

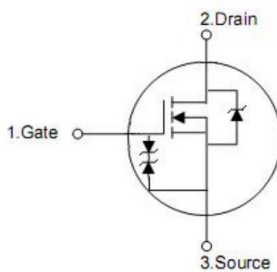
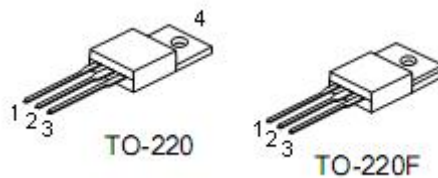
1. Description

The KNX6140S N-Channel enhancement mode silicon gate power MOSFET is designed for high voltage, high speed power switching applications such as switching regulators, switching converters, solenoid, motor drivers, relay drivers.

2. Features

- 11A, 400V, $R_{DS(on)typ.} = 0.53\Omega @ V_{GS} = 10V$
- Low gate charge (typical 15.7nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

3. Pin configuration



Pin	Function
1	Gate
2	Drain
3	Source
4	Drain

4. Ordering Information

Part Number	Package	Brand
KNF6140S	TO-220F	KIA
KNP6140S	TO-220	KIA

5. Absolute maximum ratings

(T_C=25 °C , unless otherwise specified)

Parameter		Symbol	KNP6140S	KNF6140S	Units
Drain-source voltage		V _{DSS}	400		V
Gate-source voltage		V _{GSS}	±30		V
Drain current continuous	T _C =25°C	I _D	11	11*	A
	T _C =100°C		6.6	6.6*	A
Drain current pulsed ^[1]		I _{DM}	44	44*	A
Avalanche energy	Repetitive ^[1]	E _{AR}	19.50		mJ
	Single pulse ^[2]	E _{AS}	365		mJ
Avalanche Current ^[1]		I _{AR}	11		A
Peak diode recovery dv/dt ^[3]		dv/dt	4.5		V/ns
Total power dissipation	T _C =25°C	P _D	194.5	40.2	W
	Derate above 25°C		1.55	0.32	W/°C
Operating and Storage Temperature Range		T _J ,T _{STG}	-55~+150		°C
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		T _L	300		°C
Gate Source ESD (HBM – C = 100pF, R = 1.5KΩ)		V _{ESD(G-S)}	2500		V

*Drain current limited by maximum junction temperature.

6. Thermal characteristics

Parameter	Symbol	KNP6140S	KNF6140S	Unit
Thermal resistance, Junction-to-case	R _{θJC}	0.65	3.15	°C/W
Thermal Resistance, Case-to-Sink Typ.	R _{θJS}	0.5	-	°C/W
Thermal resistance, Junction-to-ambient	R _{θJA}	62.5	62.5	°C/W

7. Electrical characteristics

(T_J=25°C, unless otherwise notes)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Off Characteristics						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	400	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =400V, V _{GS} =0V	-	-	1	μA
		V _{DS} =320V, T _C =125 °C	-	-	10	μA
Gate-body leakage current	Forward [6]	I _{GSS}	-	-	1	nA
	Reverse [6]				-1	nA
Breakdown voltage temperature	ΔBV _{DSS} /ΔT _J	I _D =250μA, Referenced to 25°C	-	0.4	-	V/°C
On characteristics						
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2.0	-	4.0	V
Static drain-source on-resistance	R _{DS(on)}	V _{GS} =10V, I _D =5A	-	530	640	mΩ
Forward Transconductance ^[4]	g _{FS}	V _{DS} = 40 V, I _D = 5 A	-	8	-	S
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz	-	980	-	pF
Output capacitance	C _{oss}		-	140	-	pF
Reverse transfer capacitance	C _{rss}		-	2.6	-	pF
Switching characteristics						
Turn-on delay time	t _{d(on)}	V _{DD} =200V, I _D =11A, R _G =20Ω ^[4,5]	-	33.5	-	ns
Rise time	t _r		-	31.5	-	ns
Turn-off delay time	t _{d(off)}		-	83	-	ns
Fall time	t _f		-	56	-	ns
Total gate charge	Q _g	V _{DS} =320V, I _D =11A, V _{GS} =10V ^[4,5]	-	15.7	-	nC
Gate-source charge	Q _{gs}		-	4.6	-	nC
Gate-drain charge	Q _{gd}		-	4.5	-	nC
Drain-source diode characteristics and maximum rating						
Drain-source diode forward voltage	V _{SD}	V _{GS} =0V, I _{SD} =11A	-	-	1.4	V
Continuous Drain-source current	I _S		-	-	11	A
Pulsed Drain-source current	I _{SM}		-	-	44	A
Reverse recovery time	t _{rr}	V _{GS} =0V, I _S =11A, dIF / dt = 100 A/us	-	430	-	ns
Reverse recovery charge ^[4]	Q _{rr}		-	3.8	-	μC

