

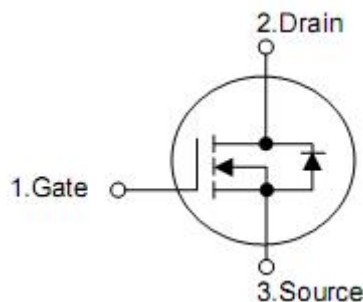
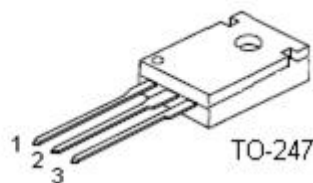
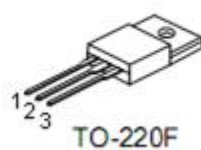
1. Description

This high voltage MOSFET uses an advanced termination scheme to provide enhanced voltage blocking capability without degrading performance over time. In addition, this advanced MOSFET is designed to withstand high energy in avalanche and commutation modes. The new energy efficient design also offers a drain-to-source diode with a fast recovery time. Designed for high voltage, high speed switching applications in power supplies, converters and PWM motor controls, these devices are particularly well suited for bridge circuits where diode speed and commutating safe operating areas are critical and offer additional and safety margin against unexpected voltage transients.

2. Features

- n Robust High Voltage Termination
- n Avalanche Energy Specified
- n Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- n Diode is Characterized for Use in Bridge Circuits
- n I_{DSS} and $V_{DS(ON)}$ Specified at Elevated Temperature
- n Isolated Mounting Hole Reduces Mounting Hardware

3. Pin configuration



Pin	Function
1	Gate
2	Drain
3	Source

4. Ordering Information

Part Number	Package	Brand
KCF3650A	TO-220F	KIA
KCM3650A	TO-247	KIA

5. Absolute maximum ratings

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

Parameter	Symbol	Rating		Units	
		220F	247		
Drain current continuous	I_D^1	60		A	
Drain current pulsed	I_{DM}	180		A	
Gate-to-Source Voltage Continue	V_{GS}	± 20		V	
Single Pulse Drain-to-Source Avalanche Energy $T_J = 25\text{ }^\circ\text{C}$ ($V_{DD} = 100\text{V}$, $V_{GS} = 10\text{V}$, $I_L = 16\text{A}$, $L = 10\text{mH}$, $R_G = 25\Omega$)	E_{AS}	1280		mJ	
Total power dissipation	P_D	$T_C = 25\text{ }^\circ\text{C}$	54	379	W
		derate above $25\text{ }^\circ\text{C}$	0.43	3.03	W/ $^\circ\text{C}$
Operating and storage temperature range	T_J, T_{STG}	-55~+150		$^\circ\text{C}$	
Maximum lead temperature for soldering purposes, 1/8 " from case for 10 seconds	T_L	260		$^\circ\text{C}$	

1. Drain current limited by maximum junction temperature

6. Thermal characteristics

Parameter	Symbol	Rating		Unit
		220F	247	
Thermal resistance, Junction-ambient	R_{thJA}	62.5	40	$^\circ\text{C/W}$
Thermal resistance, Junction-case	R_{thJC}	2.3	0.33	$^\circ\text{C/W}$

