

NF3M50330K

SiC Power MOSFET

V_{DS}	=	3300	V
$R_{DS(on)}$	=	50	mΩ
$I_D@25^{\circ}C$	=	68	A

Features

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

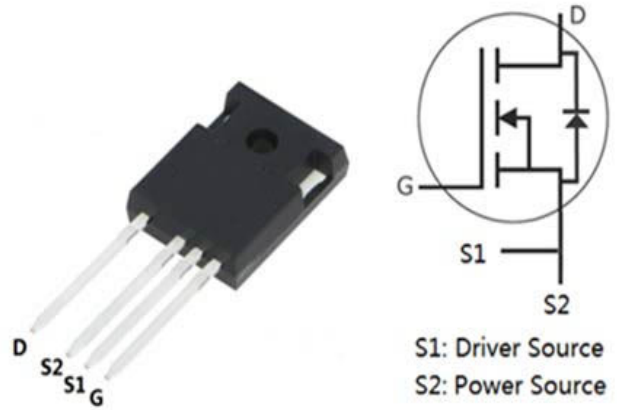
Benefits

- Higher System Efficiency
- High Temperature Operation
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Applications

- Solar Inverters
- Rail Traction
- Motor Drives
- Ultra-Fast EV Chargers
- Pulsed Power applications

Chip Outline



Part Number	Package
NF3M50330K	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	3300	V	$V_{GS}=0V, I_D=100\mu A$	
V_{GSmax}	Gate-Source Voltage	-10/+22	V	Absolute maximum values	
V_{GSop}	Gate-Source Voltage	-5/+18	V	Recommended operational values	
I_D	Continuous Drain Current	68	A	$V_{GS}=18V, T_c=25^{\circ}C$	
		42		$V_{GS}=18V, T_c=100^{\circ}C$	
$I_{D(pulse)}$	Pulsed Drain Current	150	A	Pulse width t_p limited by T_{Jmax}	
P_D	Power Dissipation	560	W	$T_c=25^{\circ}C, T_J=150^{\circ}C$	
T_J, T_{STG}	Operating Junction and Storage Temperature	-55 to +150	$^{\circ}C$		

Assumes a $R_{\theta JC} < 0.22^{\circ}C/W$

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	3300	/	/	V	$V_{GS}=0V, I_D=100\mu A$	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.6	4.0	V	$V_{DS}=V_{GS}, I_D=18mA$	
		/	1.8	/		$V_{DS}=V_{GS}, I_D=18mA, T_J=150^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current	/	1	100	μA	$V_{DS}=3300V, V_{GS}=0V$	
I_{GSS+}	Gate-Source Leakage Current	/	10	250	nA	$V_{DS}=0V, V_{GS}=22V$	
I_{GSS-}	Gate-Source Leakage Current	/	10	250	nA	$V_{DS}=0V, V_{GS}=-8V$	
$R_{DS(on)}$	Drain-Source On-State Resistance	/	50	70	m Ω	$V_{GS}=18V, I_D=50A$	
		/	120	160		$V_{GS}=18V, I_D=50A, T_J=150^\circ\text{C}$	
g_{fs}	Transconductance	/	21.4	/	S	$V_{DS}=20V, I_D=50A$	
		/	20.2	/		$V_{DS}=20V, I_D=50A, T_J=150^\circ\text{C}$	
C_{iss}	Input Capacitance	/	5050	/	pF	$V_{GS}=0V$	
C_{oss}	Output Capacitance	/	360	/		$V_{DS}=1700V$	
C_{rSS}	Reverse Transfer Capacitance	/	18	/		$f=1MHz$	
E_{oss}	C_{oss} Stored Energy		514			$V_{AC}=25mV$	
E_{ON}	Turn-On Switching Energy		6.18		mJ	$V_{DS}=1700V, V_{GS}=-5V/20V$	
E_{OFF}	Turn-Off Switching Energy		3.77			$I_D=35A, R_{G(ext)}=2.5\Omega, L=200\mu H$	
$t_{d(on)}$	Turn-On Delay Time		34		ns	$V_{DS}=1700V, V_{GS}=-5V/20V, I_D=35A$ $R_{G(ext)}=2.5\Omega, R_L=40\Omega$	
t_r	Rise Time		47.2				
$t_{d(off)}$	Turn-Off Delay Time		88				
t_f	Fall Time		39.2				
$R_{G(int)}$	Internal Gate Resistance	/	1.2	/	Ω	$f=1MHz, V_{AC}=25mV$	
Q_{GS}	Gate to Source Charge	/	72	/	nC	$V_{DS}=1700V$	
Q_{GD}	Gate to Drain Charge	/	54	/		$V_{GS}=-4V/18V$	
Q_G	Total Gate Charge	/	262	/		$I_D=40A$	

