

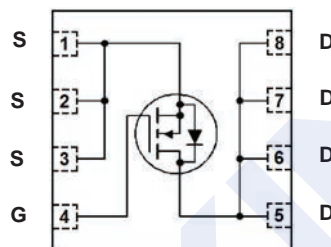
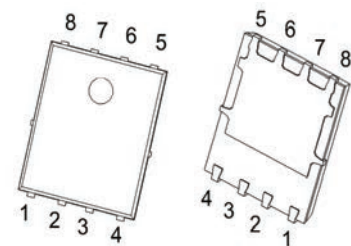
## N-Channel MOSFET

## 2KK5133DFN

## ■ Features

- $V_{DS} = 120\text{ V}$
- $I_D$  (at  $V_{GS}=10\text{ V}$ ) = 85 A
- $R_{DS(ON)}$  (at  $V_{GS} = 10\text{ V}$ ) < 7.0 m $\Omega$
- $R_{DS(ON)}$  (at  $V_{GS} = 4.5\text{ V}$ ) < 9.0 m $\Omega$

PDFN5x6-8

■ Absolute Maximum Ratings ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	$V_{DS}$	120	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current (Note 1)	$I_D$	$T_C = 25^\circ\text{C}$	A
		$T_C = 100^\circ\text{C}$	
Pulsed Drain Current (Note 2)	$I_{DM}$	250	
Continuous Drain Current	$I_{DSM}$	$T_C = 25^\circ\text{C}$	
		$T_C = 100^\circ\text{C}$	17.5
Avalanche Current	$I_{AS}$	60	
Avalanche Energy (Note 3)	$E_{AS}$	180	mJ
Thermal Resistance, Junction- to-Ambient	$R_{\theta JA}$	17	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction- to-Case	$R_{\theta JC}$	0.58	
Power Dissipation	$P_D$	$T_C = 25^\circ\text{C}$	W
		$T_C = 100^\circ\text{C}$	
Power Dissipation	$P_{DSM}$	$T_A = 25^\circ\text{C}$	W
		$T_A = 70^\circ\text{C}$	
Junction Temperature	$T_J$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55 to 150	

## Notes:

1. Drain current limited by maximum junction temperature
2. Repetitive Rating : Pulse width limited by maximum junction temperature
3.  $L = 0.1\text{ mH}$ ,  $V_{DD} = 50\text{ V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25\ ^\circ\text{C}$

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■ Electrical Characteristics (T<sub>c</sub> = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0V	120			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 120 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 120 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> =55°C			5	
Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±100	nA
Gate to Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1.4		2.4	V
Static Drain-Source On-Resistance (Note 5)	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A			7.0	mΩ
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> =125°C			13.3	
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A,			9.0	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 20 A		83		S
<b>Dynamic Characteristics</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 60 V, f = 1 MHz		3295		pF
Output Capacitance	C <sub>oss</sub>			360		
Reverse Transfer Capacitance	C <sub>rss</sub>			9		
Gate Resistance	R <sub>g</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f = 1MHz	0.5	1.1	1.6	Ω
<b>Switching Characteristics</b>						
Total Gate Charge	Q <sub>g</sub> (10V)	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 60 V, I <sub>D</sub> = 20 A (Note 4,5)		46	65	nC
	Q <sub>g</sub> (4.5V)			20	30	
Gate Source Charge	Q <sub>gs</sub>			10		
Gate Drain Charge	Q <sub>gd</sub>			5.5		
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =60V, R <sub>L</sub> =3Ω, R <sub>GEN</sub> =3Ω (Note 4,5)		10		ns
Turn-On Rise Time	t <sub>r</sub>			3.5		
Turn-Off Delay Time	t <sub>d(off)</sub>			34		
Turn-Off Fall Time	t <sub>f</sub>			5.5		
<b>Drain-Source Diode Characteristics</b>						
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 20A, di/dt = 380 A/μs		43		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			355		nC
Maximum Body-Diode Continuous Current	I <sub>S</sub>				85	A
Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 1 A		0.67	1	V

Notes:

- I<sub>SD</sub> ≤ 100 A, di/dt = 100 A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Staring T<sub>J</sub> = 25 °C
- Pulse Test : Pulse width ≤ 300 μs, Duty cycle ≤ 2%
- Essentially independent of operating temperature

## ■ Marking

Marking	K5133 KC***
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### Typical Electrical and Thermal Characteristics

