1.Description

The KIA50N06 is three-terminal silicon device with current conduction capability of about 50A, fast switching speed. Low on-state resistance, breakdown voltage rating of 60V, and max threshold voltages of 4 volt. It is mainly suitable electronic ballast, and low power switching

2. Features

$R_{DS(ON)}$=23mΩ@V_{GS}=10V.

Ultra low gate charge (typical 30nC)

Low reverse transfer capacitance

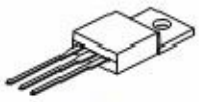
Fast switching capability

100％ avalanche energy specified

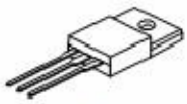
Improved dv/dt capability

3. Pin configuration

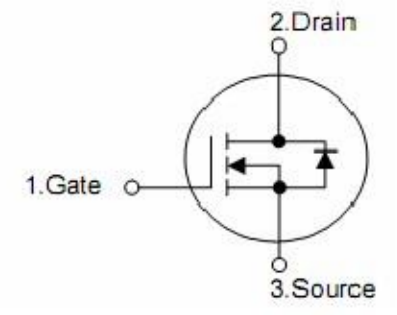
TO-252



TO-220



TO-220F



Pin	Function
1	Gate
2	Drain
3	Source

6. Absolute maximum ratings

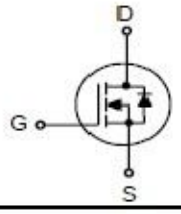
Parameter	Symbol	Value	Unit
Drain to source voltage	V_{DSS}	60	V
Gate to source voltage	V_{GSS}	±20	V
Continuous drain current T_J=25 °C	I_D	50	A
Continuous drain current T_J=100 °C	I_D	35	A
Drain current pulsed (note1)	I_{DM}	200	A
Single pulsed avalanche energy (note2)	E_{AS}	480	mJ
Repetitive avalanche energy (note1)	E_{AR}	13	mJ
Peak diode recovery dv/dt (note3)	dv/dt	7	V/ns
Total power dissipation(T_J=25 °C)	P_D	130	W
Derating factor above 25 °C	P_D	0.9	W/ °C
Operating junction temperature	T_J	-55 ~ +150	°C
Storage temperature	T_{STG}	-55 ~ +150	°C
Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.			
Absolute maximum ratings are stress ratings only and functional device operation is not implied.			

3. Thermal resistance

Parameter	Symbol	Typ	Max	Units
Thermal resistance, junction-to-case	θ_{JC}		1.15	°C/W
Thermal resistance,case-to-sink	θ_{CS}			°C/W
Thermal resistance,junction-to-ambient	θ_{JA}	0.5		°C/W
			62.5	

7. Electrical characteristics

(T_J=25°C,unless otherwise notes)

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage Breakdown voltage temperature coefficient	BV_{DSS}	V_{GS}=0V,I_D=250μA	60			V
	$\Delta BV_{DSS}/\Delta T_J$	I_D=250μA, referenced to 25 ºC		0.07		V/ºC
Drain-source leakage current	I_{DSS}	V_{DS}=60V,V_{GS}=0V			1	μA
		V_{DS}=48V,T_C=125 ºC			1	μA
Gate-source leakage current	I_{GSS}	V_{GS}=20V,V_{DS}=0V			100	nA
		V_{GS}=-20V,V_{DS}=0V			-100	nA
Gate-source leakage Reverse						
On characteristics						
Gate threshold voltage $V_{GS(TH)}$		V_{DS}=V_{GS}, I_D=250μA	2.0		4.0	V
Static drain-source on-state resistance	$R_{DS(ON)}$	V_{GS}=10V,I_D=25A		18	23	mΩ
Dynamic characteristics						
Input capacitance C_{ISS}		V_{DS}=25V,V_{GS}=0V,f=1MHz		900	1220	pF
Output capacitance C_{OSS}				430	550	pF
Reverse transfer capacitance C_{RSS}				80	100	pF
Switching characteristics						
Turn-on delay time $t_{D(ON)}$		V_{DD}=30V,I_D=25A,R_G=50Ω (note4,5)		40	60	ns
Rise time t_R				100	200	ns
Turn-off delay time $t_{D(OFF)}$				90	180	ns
Fall time t_F				80	160	ns
Total gate charge Q_G		V_{DS}=48V,V_{GS}=10V,I_D=50A (note4,5)		30	40	nC
Gate-source charge Q_{GS}				9.6		nC
Gate-drain charge (miller charge) Q_{GD}				10		nC
Source-drain diode ratings and characteristics						
Diode forward voltage V_{SD}		V_{GS}=0V,I_S=50A			1.5	V
Continuous source current	I_S	Integral reverse p-n junction diode in the MOSFET			50	A
Pulsed source current	I_{SM}				200	A
Reverse recovery time t_{RR}	V_{GS}=0V,I_S=50A			54		ns
dI_F/dt=100A/μs(note4) Reverse recovery charge Q_{RR}				81		μC

