

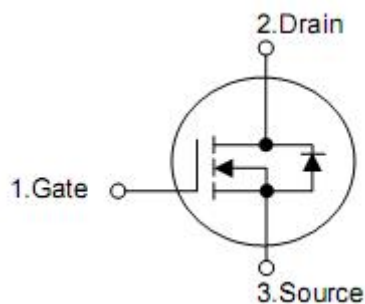
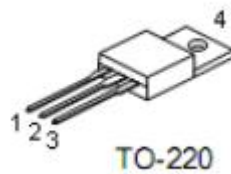
1. Features

- n $R_{DS(on)}$ (TYP)= 2.2m Ω @ V_{GS} = 10 V
- n Lead free and green device available
- n Low Rds-on to minimize conductive loss
- n High avalanche current

2. Applications

- n Power supply
- n DC-DC converters

3. Pin configuration



Pin	Function
1	Gate
2	Drain
3	Source
4	Drain

4. Ordering Information

Part Number	Package	Brand
KNP2404A	TO-220	KIA

5. Absolute maximum ratings

Parameter		Symbol	Maximum	Units
Drain-to-source voltage		V_{DSS}	40	V
Gate-to-source voltage		V_{GSS}	± 25	V
Continuous drain current	$T_C=25^\circ\text{C}$ (Silicon limited)	I_D	190	A
	$T_C=25^\circ\text{C}$ (Package limited)		120	
	$T_C=100^\circ\text{C}$ (Silicon limited)		109	
Pulsed drain current	$T_C=25^\circ\text{C}$	I_{DP}	480	A
Avalanche current(L=0.5mH)		I_{AS}	46	A
Avalanche energy(L=0.5mH)		E_{AS}	529	mJ
Maximum power dissipation	$T_C=25^\circ\text{C}$	P_D	123	W
	$T_C=100^\circ\text{C}$		82	W
Junction & storage temperature range		T_J, T_{STG}	-55~150	$^\circ\text{C}$

*Drain current limited by maximum junction temperature.

6. Thermal characteristics

Parameter	Symbol	Typical	Units
Thermal resistance-junction to case	$R_{\theta jc}$	1.02	$^\circ\text{C}/\text{W}$
Thermal resistance-junction to ambient	$R_{\theta ja}$	80	

7. Electrical characteristics

($T_A=25^\circ\text{C}$, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_{DS}=250\mu A$	40	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=64V, V_{GS}=0V$	-	-	1	μA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	2	-	4	V
Gate leakage current	I_{GSS}	$V_{GS}=\pm 25V, V_{DS}=0V$	-	-	± 100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10V, I_{DS}=30A$	-	2.2	3.5	m Ω
Forward Transconductance	G_{fs}	$V_{DS}=5V, I_D=40A$	-	135	-	S
Diode characteristics						
Diode forward voltage	V_{SD}	$I_{SD}=40A, V_{GS}=0V$	-	0.9	1.3	V
Diode continuous forward current	I_S		-	-	190	A
Reverse recovery time	t_{rr}	$I_S=40A, di/dt=100A/\mu s$	-	55	-	nS
Reverse recovery charge	Q_{rr}		-	70	-	nC
Dynamic characteristics ²						
Gate resistance	R_G	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	-	2.0	-	Ω
Input capacitance	C_{iss}	$V_{GS}=0V, V_{DS}=25V, F=1.0\text{MHz}$	-	6010	-	pF
Output capacitance	C_{oss}		-	1400	-	
Reverse transfer capacitance	C_{rss}		-	675	-	
Turn-on delay time	$t_{d(ON)}$	$V_{DD}=25V, I_D=90A, V_{GS}=10V, R_G=2.7\Omega$	-	25	-	nS
Turn-on rise time	t_r		-	102	-	
Turn-off delay time	$t_{d(OFF)}$		-	62	-	
Turn-off fall time	t_f		-	84	-	
Gate charge characteristics ²						
Total gate charge	Q_g	$V_{DS}=40V, V_{GS}=10V, I_D=32A, F=1.0\text{MHz}$	-	150	-	nC
Gate-to-source charge	Q_{gs}		-	32	-	
Gate-to-drain charge	Q_{gd}		-	70	-	