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.2	/	V	$V_{GS}=-4V, I_{SD}=25A$	
		3.8	/		$V_{GS}=-4V, I_{SD}=25A, T_J=150^\circ\text{C}$	
I_S	Continuous Diode Forward Current	/	68	A	$T_c=25^\circ\text{C}$	
t_{rr}	Reverse Recover Time	61	/	ns	$V_R=1700V, I_{SD}=20A$	
Q_{rr}	Reverse Recovery Charge	298	/	nC		
I_{rrm}	Peak Reverse Recovery Current	8.9	/	A		

Typical Performance

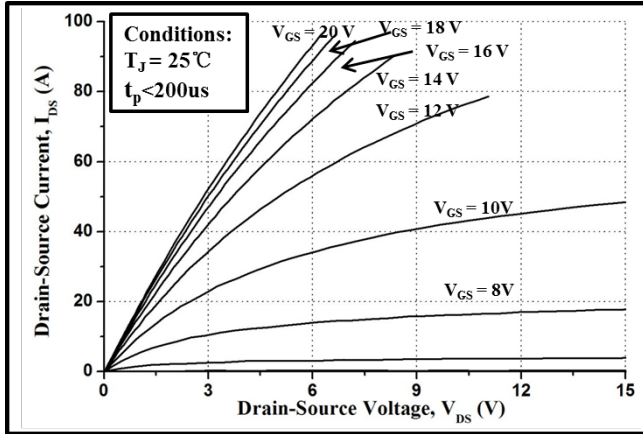


Figure 1. Output Characteristics $T_J = 25\text{ }^\circ\text{C}$

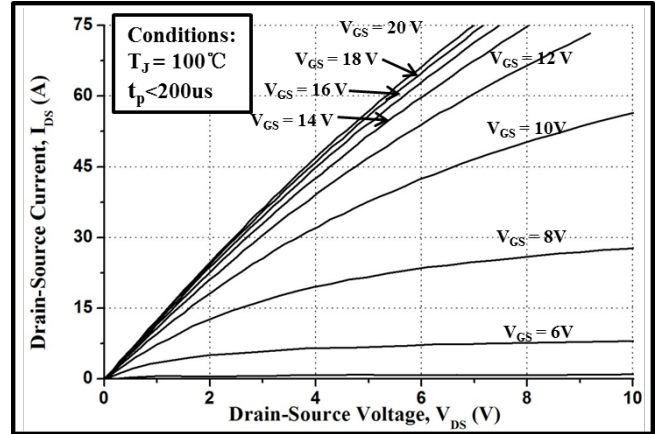


Figure 2. Output Characteristics $T_J = 100\text{ }^\circ\text{C}$

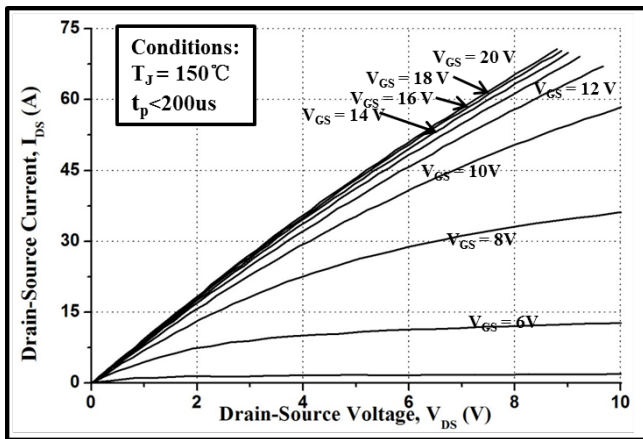


Figure 3. Output Characteristics $T_J = 150\text{ }^\circ\text{C}$ Temperature

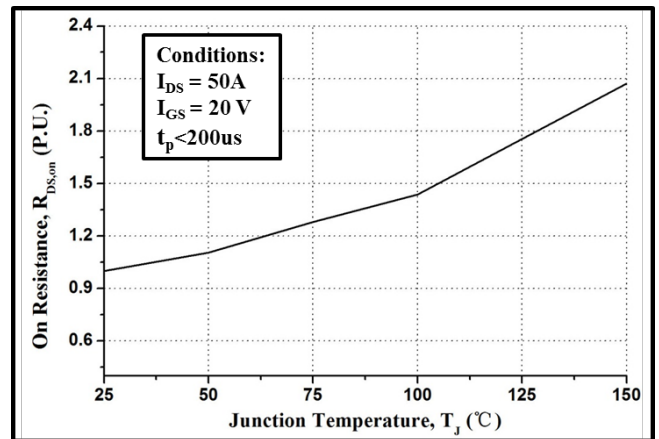


Figure 4. Normalized On-Resistance vs.