Note:1. repetitive rating:pulse width limited by junction temperature
2.L=5.6mH,I_{AS}=50A,V_{DD}=25V,R_G=0Ω,staring T_J=25ºC
3.I_{SD}<50A,di/dt<300A/μs,V_{DD}<BV_{DSS},staring T_J=25 ºC
4.Pulse test:pulse width<300μs,duty cycle<2%
5.Essentially independent of operating temperature

8.Test circuits and waveforms

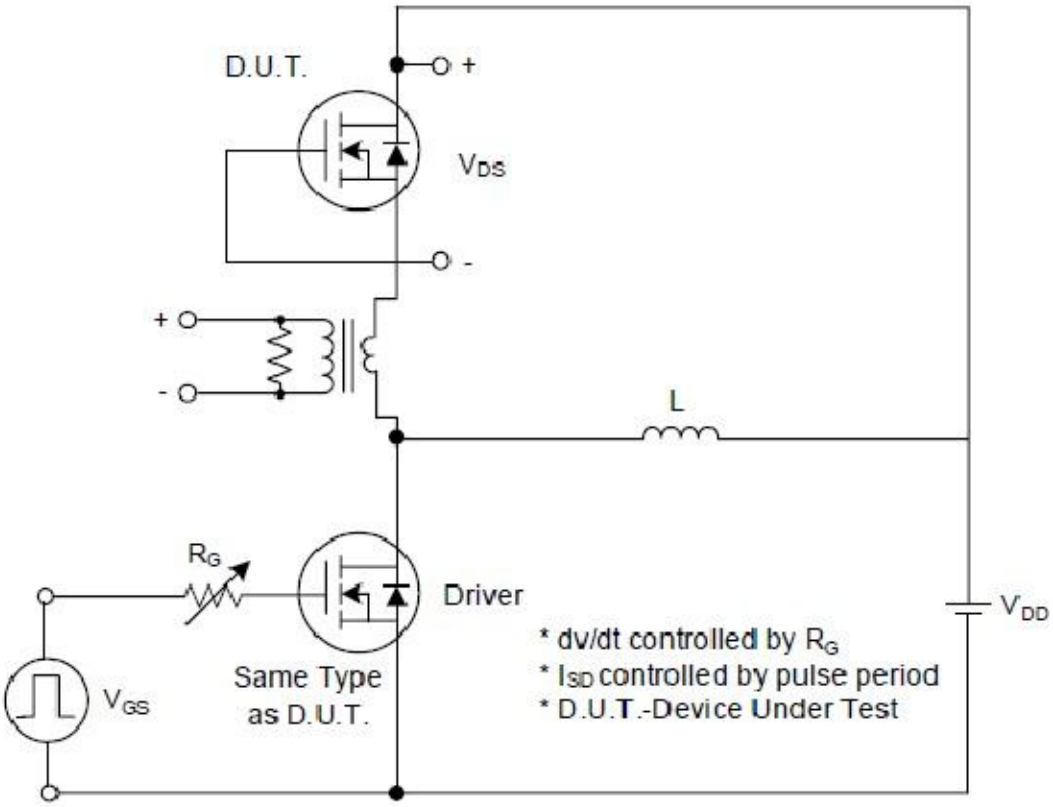


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

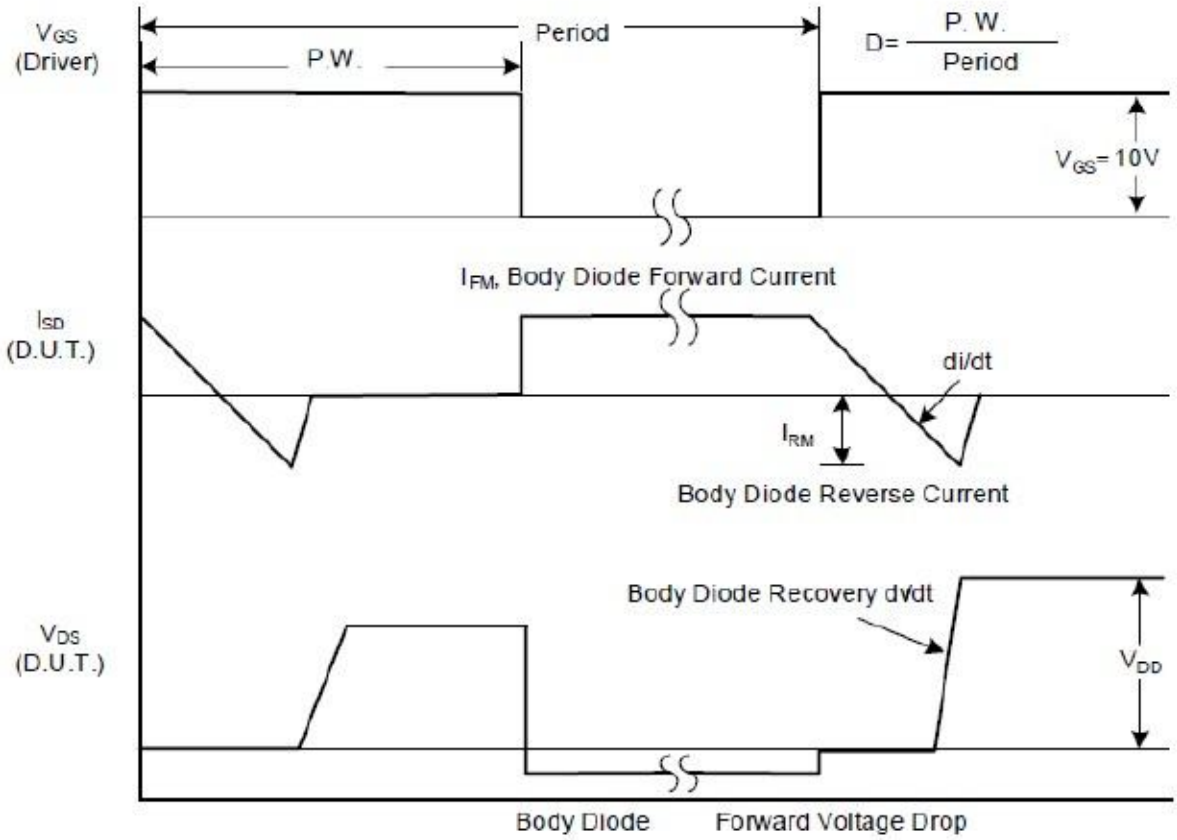


Fig. 1B Peak Diode Recovery dv/dt Waveforms

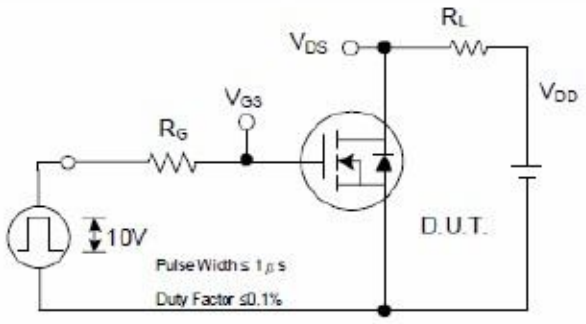


Fig. 2A Switching Test Circuit