8. Test circuits and waveforms

Fig 1: Output Characteristics

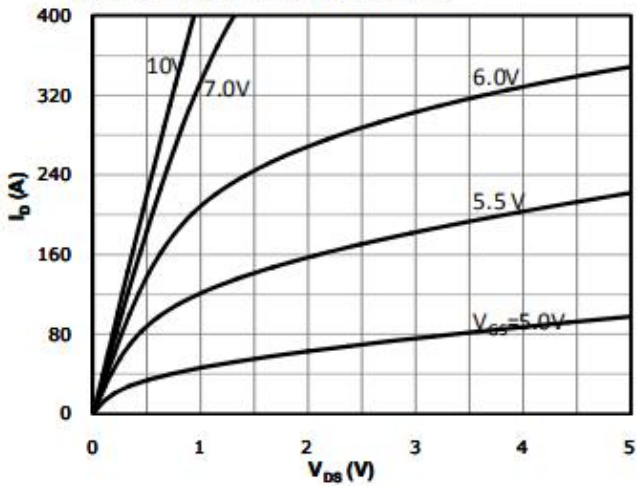


Fig 2: Transfer Characteristics

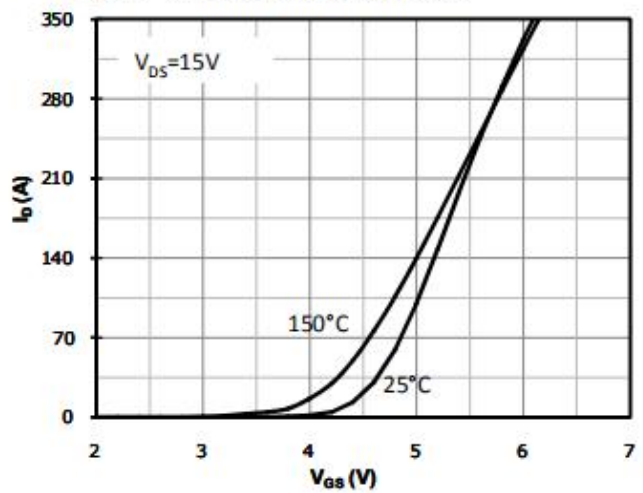


Fig 3: Rds(on) vs Drain Current and Gate Voltage

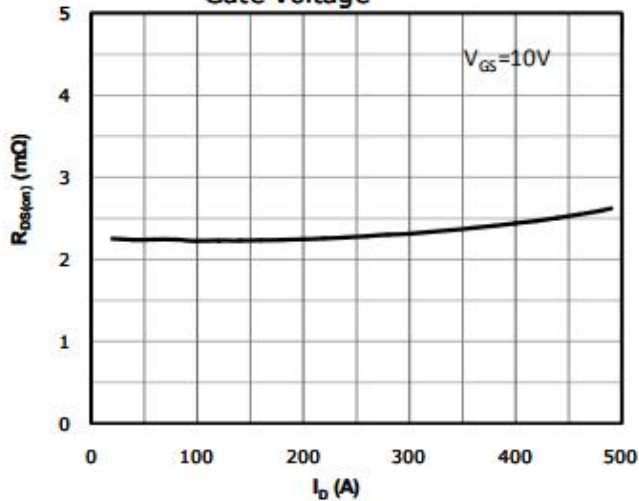


Fig 4: Rds(on) vs Gate Voltage