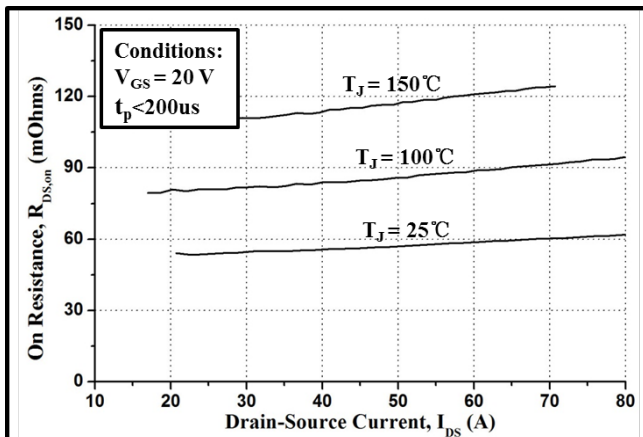


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

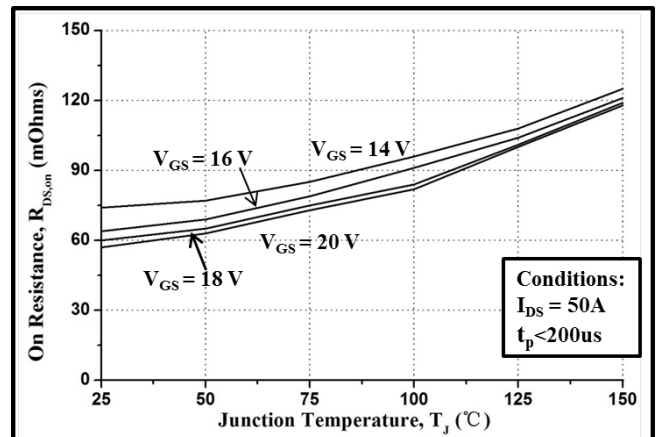


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

Typical Performance

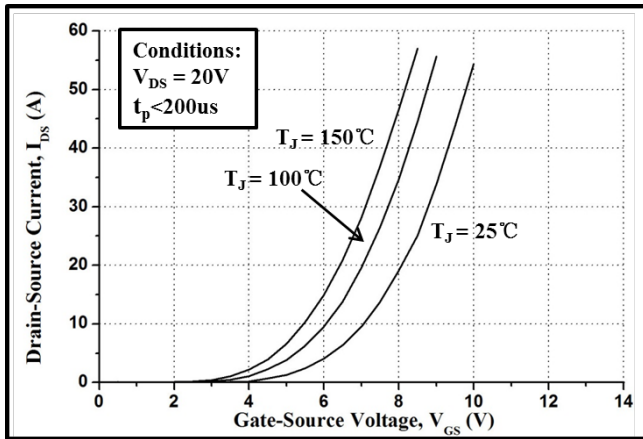


Figure 7. Transfer Characteristic for Various Junction Temperatures

