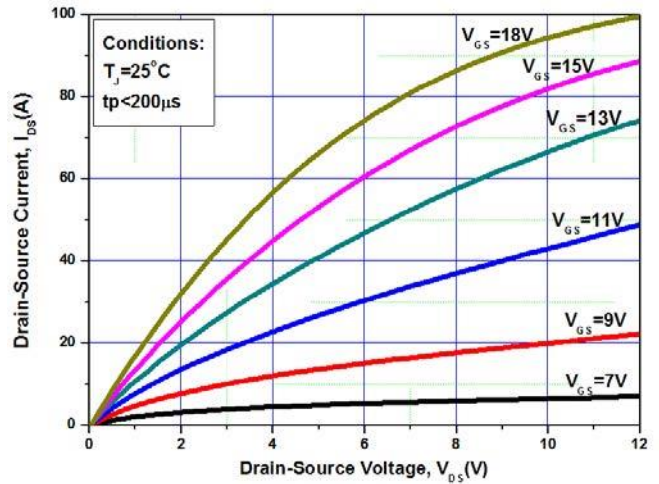


Figure 2. Output Characteristics $T_j = 25^\circ\text{C}$

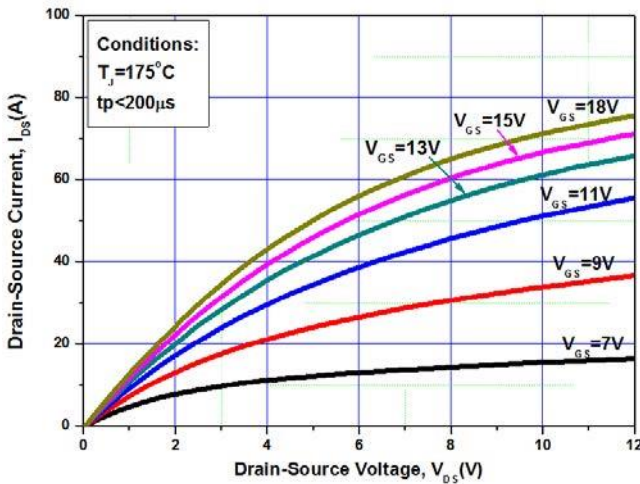


Figure 3. Output Characteristics $T_j = 175^\circ\text{C}$

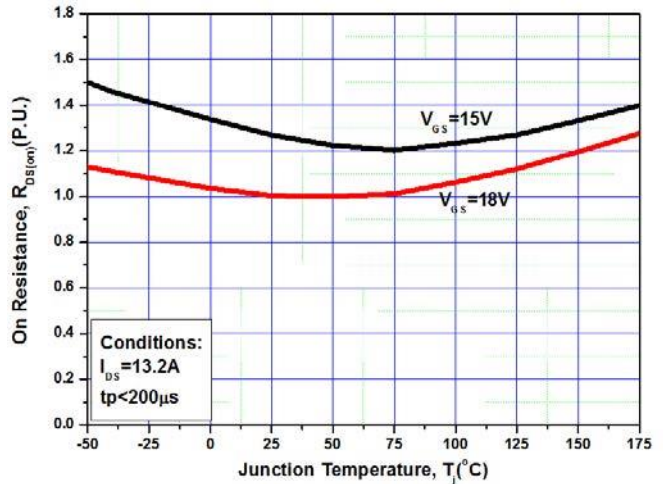


Figure 4. Normalized On-Resistance vs. Temperature

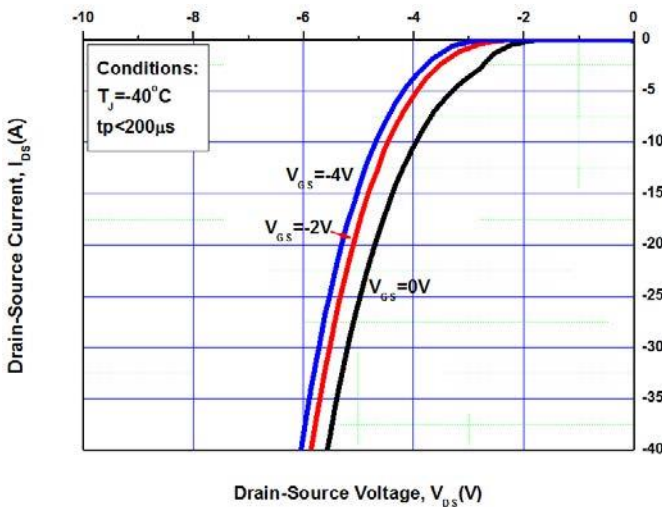