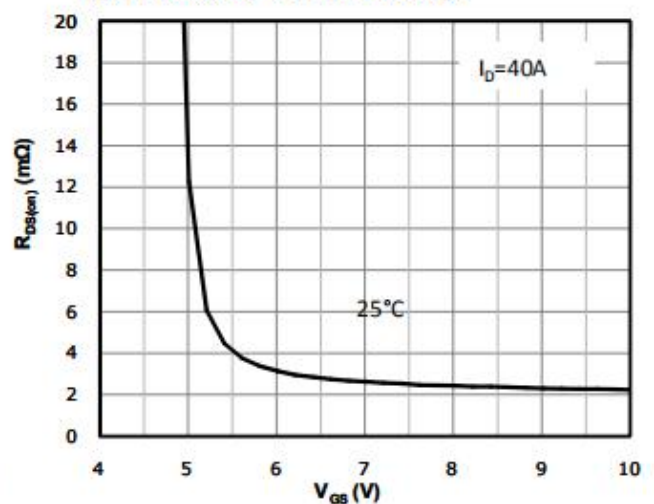


Fig 5: Rds(on) vs. Temperature

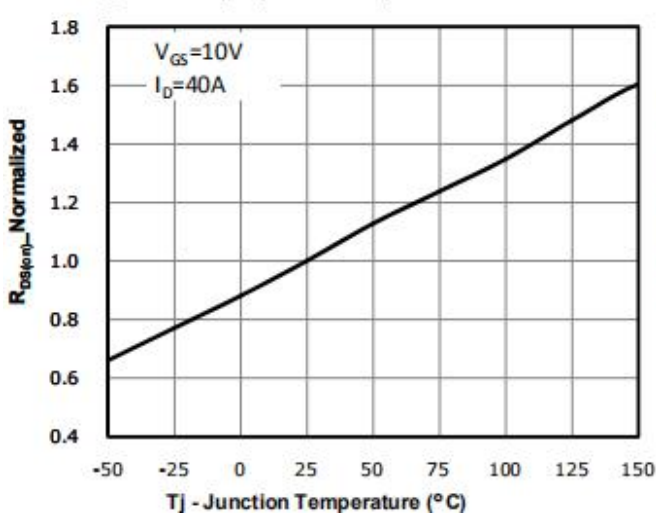


Fig 6: Capacitance Characteristics

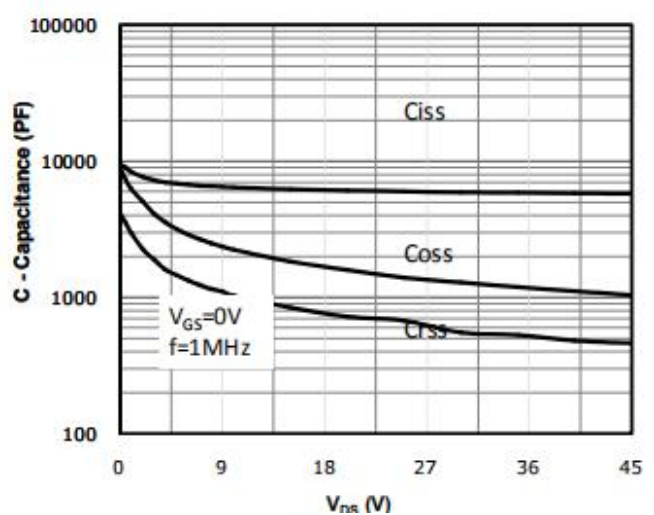


Fig 7: Gate Charge Characteristics

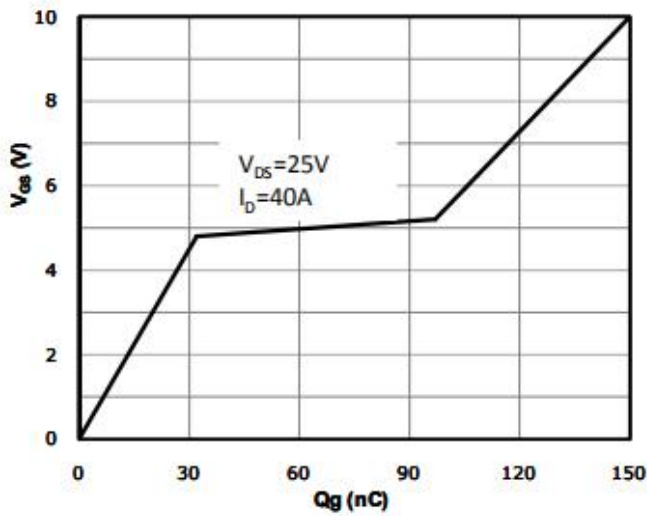


Fig 8: Body-diode Forward Characteristics

