

N-Ch Super Junction MOSFET

KP190N60FWM3ZA

This Super Junction MOSFET has better characteristics, such as fast switching time, low on resistance, low gate charge, low EMI characteristics and excellent avalanche characteristics. It is mainly suitable for power factor correction and switching mode power supplies.

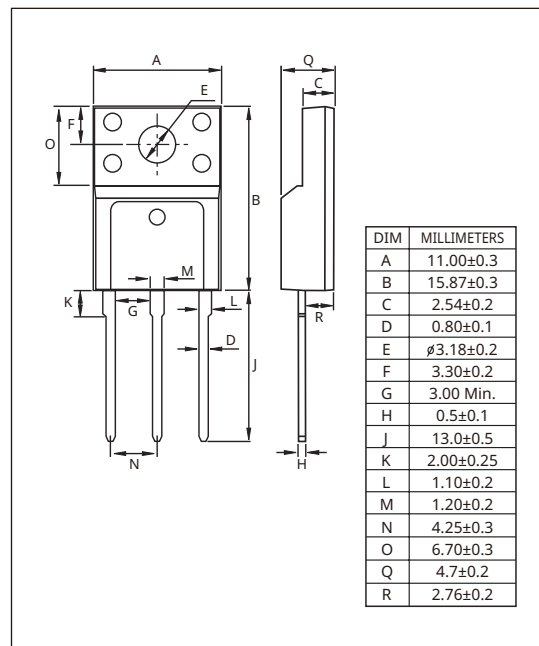
FEATURES

- $V_{DSS}=600V$, $I_D=20A$
- Drain-Source ON Resistance:
 $R_{DS(ON)}(MAX)=190m\Omega$ @ $V_{GS}=10V$
- $Q_g(typ.)=33nC$ @ $V_{GS}=10V$
- Excellent ESD robustness > 2kV(HBM)

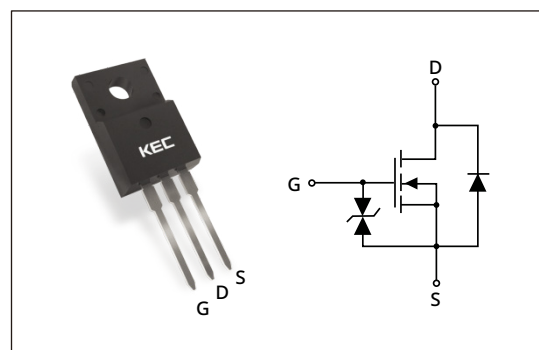
APPLICATION

- PFC Stages
- Resonant switching stages
- Fly Back converters
- Power of PC, TV, Lighting, Adapter, Server and Telecom

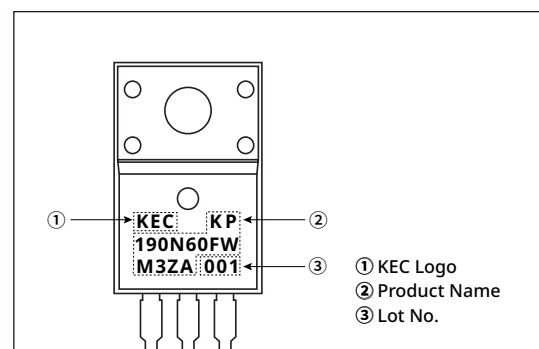
PACKAGE DIMENSION(TO-220ISW)



PIN CONFIGURATION



MARKING CODE



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N-Ch Super Junction MOSFET - KP190N60FWM3ZA

MAXIMUM RATING (T_J=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V _{DSS}	600	V
Gate-Source Voltage		V _{GSS}	±25	V
Drain Current	@T _C =25°C	I _D	20*	A
	@T _C =100°C	I _D	12.6*	
	Pulsed (Note 1)	I _{DP}	60*	
Single Pulsed Avalanche Energy (Note 2)		E _{AS}	476	mJ
Repetitive Avalanche Energy (Note 1)		E _{AR}	7.3	mJ
Peak MOSFET dv/dt		dv/dt	50	V/ns
Peak Diode Recovery dv/dt (Note 3)		dv/dt	15	V/ns
Drain Power Dissipation	T _C =25°C	P _D	59.5	W
	T _A =25°C		2	W
Maximum Junction Temperature		T _J	150	°C
Operation and Storage Temperature Range		T _{opr} , T _{stg}	-55 ~ 150	°C
Thermal Characteristics				
Thermal Resistance, Junction-to-Case		R _{thJC}	2.1	°C/W
Thermal Resistance, Junction-to-Ambient		R _{thJA}	62.5	°C/W