Figure 5. Body Diode Characteristics at -40°C

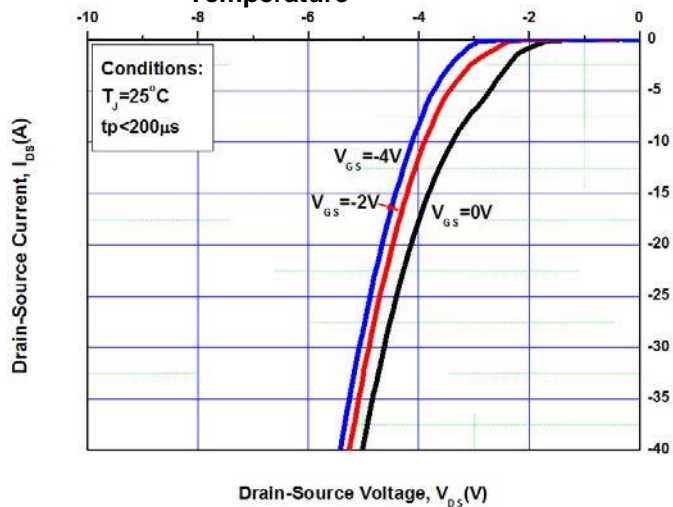


Figure 6. Body Diode Characteristics at 25°C

Typical Performance

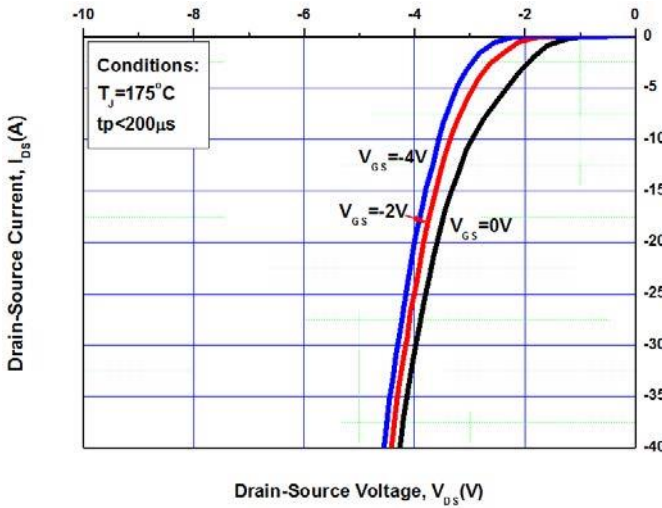


Figure 7. Body Diode Characteristics at 175 °C

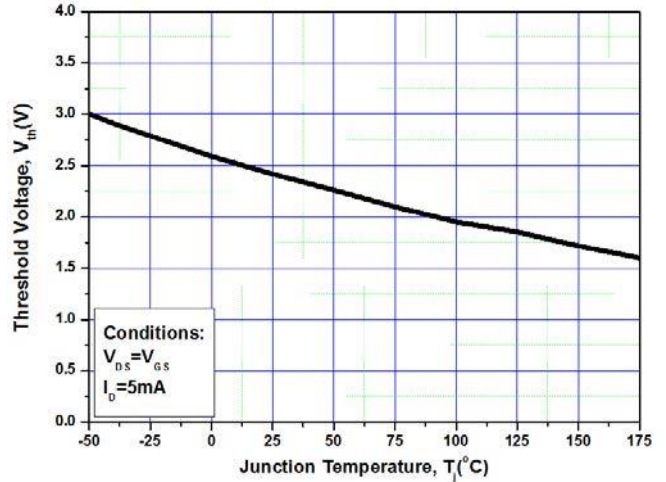


Figure 8. Threshold Voltage vs. Temperature

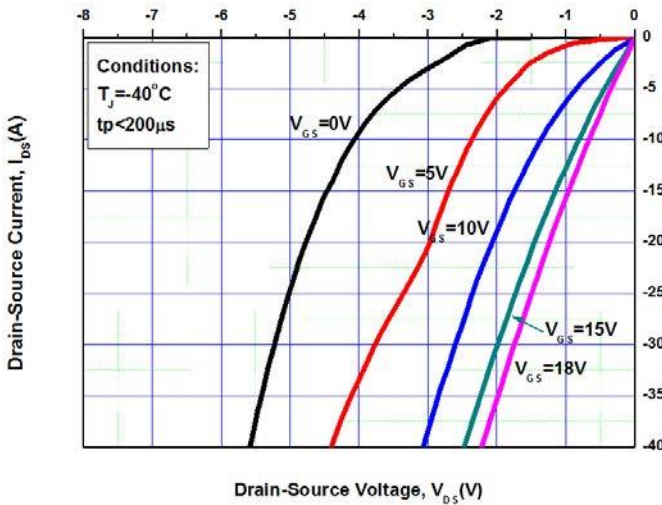


