

N-Ch Super Junction MOSFET

KP190N65FM3

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 active power factor correction and mode power supplies.

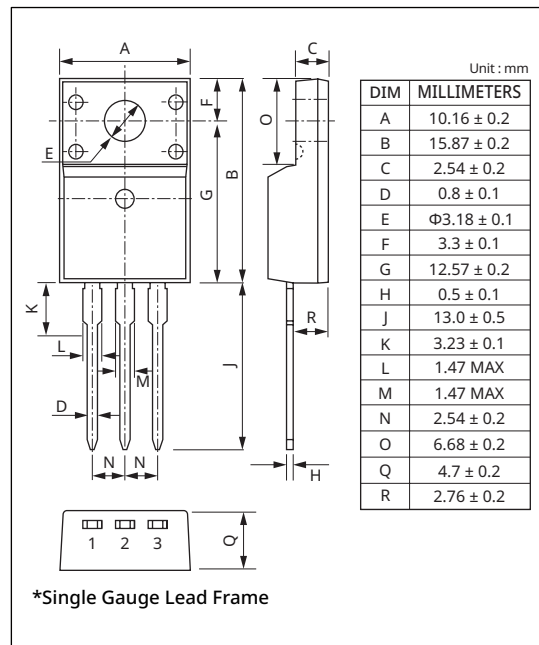
FEATURES

- $V_{DS} = 650V$, $I_D = 20A$
- Drain-Source ON Resistance:
 $R_{DS(ON)}(MAX) = 190m\Omega @ V_{GS} = 10V$
- $Q_g(typ.) = 35nC @ V_{GS} = 10V$

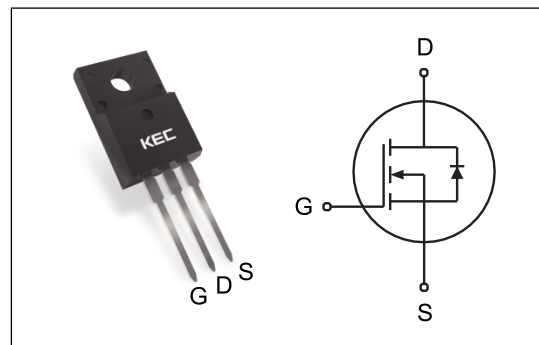
APPLICATION

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

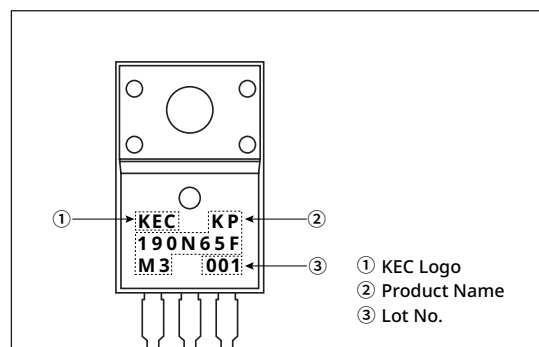
PACKAGE DIMENSION(TO-220IS(1))



PIN CONFIGURATION



MARKING CODE



PRODUCT DATASHEET

N-Ch Super Junction MOSFET - KP190N65FM3

MAXIMUM RATING (T_J=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V _{DSS}	650	V
Gate-Source Voltage		V _{GSS}	±30	V
Drain Current	@T _C =25°C	I _D	20*	A
	@T _C =100°C		12.6*	
	Pulsed (Note 1)	I _{DP}	60*	
Single Pulsed Avalanche Energy (Note 2)		E _{AS}	570	mJ
Repetitive Avalanche Energy (Note 1)		E _{AR}	7.9	mJ
Peak MOSFET dv/dt		dv/dt	50	V/ns
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5	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