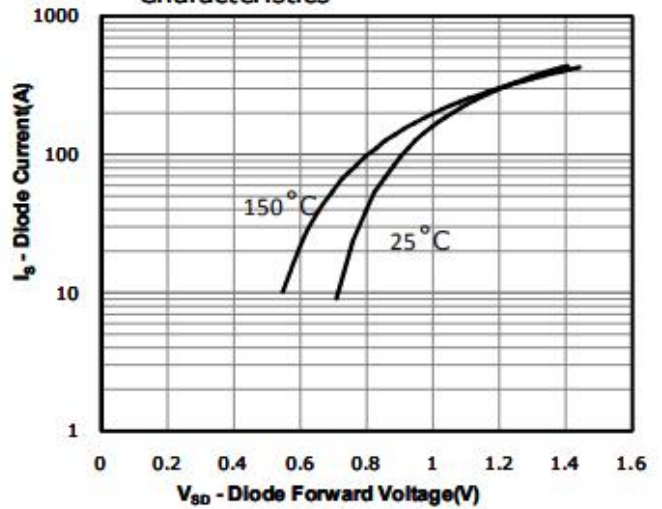


Fig 9: Power Dissipation

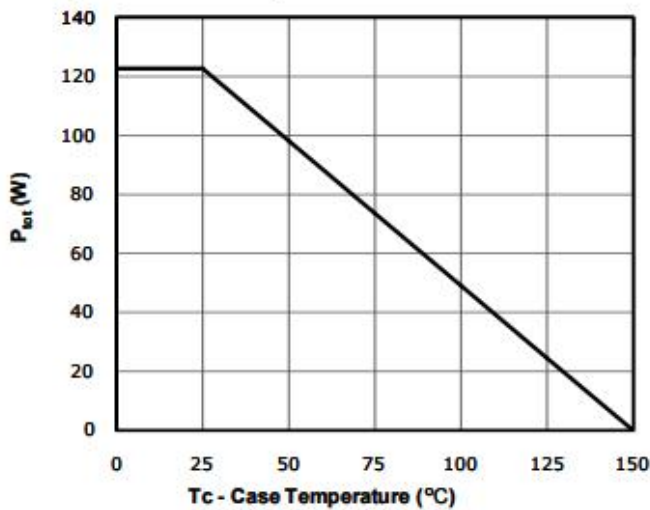


Fig 10: Drain Current Derating

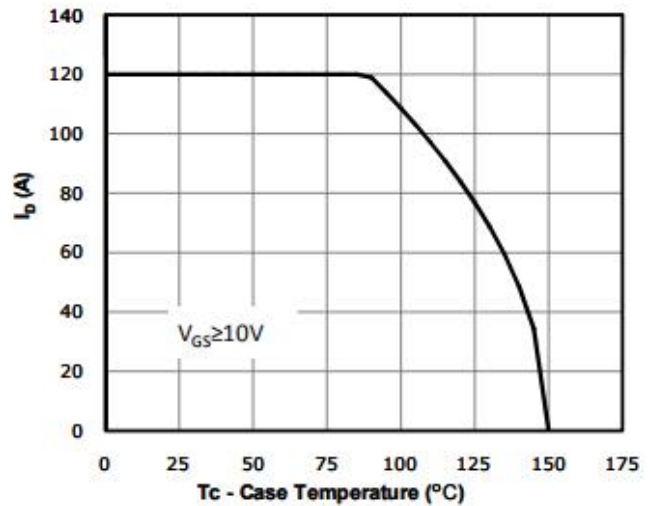


Fig 11: Safe Operating Area

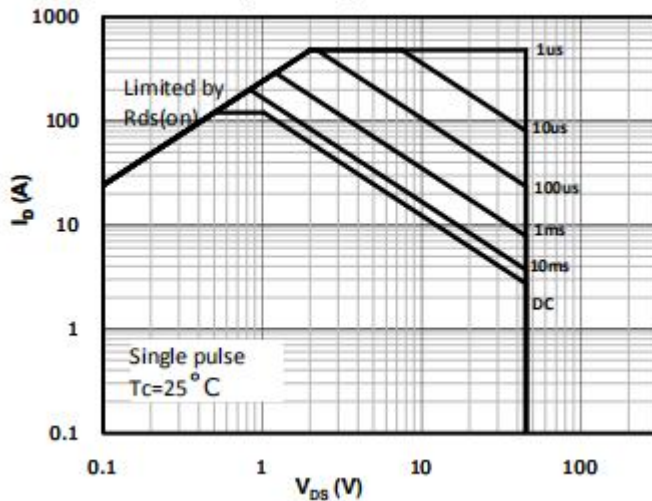


Fig 12: Max. Transient Thermal Impedance