Figure 9. 3rd Quadrant Characteristic at -40 °C

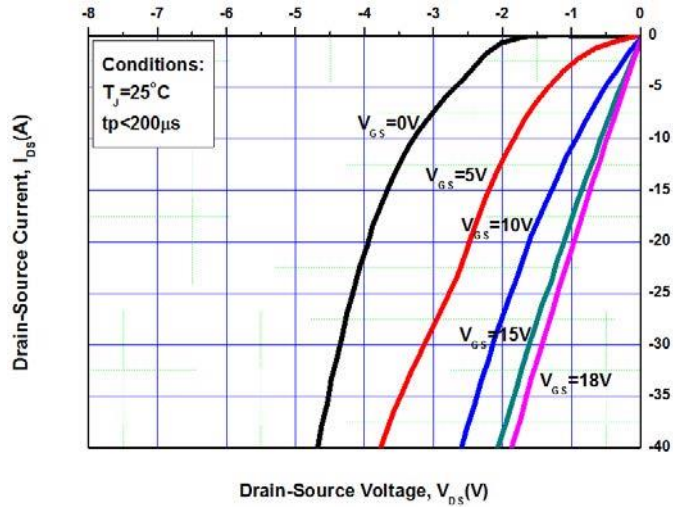


Figure 10. 3rd Quadrant Characteristic at 25 °C

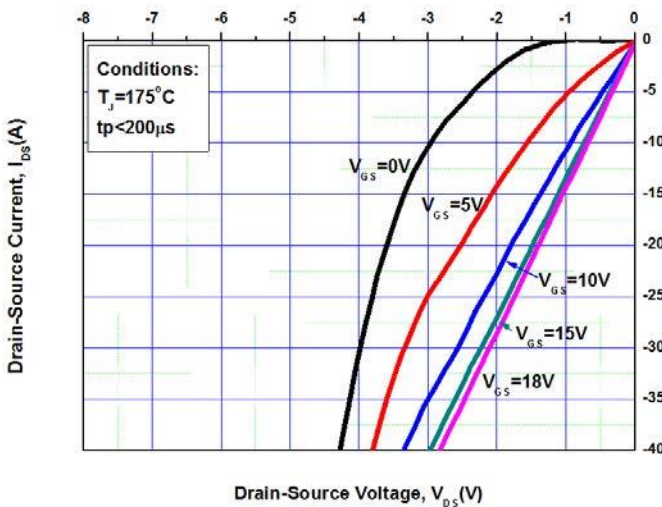


Figure 11. 3rd Quadrant Characteristic at 175 °C

Typical Performance

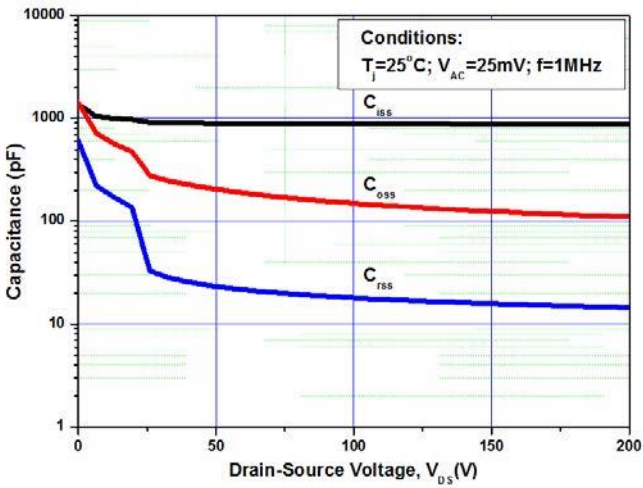


Figure 12. Capacitances vs. Drain-Source Voltage (0 - 200V)