* : Drain current limited by maximum junction temperature

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ELECTRICAL CHARACTERISTICS (T_J=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	BV _{DSS}	I _D =250μA, V _{GS} =0V	600	-	-	V
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D =1mA, Referenced to 25°C	-	0.7	-	V/°C
Drain Cut-off Current	I _{DSS}	V _{DS} =600V, V _{GS} =0V	-	-	1	μA
Gate Threshold Voltage	V _{th}	V _{DS} =V _{GS} , I _D =250μA	2	3	4	V
Gate Leakage Current	I _{GSS}	V _{GS} =±25V, V _{DS} =0V	-	-	±10	μA
Drain-Source ON Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =10A	-	165	190	mΩ
Dynamic						
Total Gate Charge	Q _g	V _{DD} =400V, I _D =10A V _{GS} =10V (Note 4)	-	33.9	-	nC
Gate-Source Charge	Q _{gs}		-	7.2	-	
Gate-Drain Charge	Q _{gd}		-	12	-	
Turn-on Delay time	t _{d(on)}	V _{DD} =400V, V _{GS} =10V R _G =25Ω, I _D =10A (Note 4)	-	45	-	ns
Turn-on Rise time	t _r		-	28	-	
Turn-off Delay time	t _{d(off)}		-	173	-	
Turn-off Fall time	t _f		-	27	-	
Input Capacitance	C _{iss}	V _{DS} =400V, V _{GS} =0V, f=1MHz	-	1440	-	pF
Output Capacitance	C _{oss}		-	37	-	
Reverse Transfer Capacitance	C _{rss}	V _{DS} =400V, V _{GS} =0V, f=250MHz	-	2	-	
Effective output capacitance, energy related	C _{o(er)}	V _{GS} =0V, V _{DS} =0...400V (Note 5)	-	67	-	
Effective output capacitance, time related	C _{o(tr)}	V _{GS} =0V, V _{DS} =0...400V (Note 6)	-	335	-	
Gate Resistance(Target)	R _G	V _{GS} =0V, f=1MHz	-	19	-	Ω
Source-Drain Diode Ratings						
Continuous Source Current	I _S	V _{GS} <V _{th} , T _C =25°C	-	-	20	A
Pulsed Source Current	I _{SP}		-	-	60	
Diode Forward Voltage	V _{SD}	I _S =10A, V _{GS} =0V	-	-	1.4	V
Reverse Recovery Time	t _{rr}	I _S =10A, V _{GS} =0V, V _{DD} =400V dI _S /dt=100A/μs	-	290	-	ns
Reverse Recovery Charge	Q _{rr}		-	3.7	-	μC
Reverse Recovery Current	I _{rrm}		-	25	-	A

Note 1) Repetivity rating: Pulse width limited by junction temperature.

Note 2) L=35.6mH, I_D=5A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C.

Note 3) I_S ≤ I_D, di/dt ≤ 100A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J=25°C.

Note 4) Essentially independent of operating temperature.

Note 5) C_{o(er)} is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 400V.

Note 6) C_{o(tr)} is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 400V.