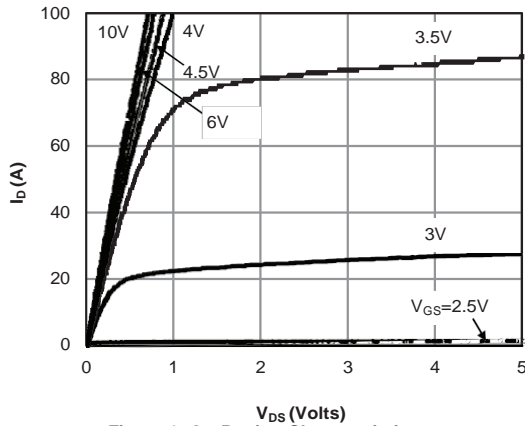


Figure 1: On-Region Characteristics

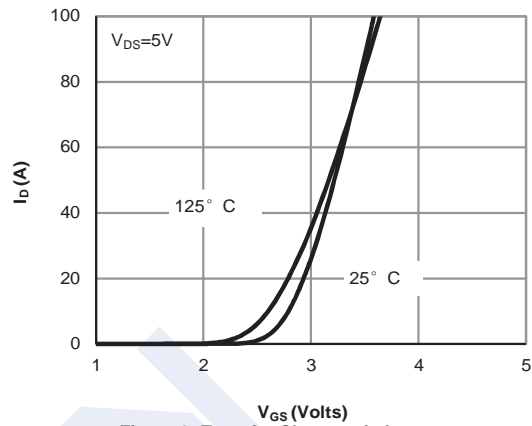


Figure 2: Transfer Characteristics

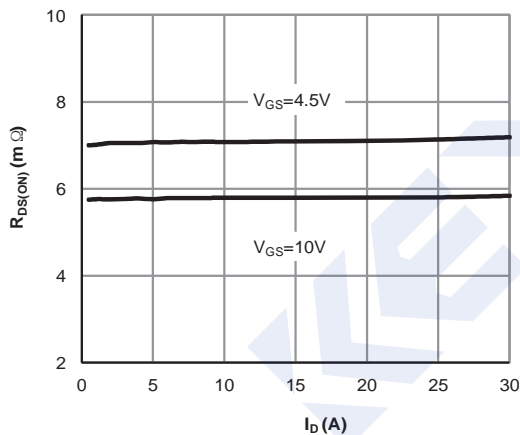


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

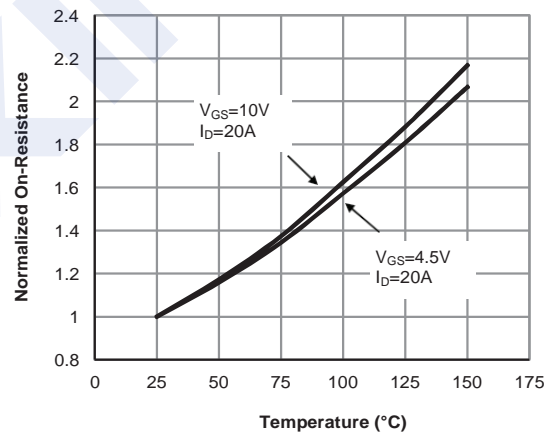


Figure 4: On-Resistance vs. Junction Temperature

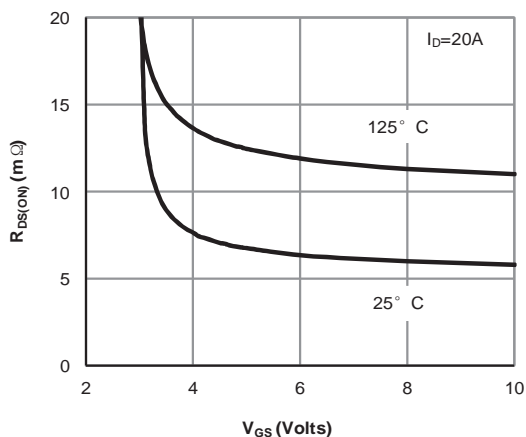


Figure 5: On-Resistance vs. Gate-Source Voltage

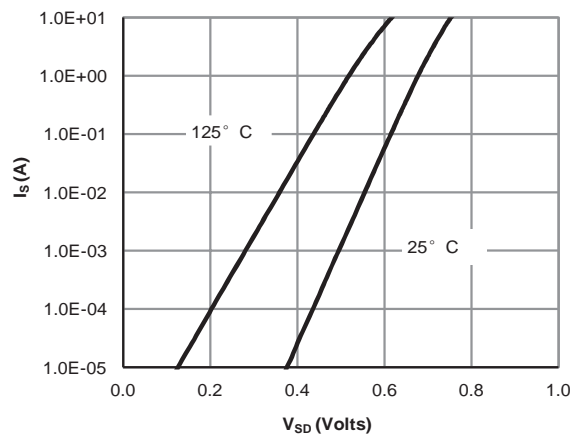


Figure 6: Body-Diode Characteristics

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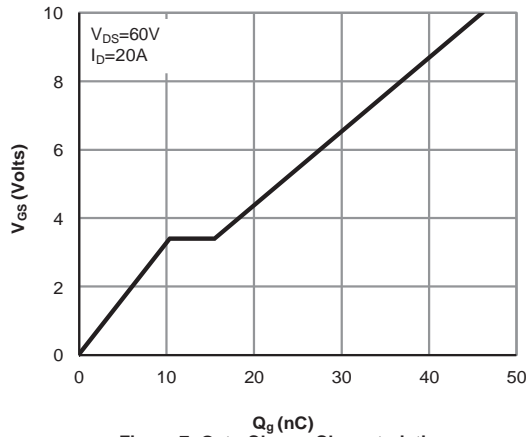