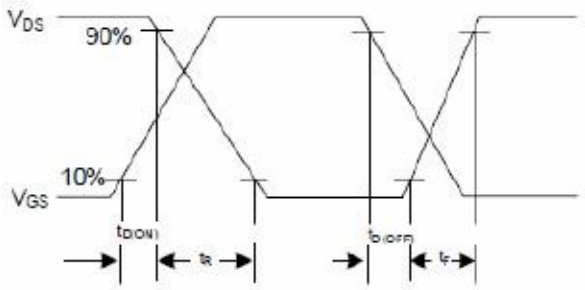


Fig. 2B Switching Waveforms

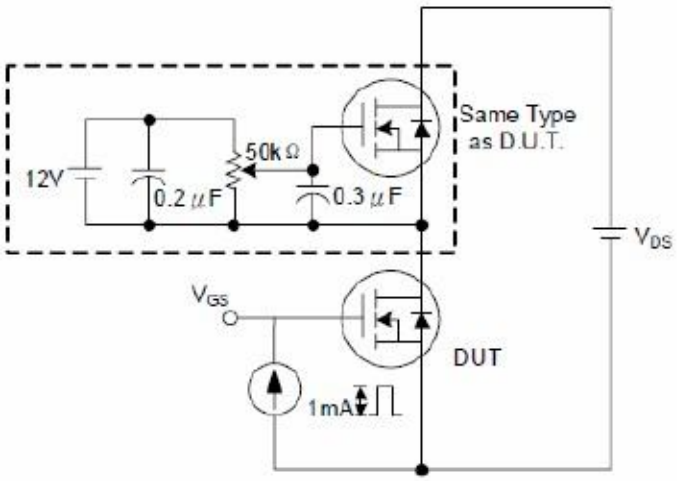


Fig. 3A Gate Charge Test Circuit

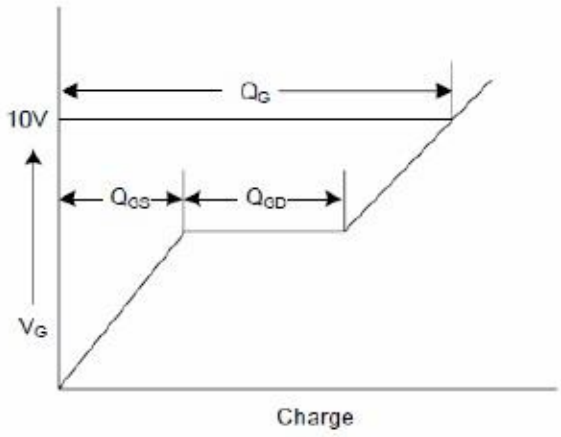


Fig. 3B Gate Charge Waveform

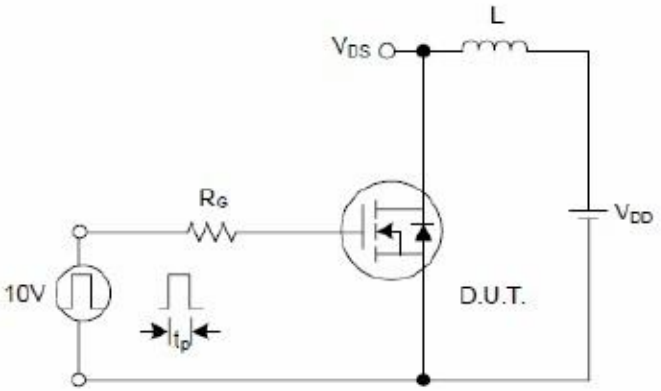