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Fig 1. $I_D - V_{DS}$ - 1

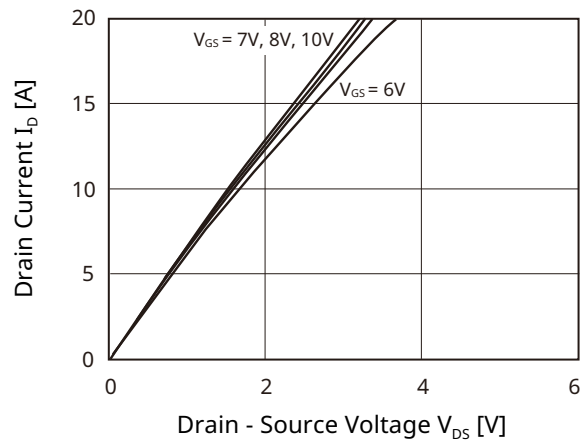


Fig 2. $I_D - V_{DS}$ - 2

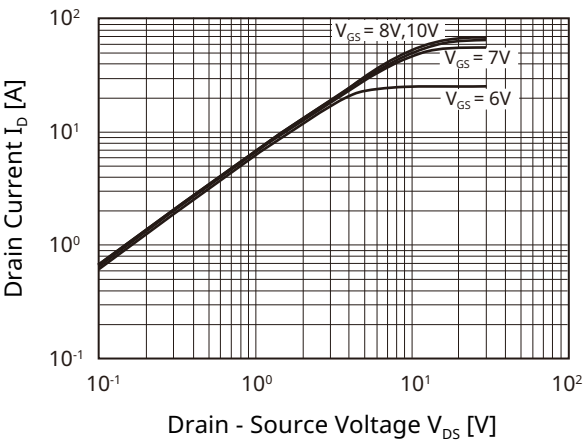


Fig 3. $I_D - V_{GS}$

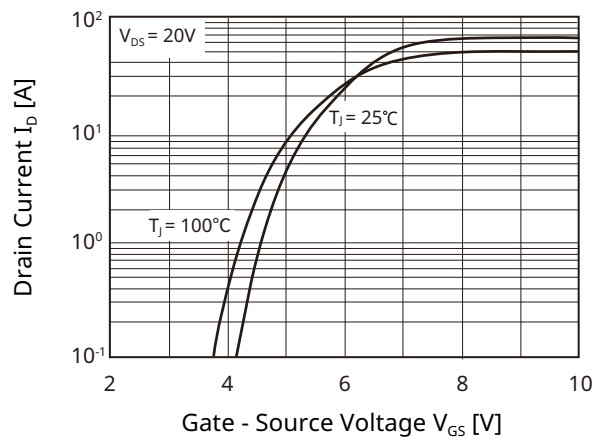


Fig 4. $R_{DS(ON)} - I_D$

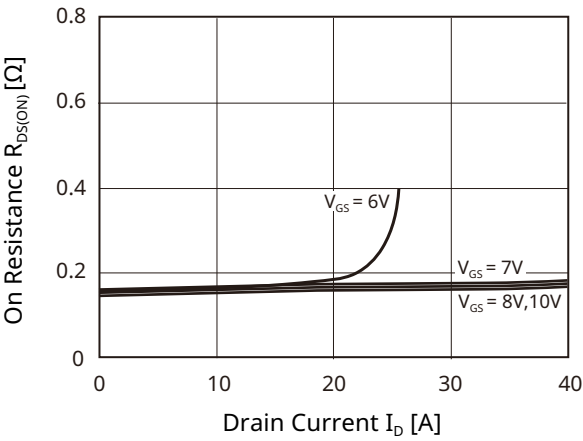


Fig 5. $R_{DS(ON)} - V_{GS}$

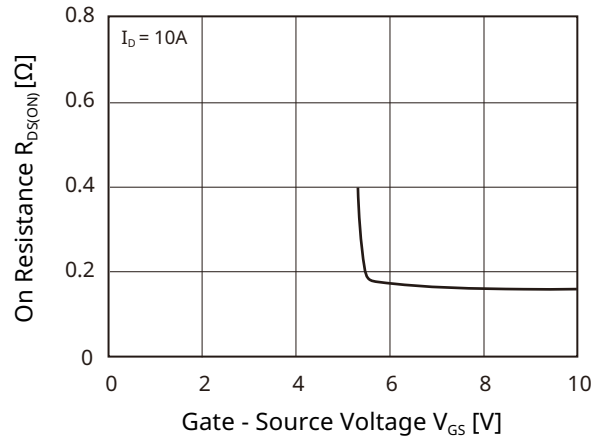
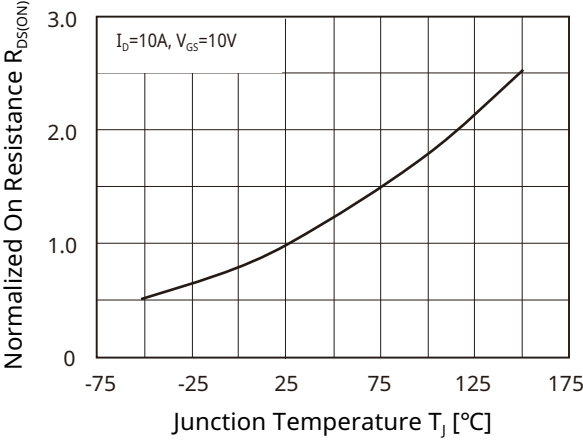