Figure 7: Gate-Charge Characteristics

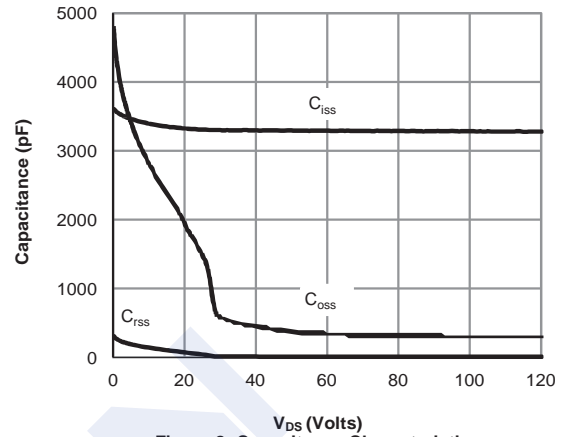


Figure 8: Capacitance Characteristics

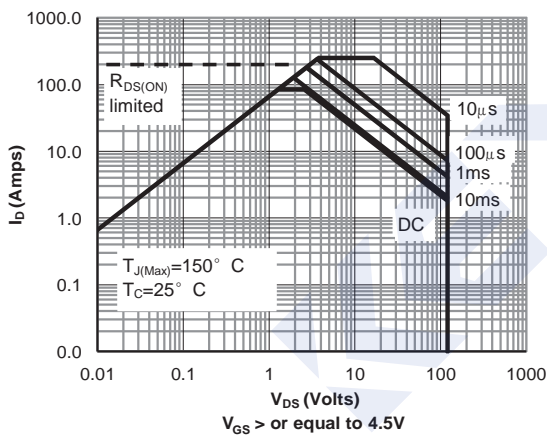


Figure 9: Maximum Forward Biased Safe Operating Area

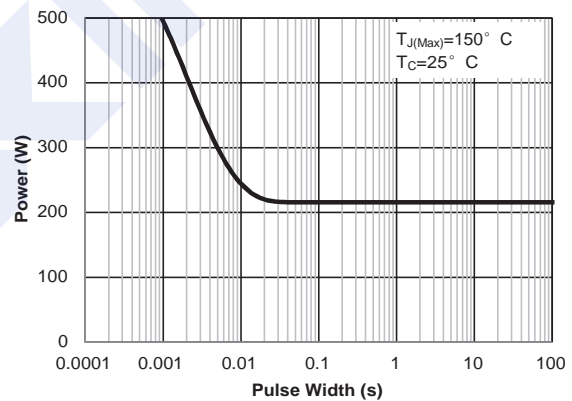


Figure 10: Single Pulse Power Rating Junction-to-Case

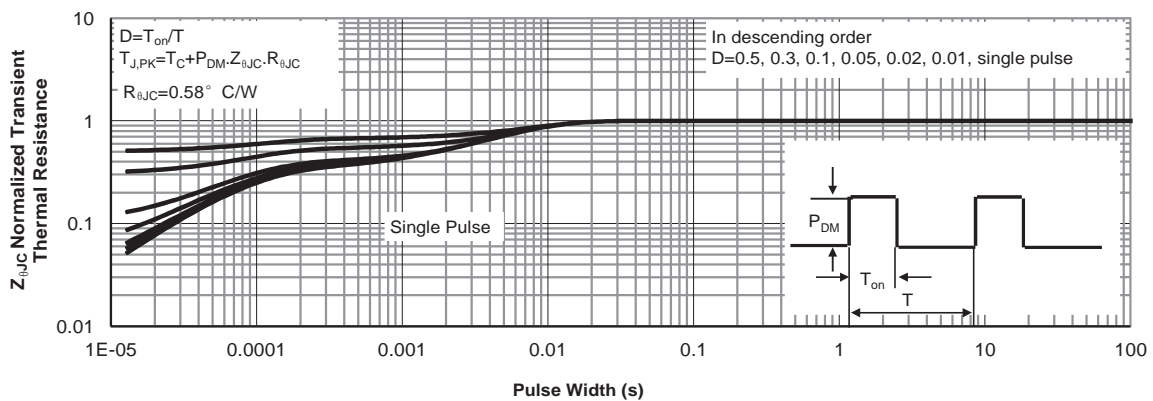


Figure 11: Normalized Maximum Transient Thermal Impedance

### N-Channel MOSFET

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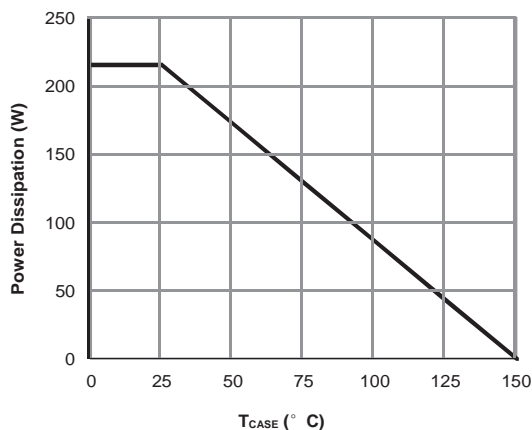