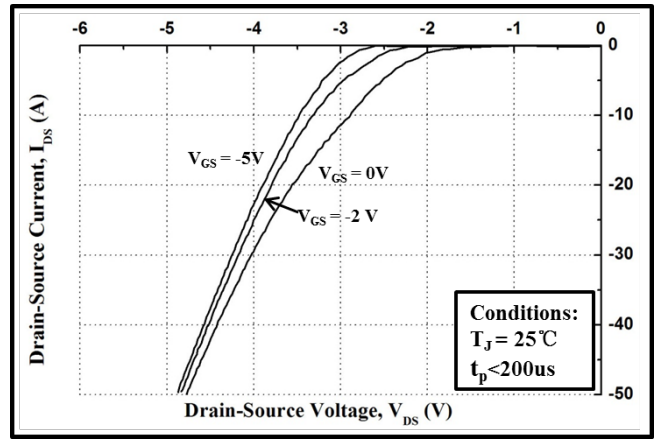


Figure 8. Body Diode Characteristic at 25 °C

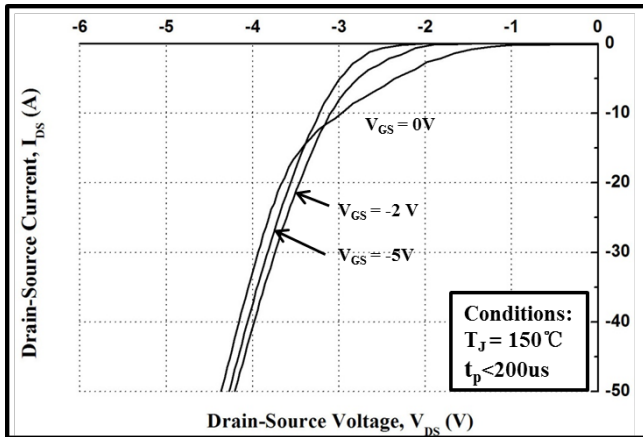


Figure 9. Body Diode Characteristic at 150 °C

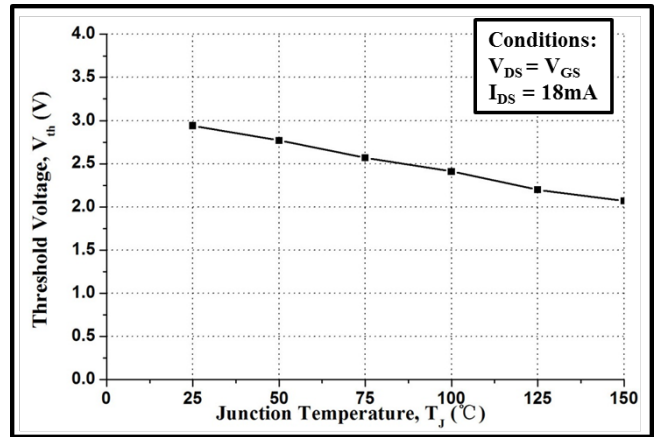


Figure 10. Threshold Voltage vs. Temperature

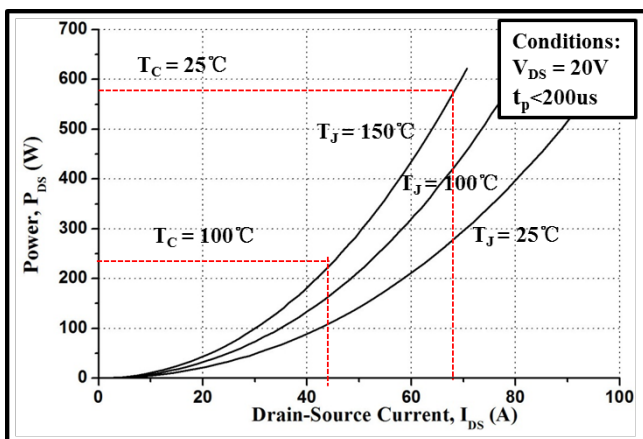