Fig 6. $R_{DS(ON)} - T_J$



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Fig 7. $BV_{DSS} - T_J$

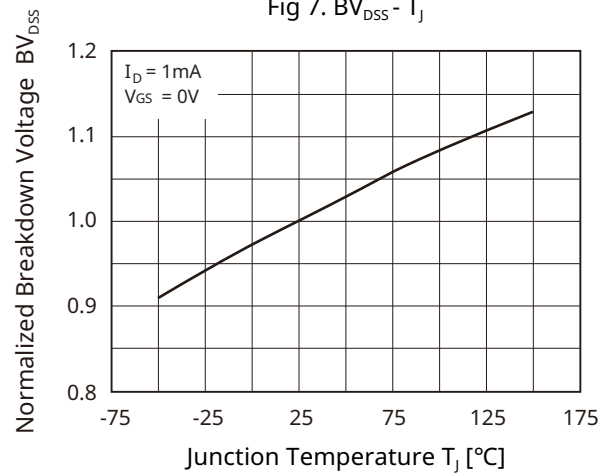


Fig 8. $V_{th} - T_J$

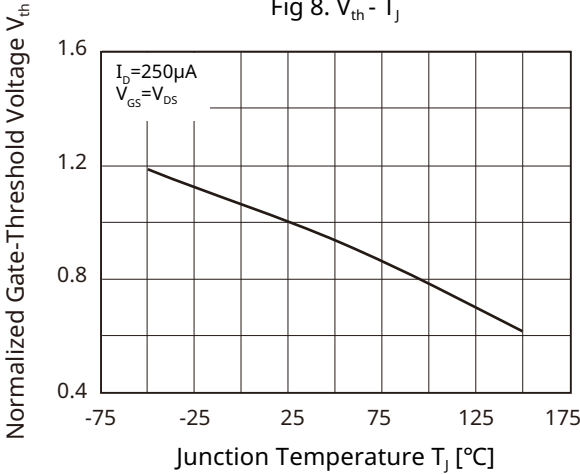


Fig 9. $I_S - V_{SD}$

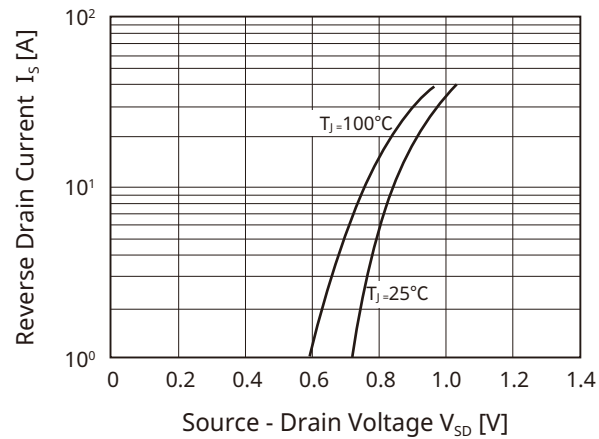


Fig 10. Capacitance V_{DS}

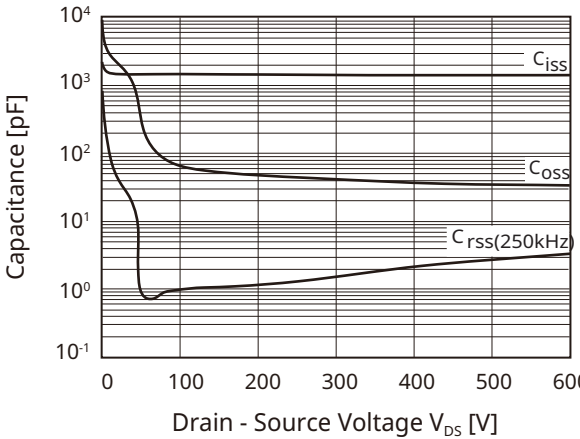


Fig 11. $E_{OSS} - V_{DS}$

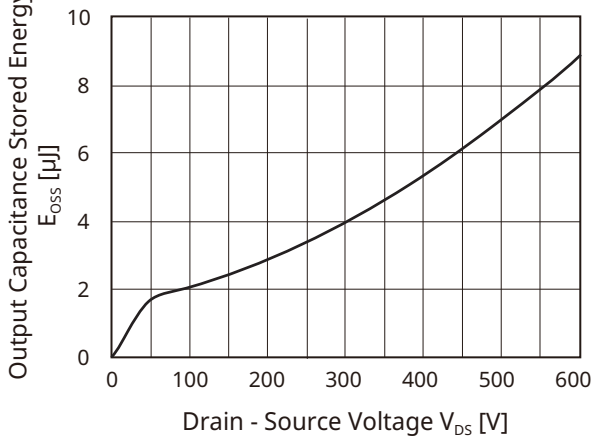
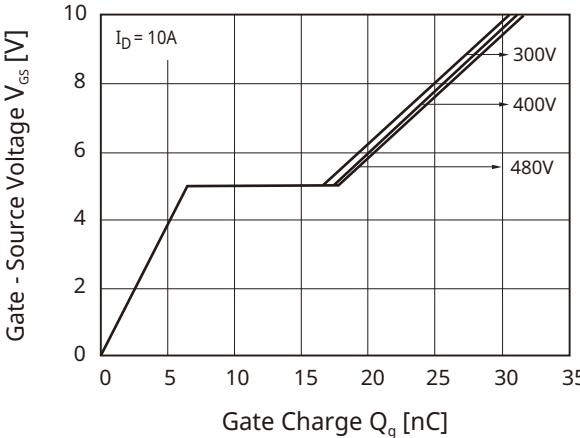