PRODUCT DATASHEET
N-Ch Super Junction MOSFET - KP190N65FM3

ELECTRICAL CHARACTERISTICS (Tj=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	BV _{DSS}	I _D =250μA, V _{GS} =0V	650	-	-	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} =650V, V _{GS} =0V	-	-	10	μA
Gate Threshold Voltage	V _{th}	V _{DS} =V _{GS} , I _D =250μA	2	3	4	V
Gate Leakage Current	I _{GSS}	V _{GS} =±30V, V _{DS} =0V	-	-	±100	nA
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)	-	35	-	nC
Gate-Source Charge	Q _{gs}		-	7.5	-	
Gate-Drain Charge	Q _{gd}		-	14	-	
Turn-on Delay time	t _{d(on)}	V _{DD} =400V, I _D =10A, V _{GS} =10V, R _G =25Ω (Note 3, 4)	-	34	-	ns
Turn-on Rise time	t _r		-	30	-	
Turn-off Delay time	t _{d(off)}		-	145	-	
Turn-off Fall time	t _f		-	25	-	
Input Capacitance	C _{iss}	V _{DS} =400V, V _{GS} =0V, f=1.0MHz	-	1460	-	pF
Output Capacitance	C _{oss}		-	36	-	
Reverse Transfer Capacitance	C _{rss}	V _{DS} =400V, V _{GS} =0V, f=250kHz	-	1.3	-	
Effective output capacitance, energy related	C _{o(er)}	V _{GS} =0V, V _{DS} =0...400V (Note 5)	-	60	-	
Effective output capacitance, time related	C _{o(tr)}	V _{GS} =0V, V _{DS} =0...400V (Note 6)	-	310	-	
Gate Resistance	R _G	V _{GS} =0V, f=1MHz	-	6	-	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	-	310	-	ns
Reverse Recovery Charge	Q _{rr}	dI _S /dt=100A/μs	-	4.1	-	μC

Note 1) Repetivity rating: Pulse width limited by junction temperature.
Note 2) L=43mH, I_D=5A, V_DD=50V, R_G=25Ω, Starting T_j=25°C.
Note 3) Pulse Test: Pulse width ≤ 100μs, Duty Cycle ≤ 2%.
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.