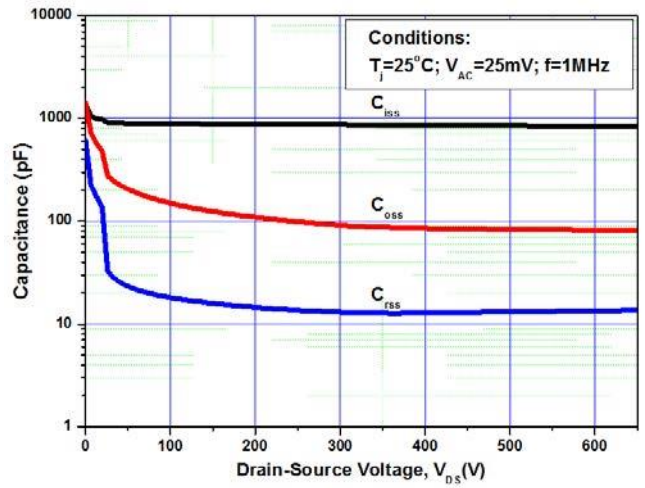
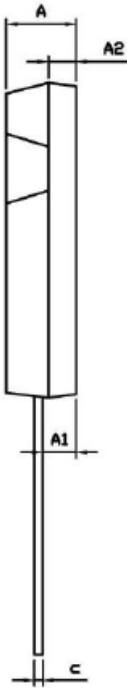
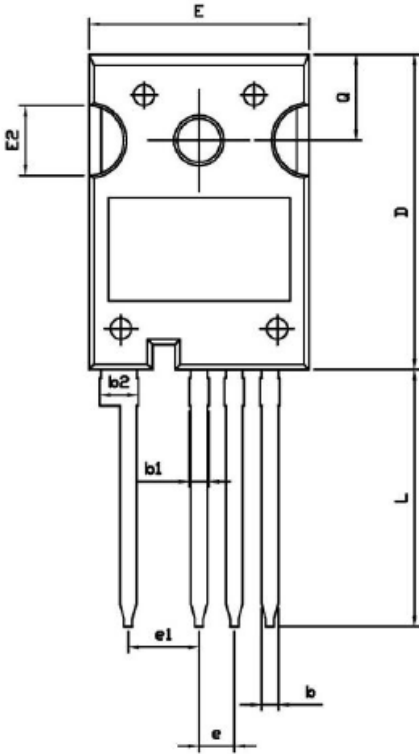
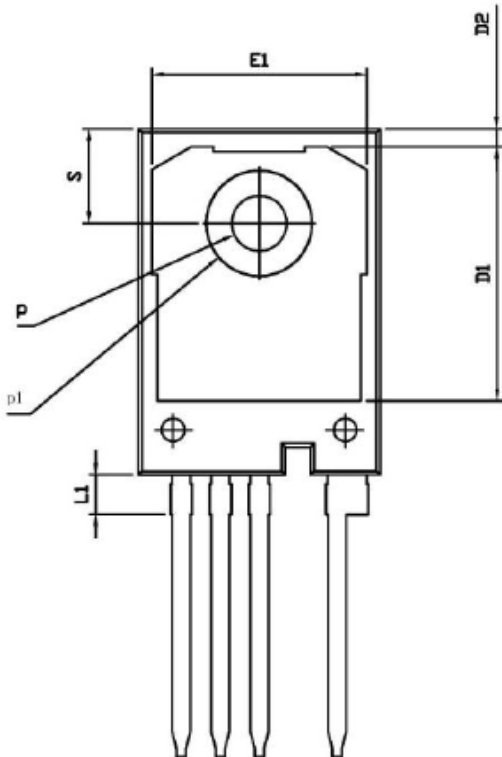
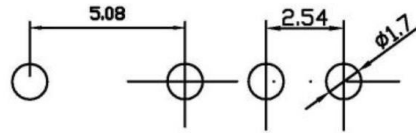


Figure 13. Capacitances vs. Drain-Source Voltage (0 - 650V)

Package TO-247-4



RECOMMENDED LAND PATTERN



	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.25	2.40	2.45
A2	1.85	2.00	2.15
b	1.05	1.20	1.35
b1	1.00	1.30	1.60
b2	2.35	2.65	2.95
c	0.50	0.60	0.70
D	22.34	22.54	22.74
D1	16.00	16.50	17.00
D2	0.97	1.17	1.37
e	2.34	2.54	2.74
e1	4.88	5.08	5.28
E	15.60	15.80	16.00
E1	13.50	14.00	14.50
E2	4.80	5.00	5.20
L	18.08	18.38	18.68
L1	2.38	2.58	2.78
p	3.50	3.60	3.70
p1	6.60	6.80	7.00
Q	6.00	6.15	6.30
S	6.00	6.15	6.30