Fig 12. $Q_g - V_{GS}$



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Fig 13. Ptot - T_C

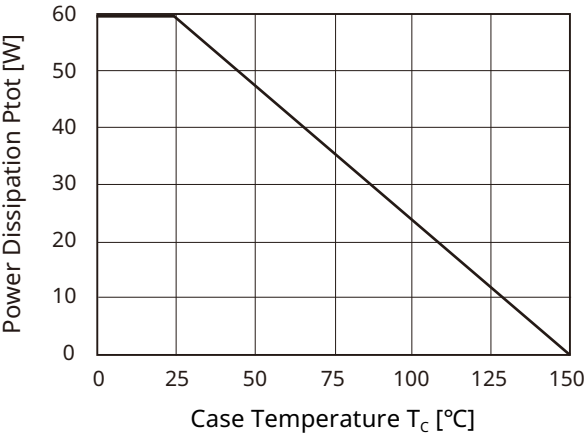


Fig 14. Switching Time - I_D

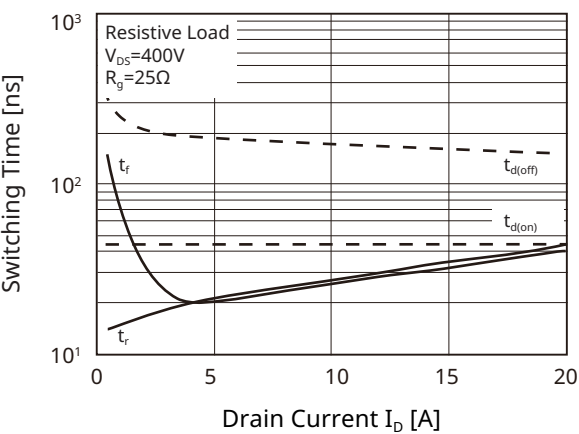


Fig 15. Switching Loss - I_D

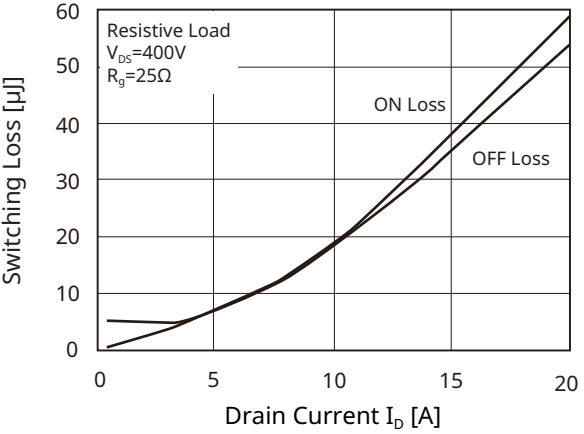


Fig 16. Switching Time - R_g

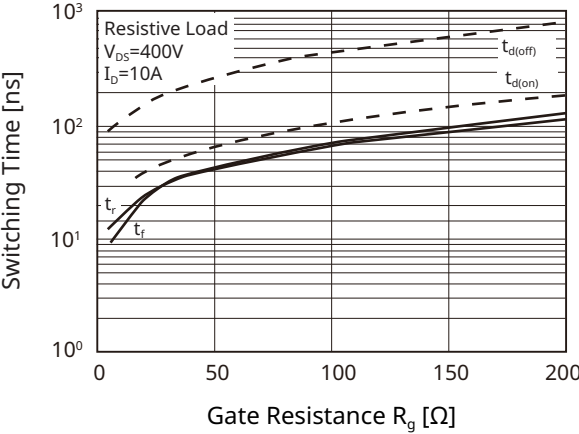


Fig 17. Switching Loss - R_g

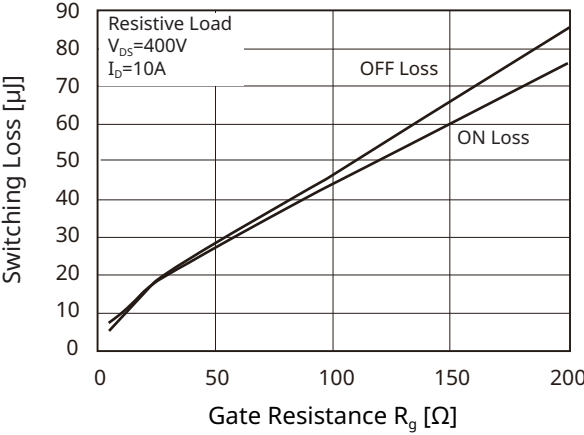
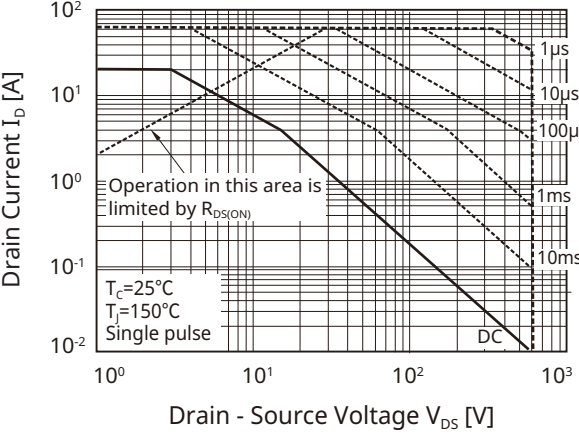