Figure 12: Power De-rating

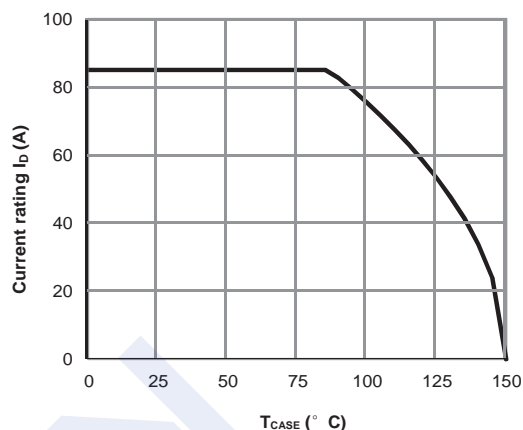


Figure 13: Current De-rating

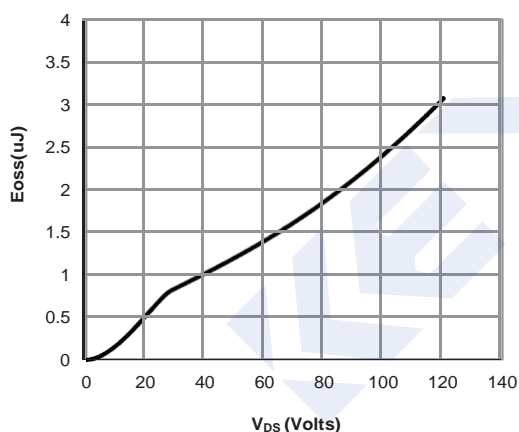


Figure 14: Coss stored Energy

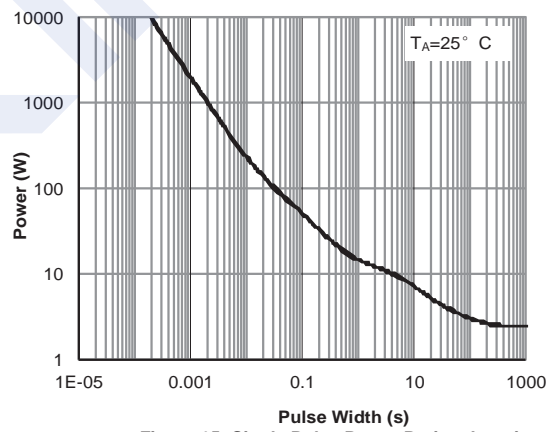


Figure 15: Single Pulse Power Rating Junction-to-Ambient

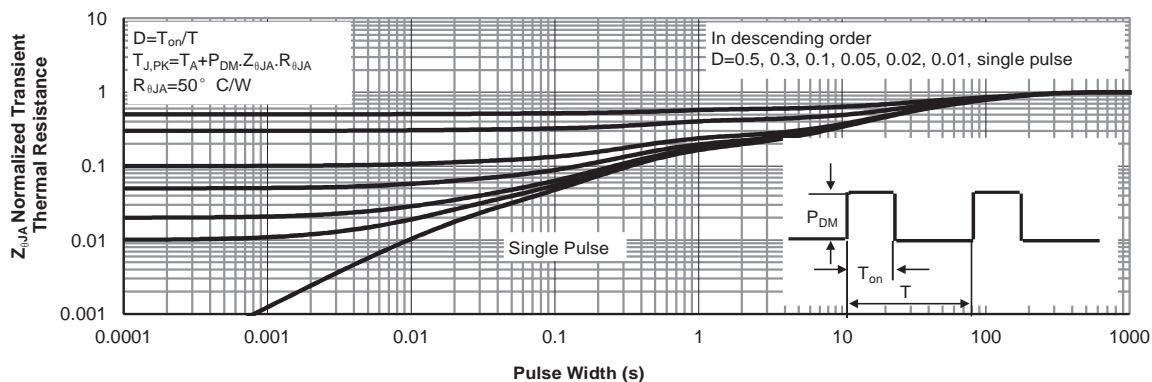
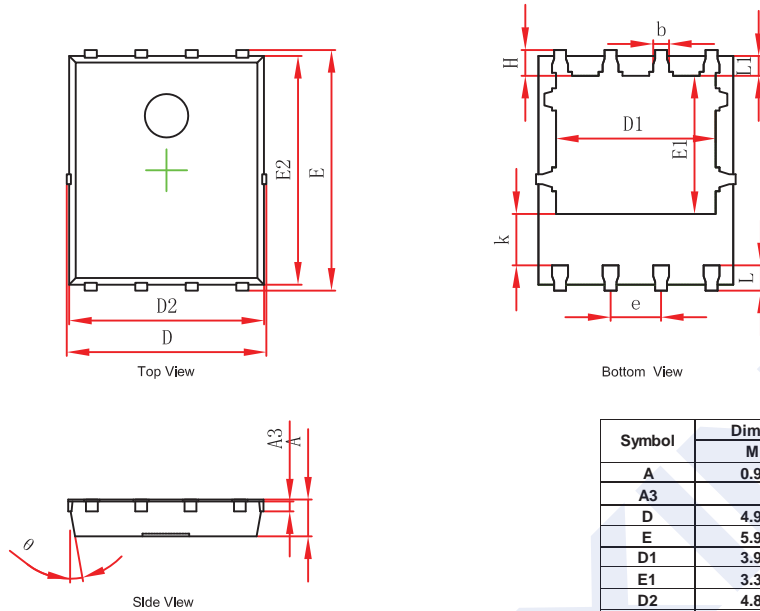


Figure 16: Normalized Maximum Transient Thermal Impedance

## N-Channel MOSFET

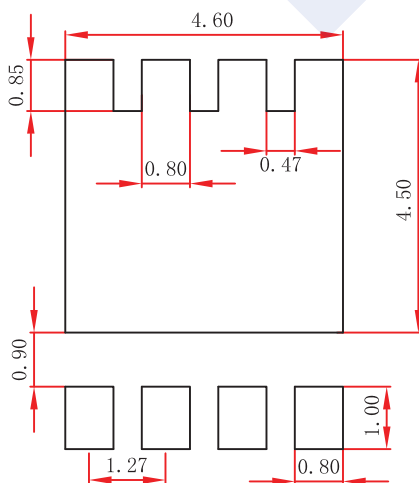
### 2KK5133DFN

#### PDFN5x6-8 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254REF.		0.010REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	3.910	4.110	0.154	0.162
E1	3.375	3.575	0.133	0.141
D2	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270TYP.		0.050TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
$\theta$	10°	12°	10°	12°

#### PDFN5x6-8 Suggested Pad Layout



- Note:**
1. Controlling dimension: in millimeters.
  2. General tolerance:  $\pm 0.05\text{mm}$ .
  3. The pad layout is for reference purposes only.