Figure 11. Power Dissipation vs. Drain Current Various Junction Temperatures

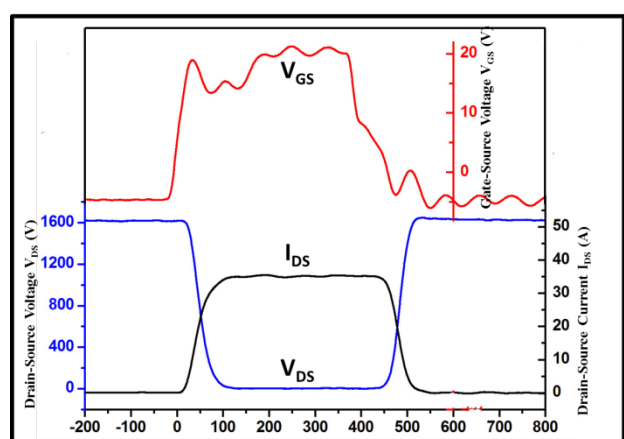
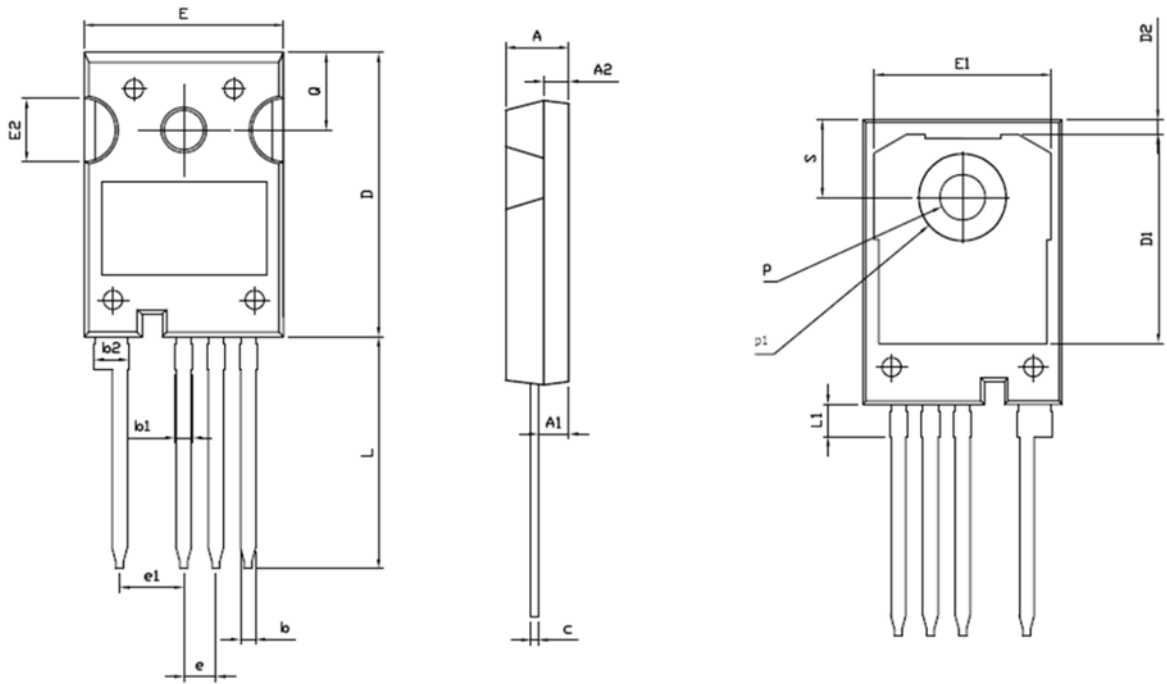
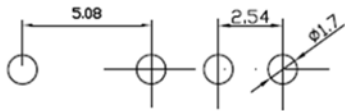


Figure 12. Switching waveforms

Package Dimensions



RECOMMENDED LAND PATTERN



UNIT: mm

	MIN	NOM	MAX
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