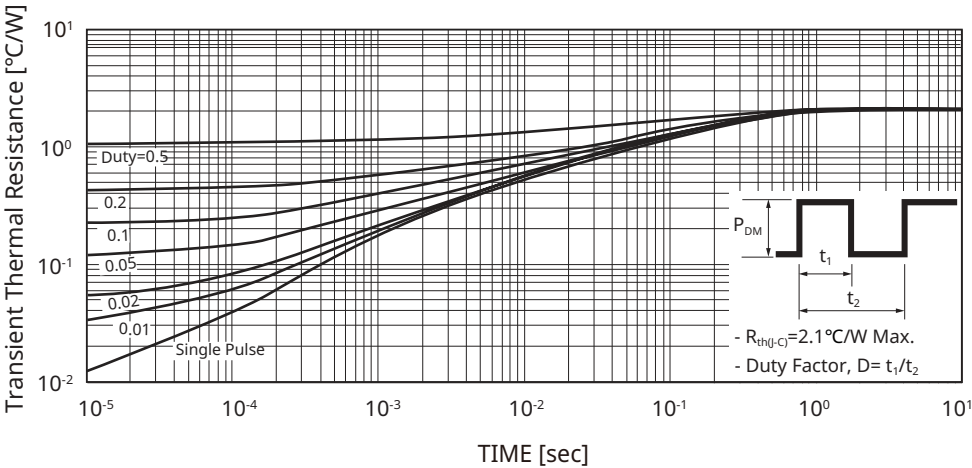
Fig 18. Safe Operation Area



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Fig 19. Transient Rth Curve (J-C)