Fig. 4A Unclamped Inductive Switching Test Circuit

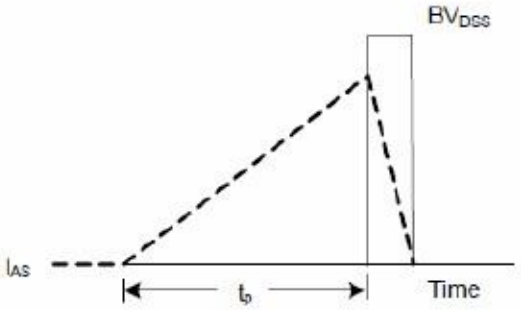
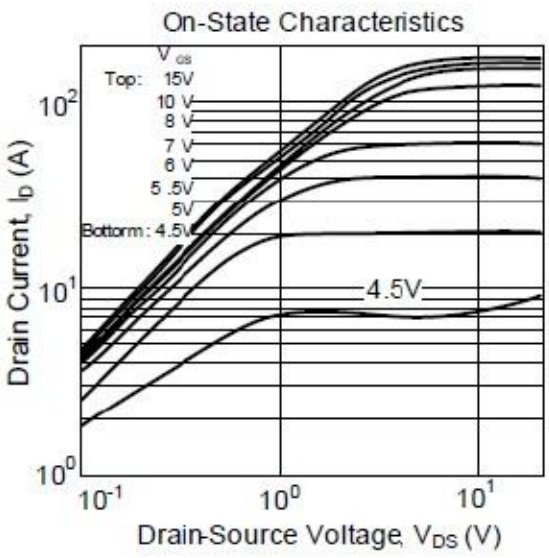
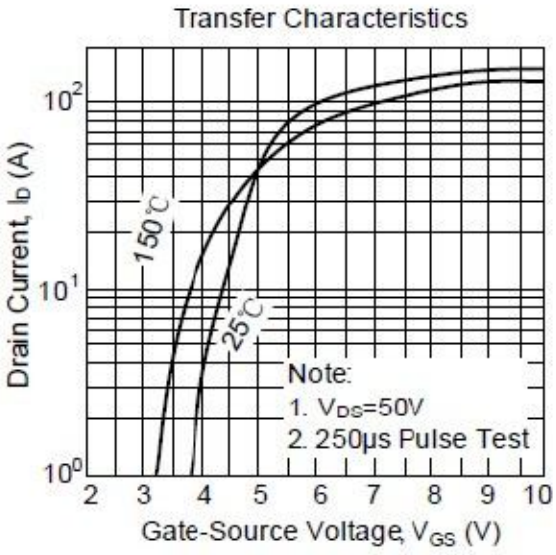
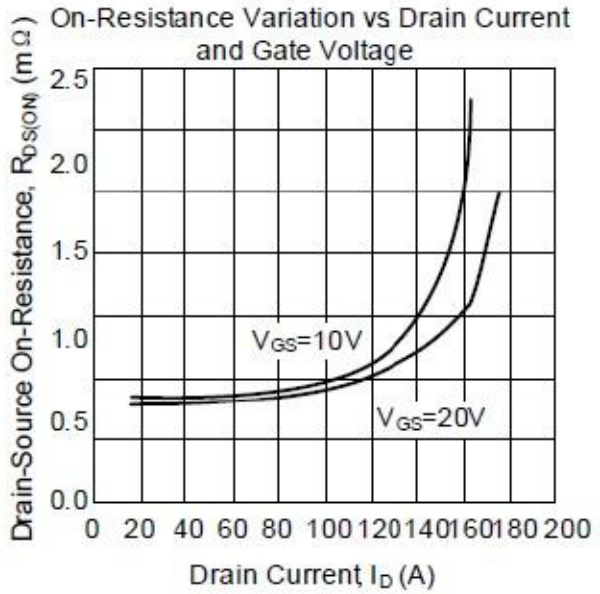


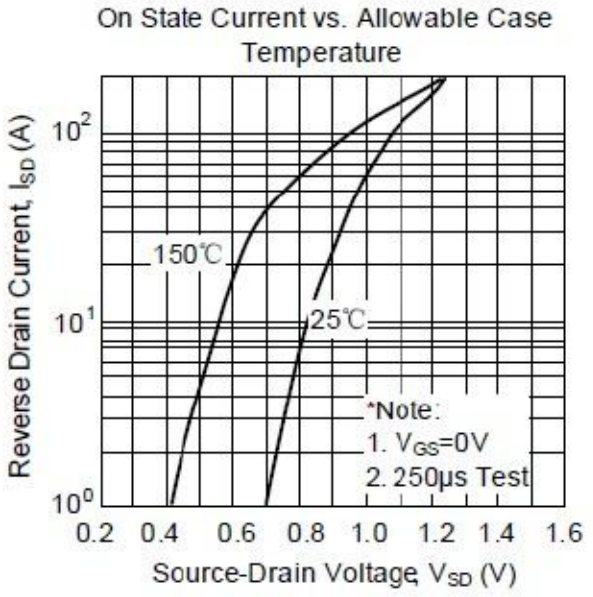
Fig. 4B Unclamped Inductive Switching Waveforms