PRODUCT DATASHEET

N-Ch Super Junction MOSFET - KP190N65FM3

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

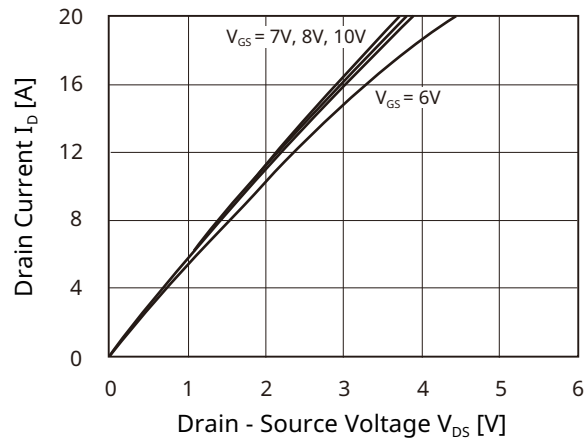


Fig 2. $I_D - V_{DS}$ - 2

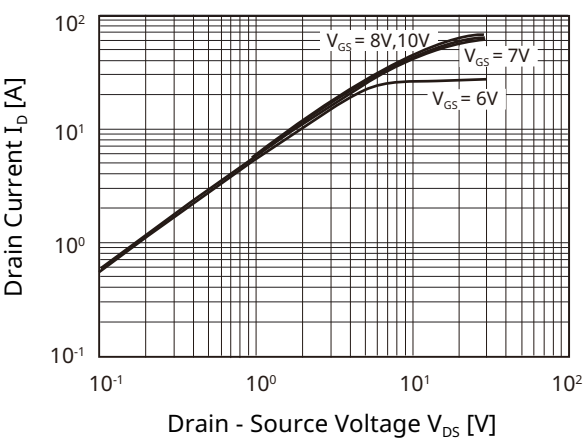


Fig 3. $I_D - V_{GS}$

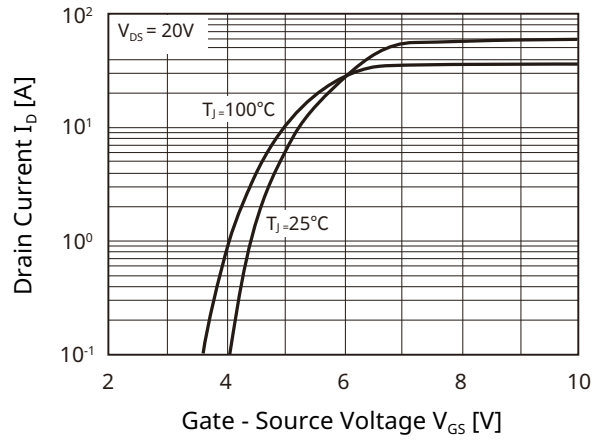


Fig 4. $R_{DS(ON)} - I_D$

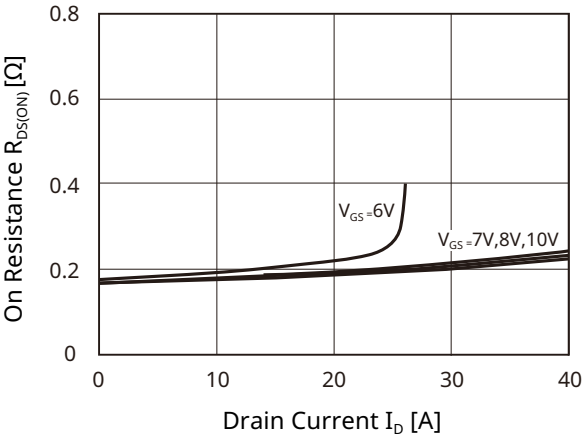


Fig 5. $R_{DS(ON)} - V_{GS}$

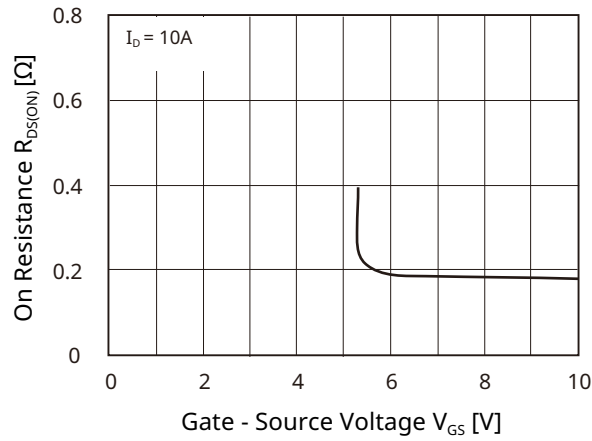
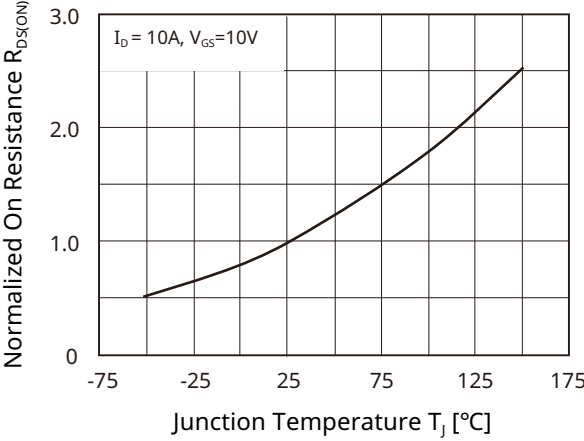