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Fig 20. Gate Charge

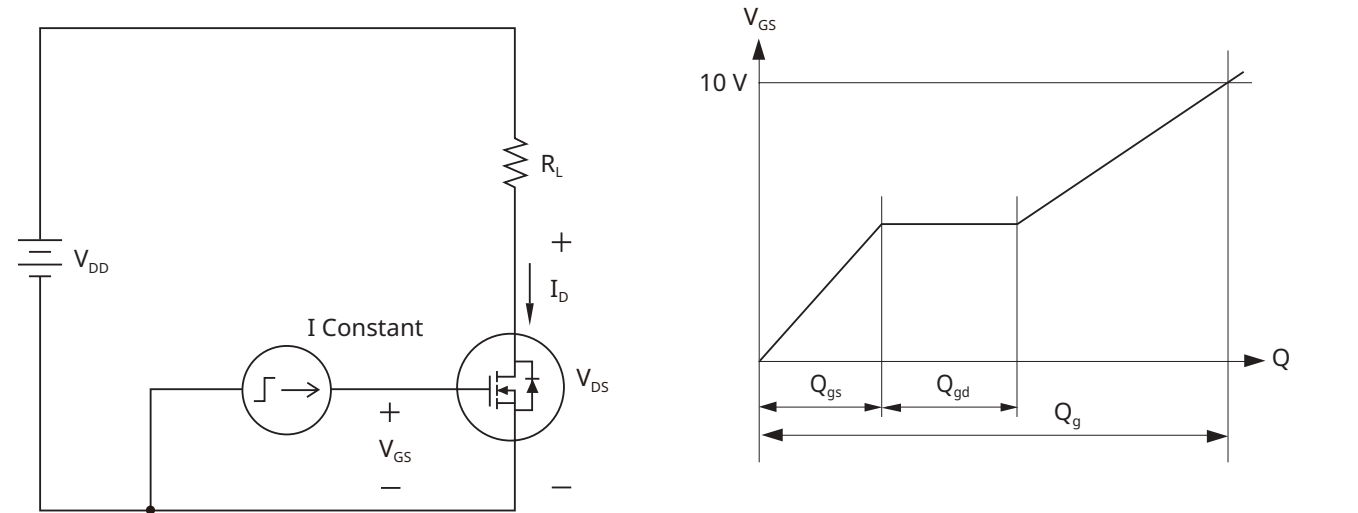


Fig 21. Single Pulsed Avalanche Energy

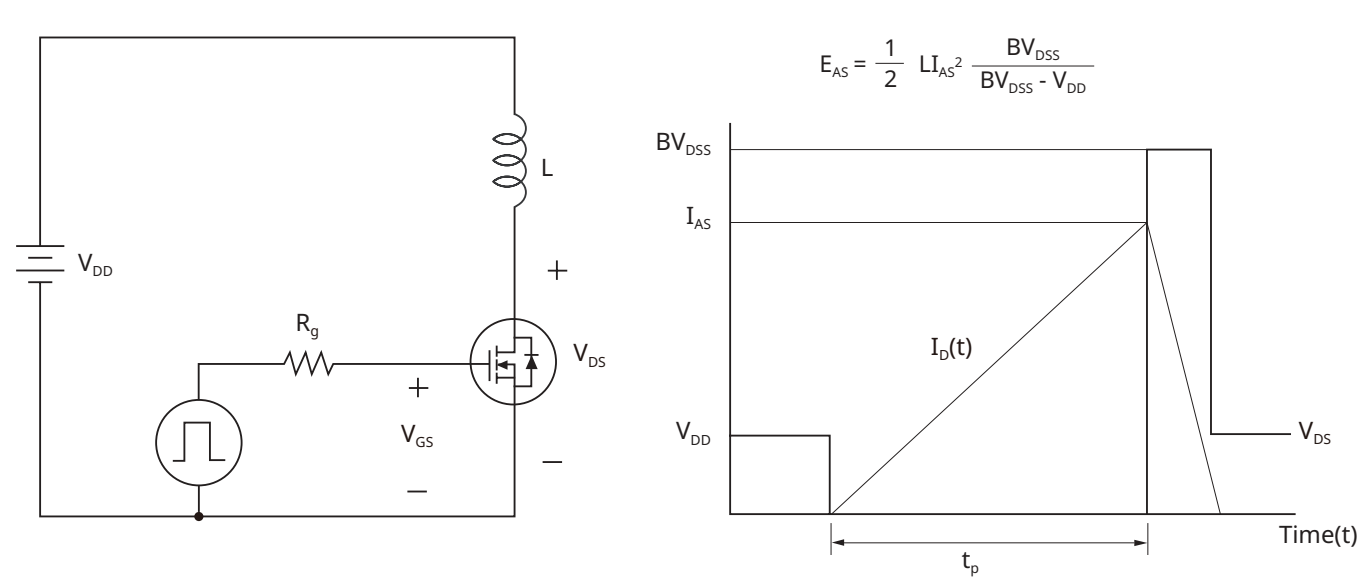
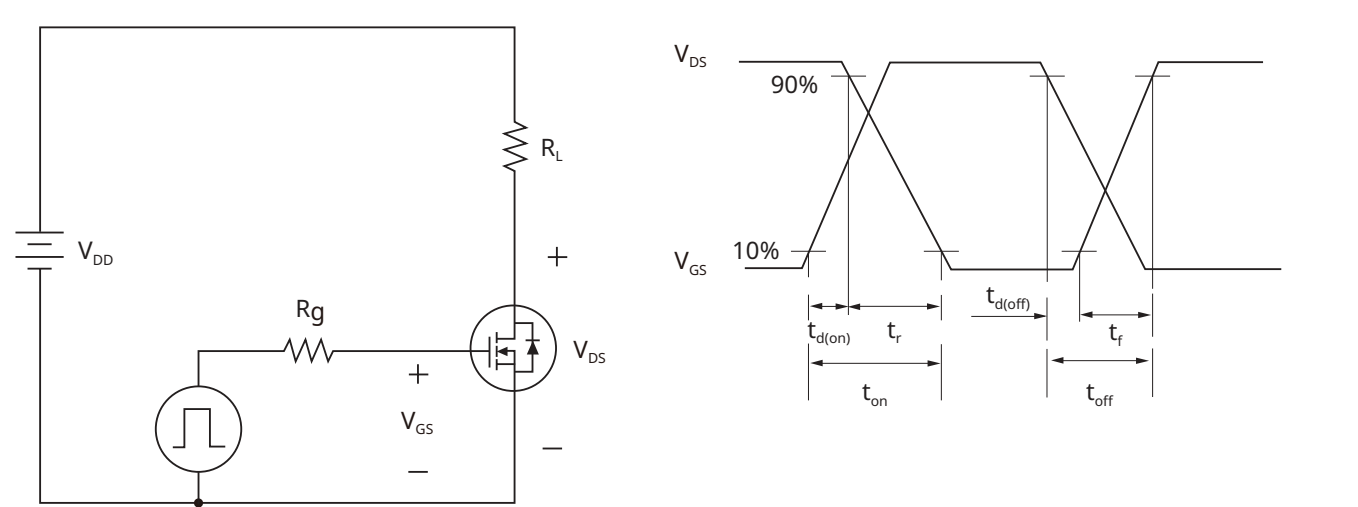