7. Electrical characteristics

 (T_C=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =250μA	500	-	-	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =500V, V _{GS} =0V	-	-	1	μA
Gate-Source Leakage Current-Forward	I _{GSSF}	V _{GS} =20V, V _{DS} =0V	-	-	100	nA
Gate-Source Leakage Current-Reverse	I _{GSSR}	V _{GS} =-20V, V _{DS} =0V	-	-	-100	nA
On characteristics						
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2	3	4	V
Static drain-source on-resistance	R _{DS(on)}	V _{GS} =10V, I _D =20A*	-	50	56	mΩ
Gate resistance	R _G	f=1MHz, open drain	-	3.9	-	Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1MHz	-	3180	-	pF
Output capacitance	C _{oss}		-	4400	-	pF
Reverse transfer capacitance	C _{rss}		-	80	-	pF
Switching characteristics						
Turn-on delay time	t _{d(on)}	V _{DD} =250V, I _D =20A, R _G =25Ω*	-	52	-	ns
Rise time	t _r		-	148	-	ns
Turn-off delay time	t _{d(off)}		-	127	-	ns
Fall time	t _f		-	75	-	ns
Total gate charge	Q _g	V _{DS} =400V, I _D =20A, V _{GS} =10V*	-	66	-	nC
Gate-source charge	Q _{gs}		-	24	-	nC
Gate-drain charge	Q _{gd}		-	28	-	nC
Drain-source diode characteristics and maximum ratings						
Drain-source diode forward voltage ¹	V _{SD}	I _S =20A d _{IS} /dt=100A/μs	-	-	1.5	V
Forward turn-On Time	t _{ON}		-	**	-	ns
Reverse recovery charge	t _{rr}		-	992	-	ns