Fig 6. $R_{DS(ON)} - T_J$



PRODUCT DATASHEET

N-Ch Super Junction MOSFET - KP190N65FM3

Fig 7. $BV_{DSS} - T_J$

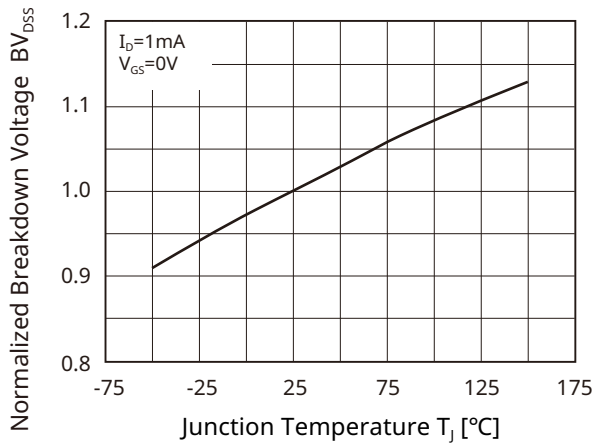


Fig 8. $V_{th} - T_J$

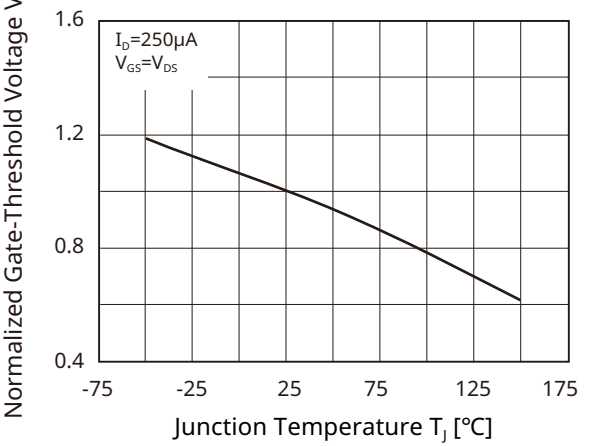


Fig 9. $I_S - V_{SD}$

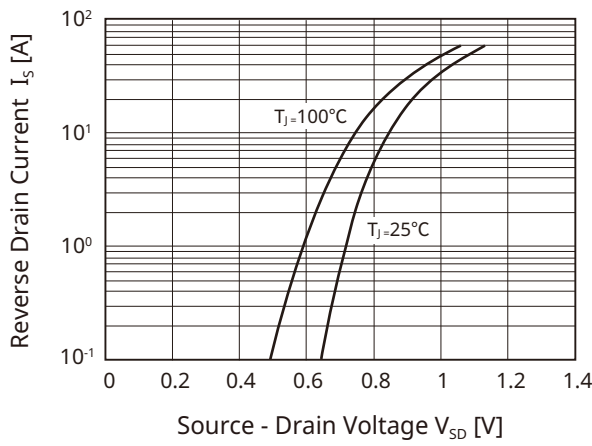


Fig 10. Capacitance V_{DS}

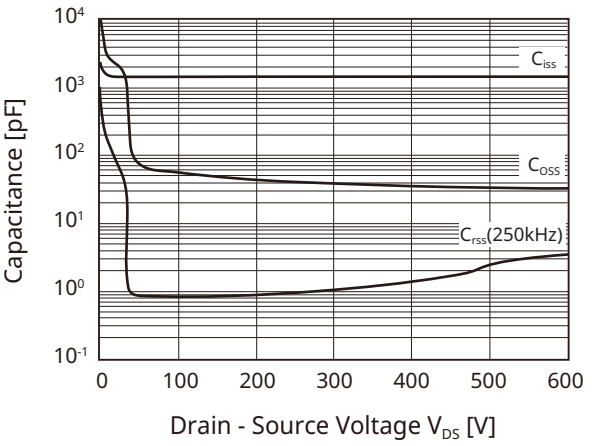


Fig 11. $E_{OSS} - V_{DS}$