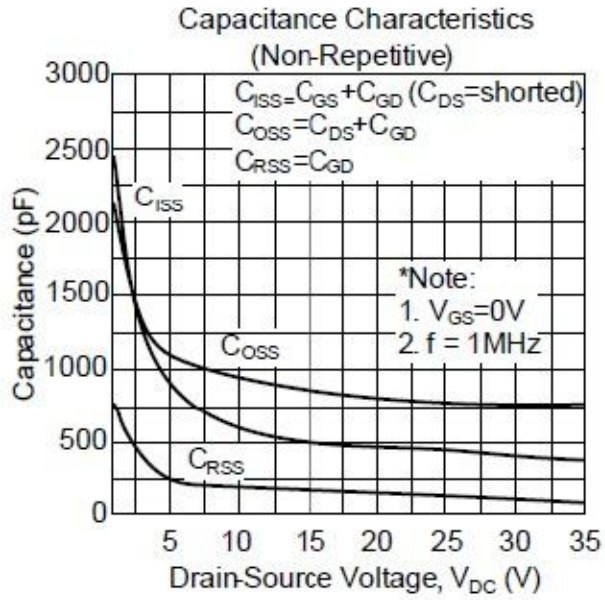
9.Typical characteristics

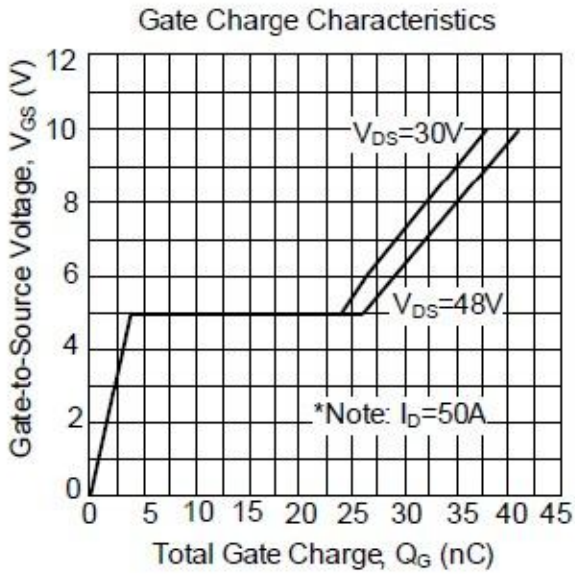


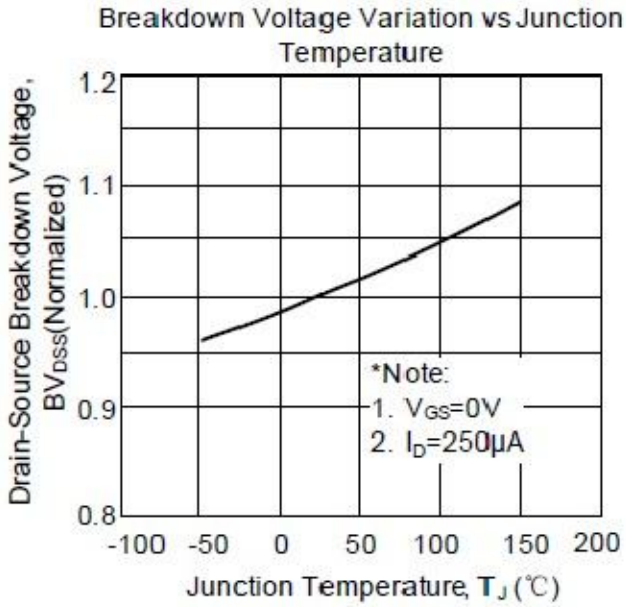


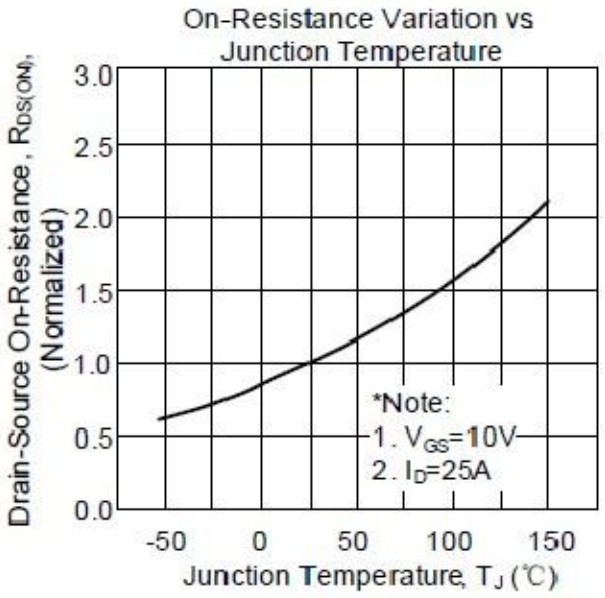




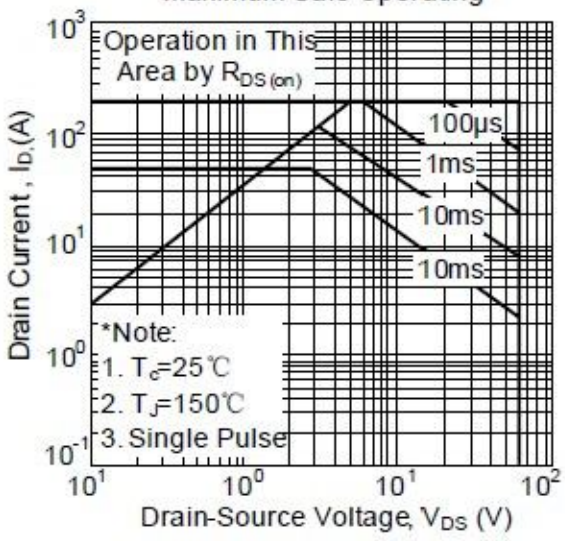

Capacitance Characteristics
(Non-Repetitive)
$C_{ISS}=C_{GS}+C_{GD}$ (C_{DS}=shorted)
$C_{OSS}=C_{DS}+C_{GD}$
$C_{RSS}=C_{GD}$
C_{ISS}
C_{OSS}
C_{RSS}
*Note:
1. V_{GS}=0V
2. f = 1MHz
Capacitance (pF)
3000
2500
2000
1500
1000
500
0
5 10 15 20 25 30 35
Drain-Source Voltage, V_{DC} (V)


Gate Charge Characteristics
V_{DS}=30V
V_{DS}=48V
*Note: I_D=50A
Gate-to-Source Voltage, V_{GS} (V)
12
10
8
6
4
2
0