Notes: 1. Repetitive Rating : Pulse width limited by maximum junction temperature

2. L = 5.5 mH, I_{AS} = 11A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C

3. I_{SD} ≤ 11A, di/dt ≤ 100A/us, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

4. Pulse Test : Pulse width ≤ 300us, Duty cycle ≤ 2%

5. Essentially independent of operating temperature

6. V_{GS} = ± 30 V, V_{DS} = 0 V, I_{GSS} ≤ 2μA, Starting T_J = 25°C

8. Test circuits and waveforms

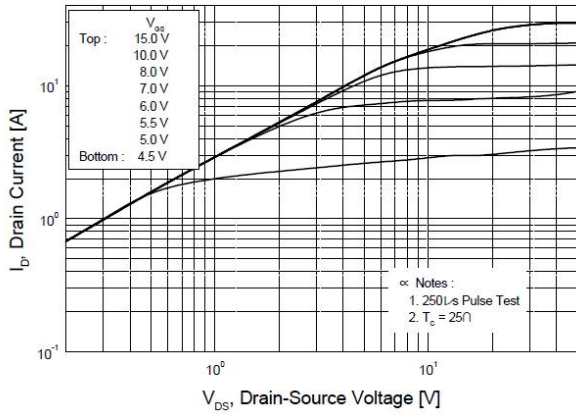


Figure 1. On-Region Characteristics

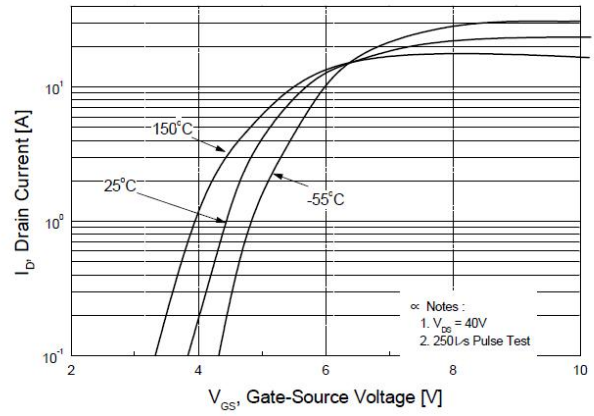