Note:*. Pulse test: pulse width≤300μs, duty cycle≤2%

**. Negligible, Dominated by circuit inductance

8. Test circuits and waveforms

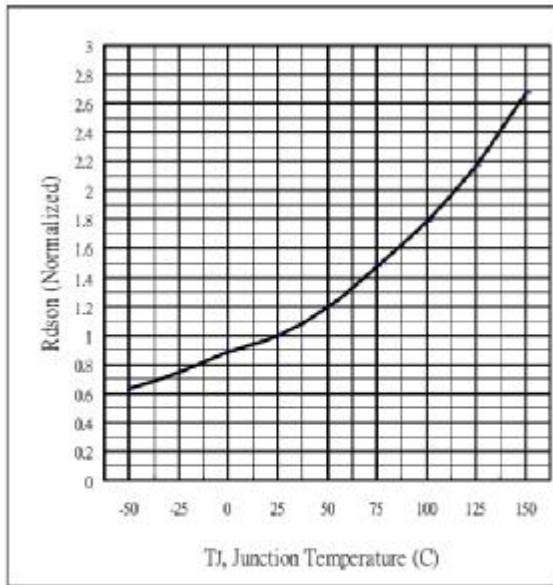


Fig 1. On-Resistance Variation with vs. Temperature

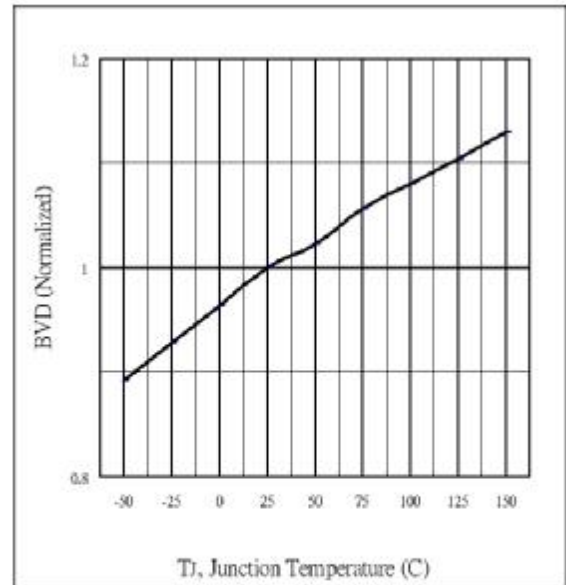


Fig.2 Breakdown Voltage Variation vs. Temperature

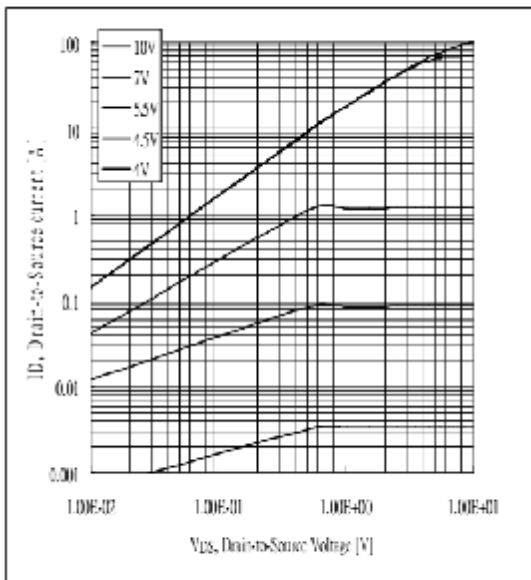


Fig 3. Typical Output Characteristics

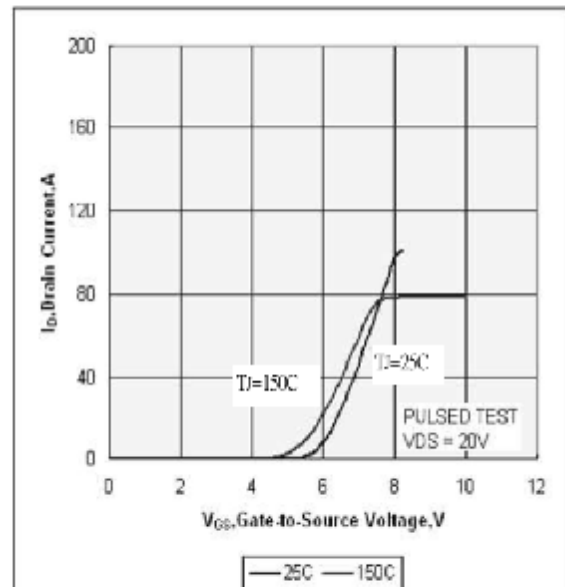


Fig 4. Typical Transfer Characteristics

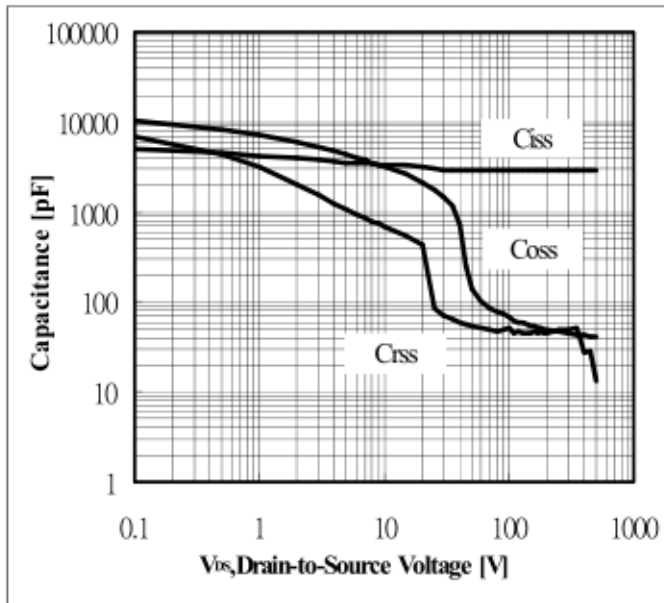


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

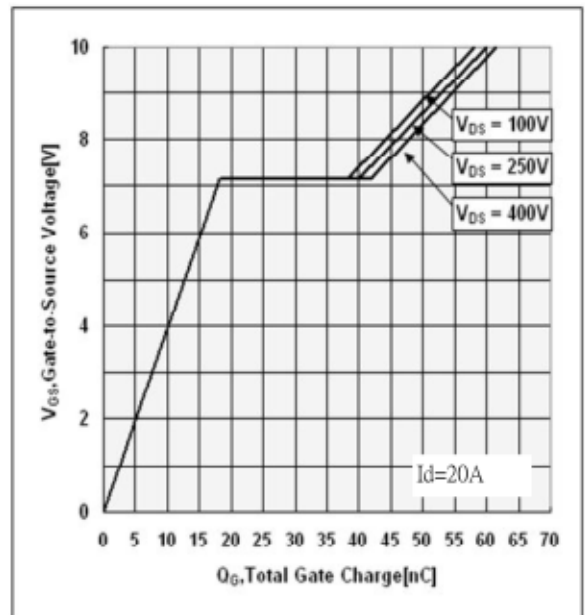


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

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