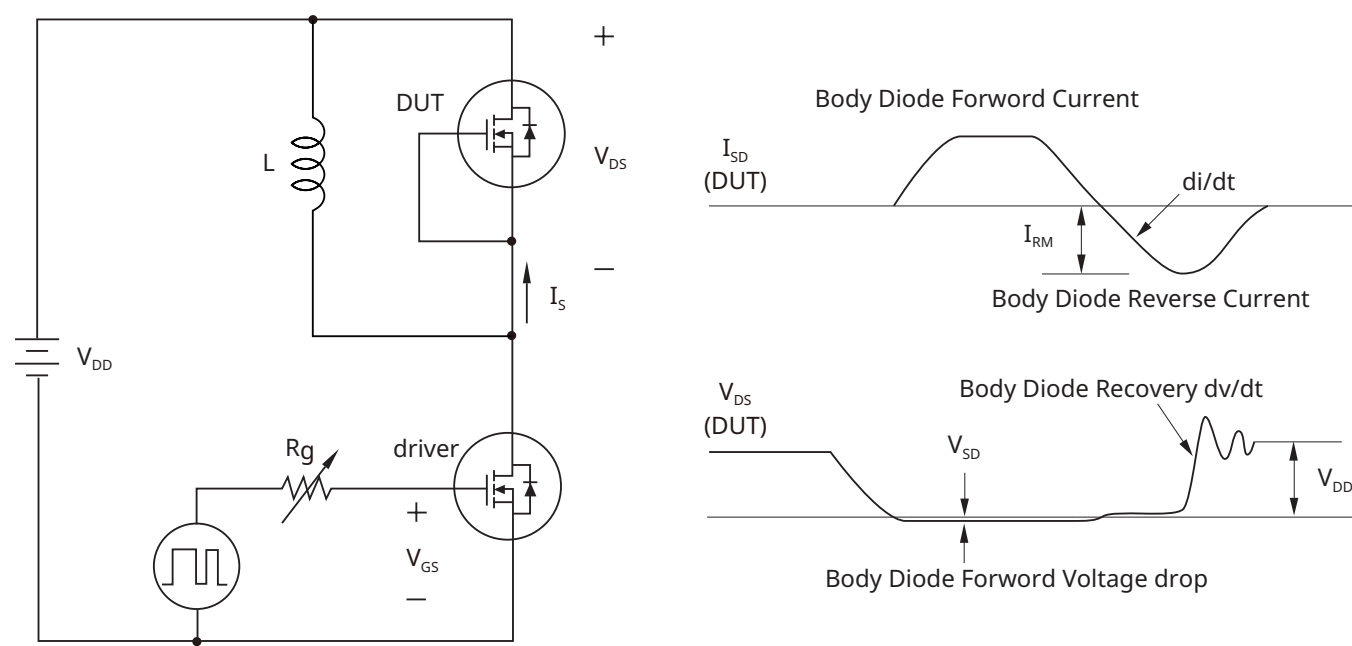
Fig 22. Resistive Load Switching



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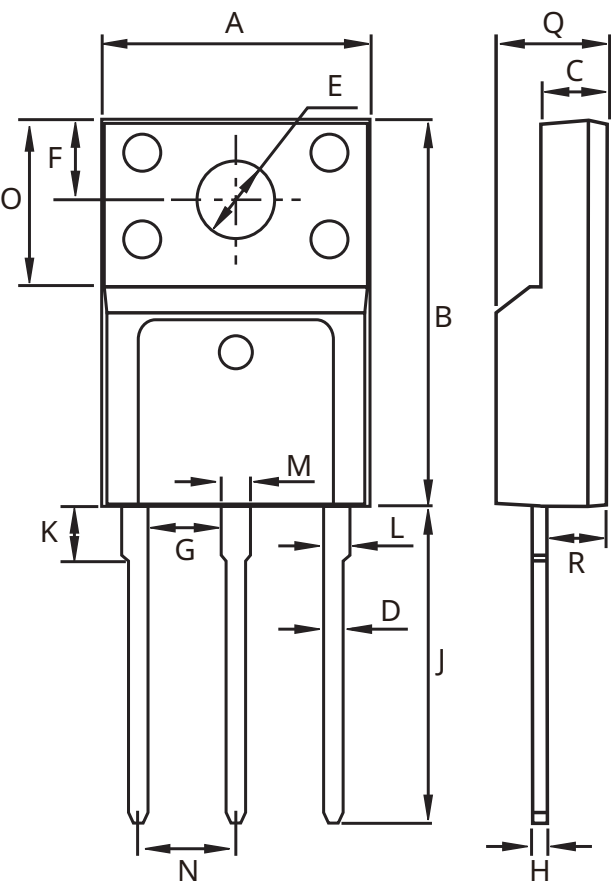
Fig 23. Source - Drain Diode Reverse Recovery and dv/dt



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PACKAGE INFORMATION(TO-220ISW)



DIM	MILLIMETERS
A	11.00±0.3
B	15.87±0.3
C	2.54±0.2
D	0.80±0.1
E	ø3.18±0.2
F	3.30±0.2
G	3.00 Min.
H	0.5±0.1
J	13.0±0.5
K	2.00±0.25
L	1.10±0.2
M	1.20±0.2
N	4.25±0.3
O	6.70±0.3
Q	4.7±0.2
R	2.76±0.2

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ORDERING INFORMATION

Part Number	Status	Compliance			Packing Type	Packing Qty
		AEC-Q	Pb-Free	Halogen Free		
KP190N60FWM3ZA-U/H	Active	-	Y	Y	Tube	45pcs

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1. The products described in this data are intended to be used in general-purpose electronic equipment. (Office equipment, telecommunication equipment, measuring equipment, home appliances)
2. When you intend to use these products with equipment or device which require an extremely high of reliability and special applications (such as automobile, air travel aerospace, transportation equipment, life support, system and safety devices) in which special quality and reliability and the failure or malfunction of products may directly jeopardize or harm the human body or damage to property and any application other than the standard application intended, please be sure to consult with our sales representative in advance.
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5. What are described in the data may be changed without any prior notice to reflect new technical development. Please confirm that you have received the latest product standards or specification before final design, purchase or use.
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