Figure 2. Transfer Characteristics

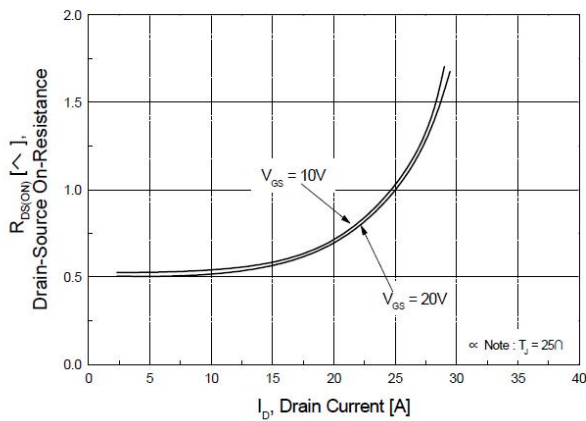


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

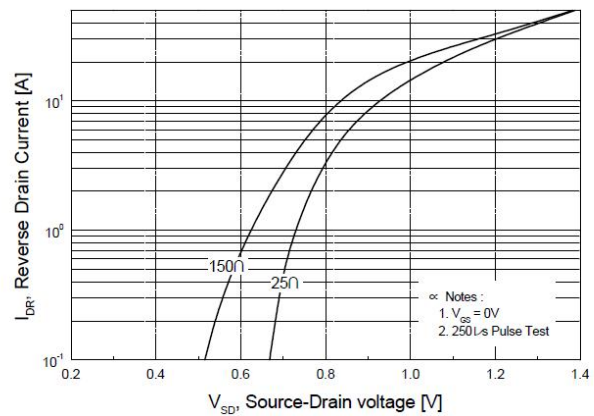


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

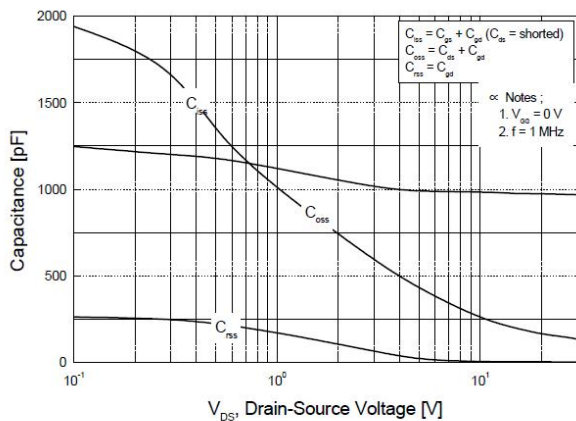


Figure 5. Capacitance Characteristics

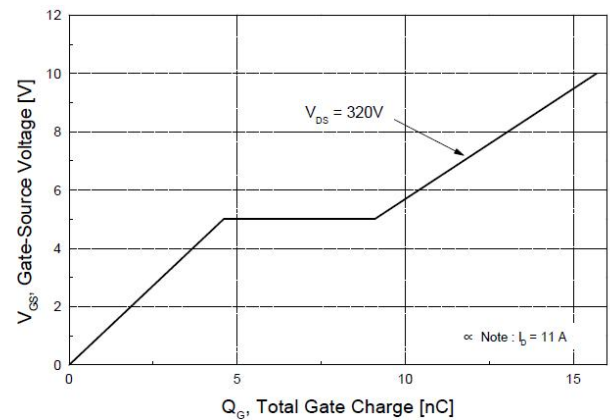


Figure 6. Gate Charge Characteristics

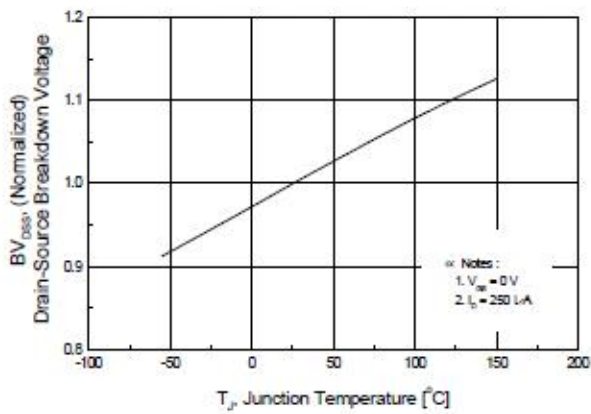


Figure 7. Breakdown Voltage Variation vs Temperature

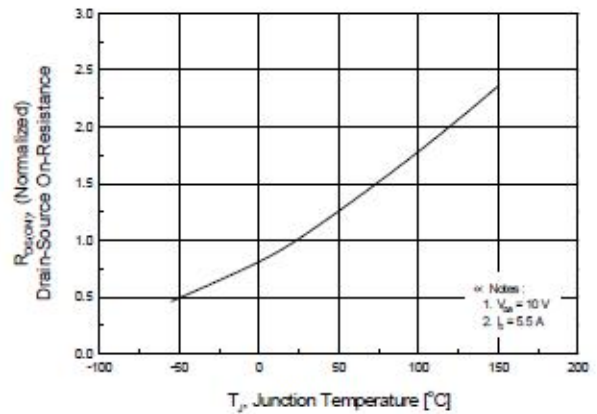


Figure 8. On-Resistance Variation vs Temperature