0 5 10 15 20 25 30 35 40 45
Total Gate Charge, Q_G (nC)

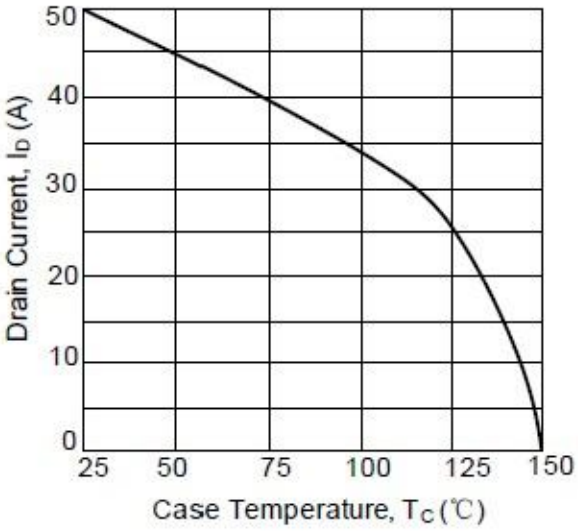

Breakdown Voltage Variation vs Junction Temperature
*Note:
1. V_{GS}=0V
2. I_D=250μA
Drain-Source Breakdown Voltage, BV_{DSS}(Normalized)
1.2
1.1
1.0
0.9
0.8
-100 -50 0 50 100 150 200
Junction Temperature, T_J (℃)


On-Resistance Variation vs Junction Temperature
*Note:
1. V_{GS}=10V
2. I_D=25A
Drain-Source On-Resistance, $R_{DS(ON)}$, (Normalized)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-50 0 50 100 150
Junction Temperature, T_J (℃)

Maximum Safe Operating



Maximum Drain Current vs. Case Temperature



Transient Thermal Response Curve