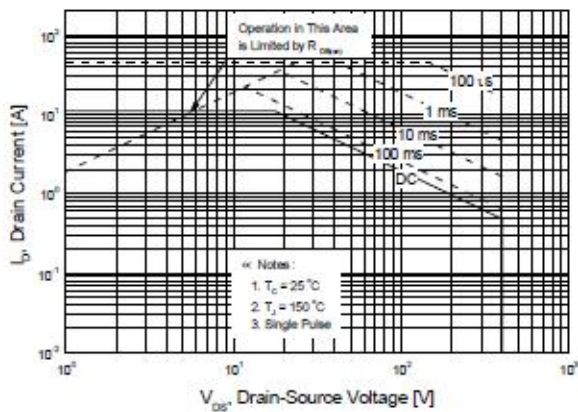


Figure 9-1. Maximum Safe Operating Area for KNP6140S

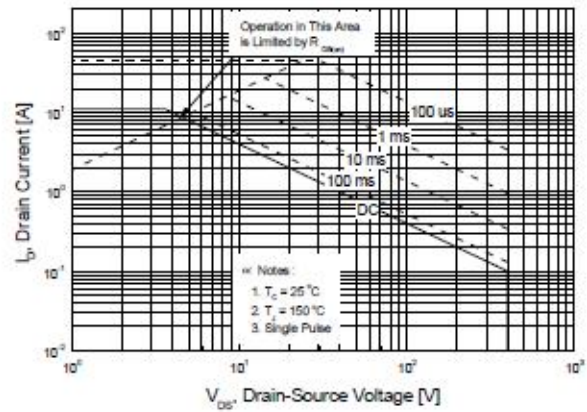


Figure 9-2. Maximum Safe Operating Area for KNF6140S

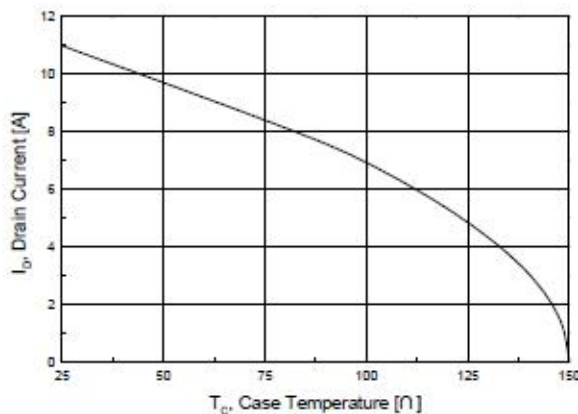


Figure 10. Maximum Drain Current vs Case Temperature

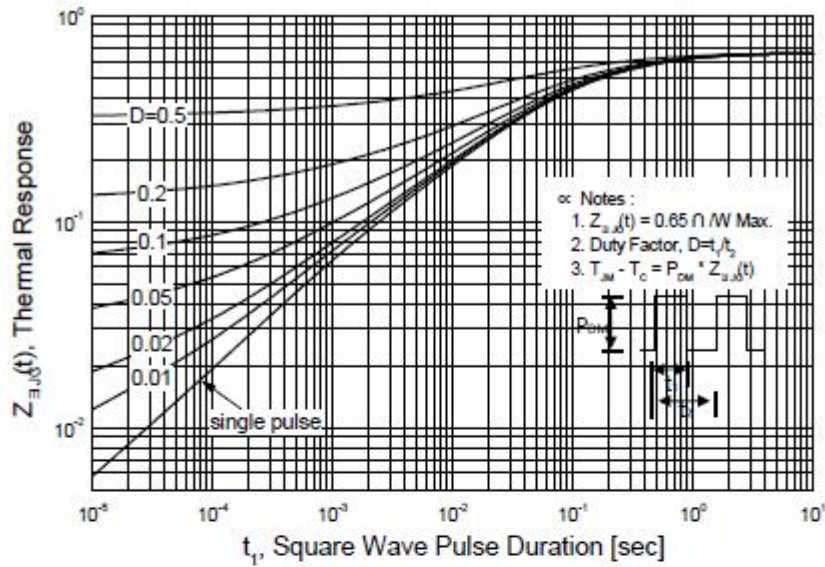


Figure 11-1. Transient Thermal Response Curve for KNP6140S

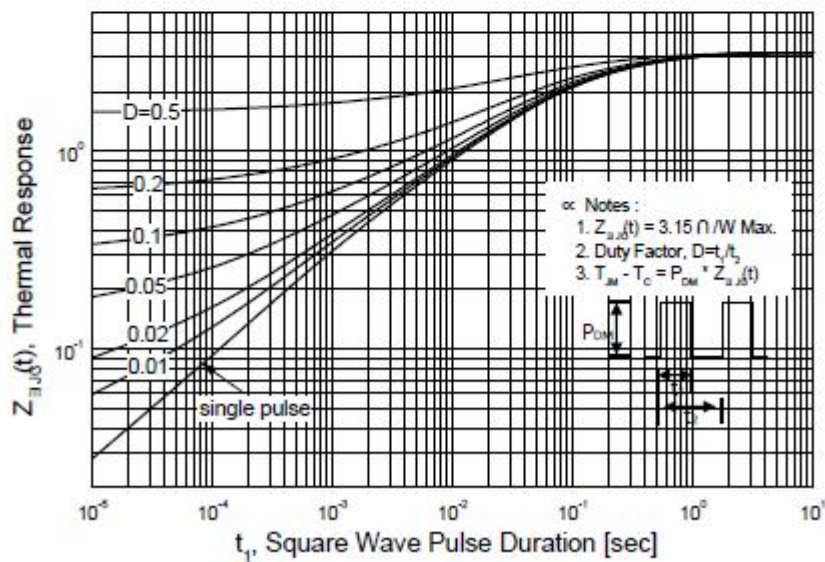


Figure 11-2. Transient Thermal Response Curve for KNF6140S

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