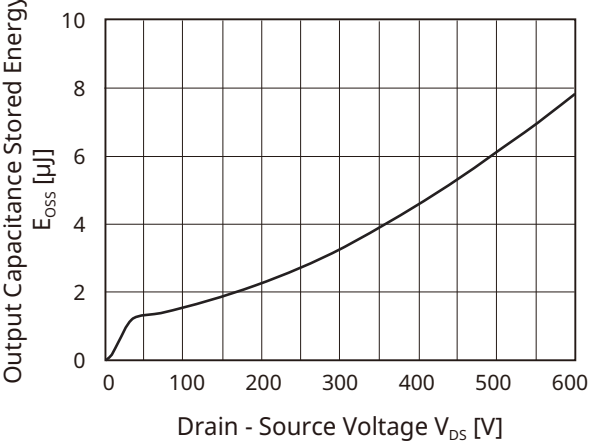
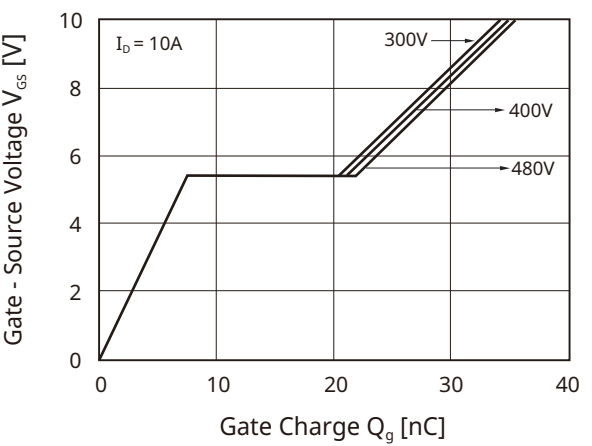


Fig 12. $Q_g - V_{GS}$



PRODUCT DATASHEET

N-Ch Super Junction MOSFET - KP190N65FM3

Fig 13. P_{tot} - T_C

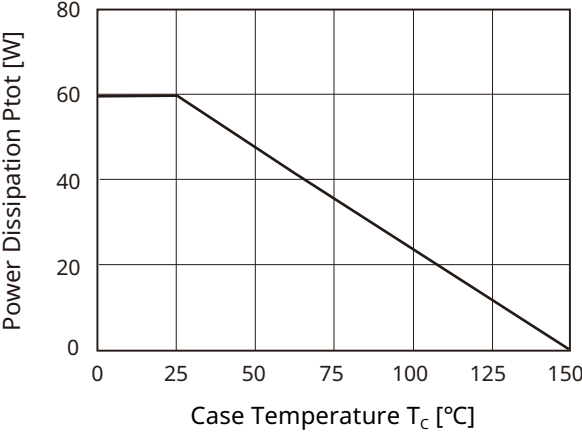


Fig 14. Switching Time - I_D

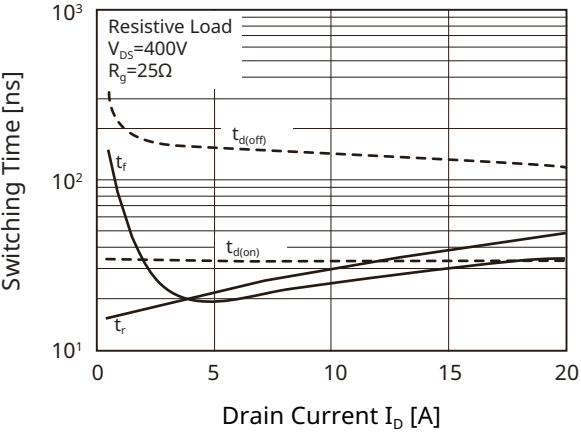


Fig 15. Switching Loss - I_D

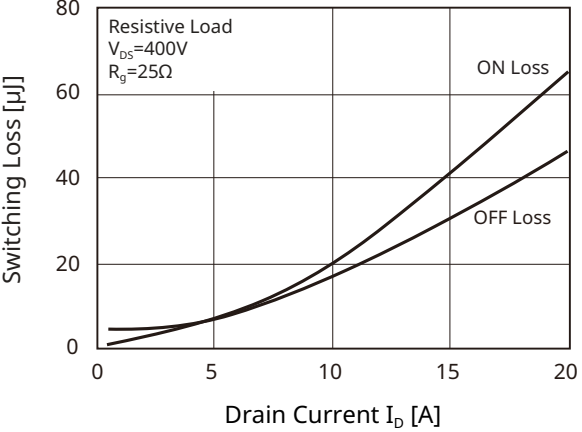


Fig 16. Switching Time - R_g

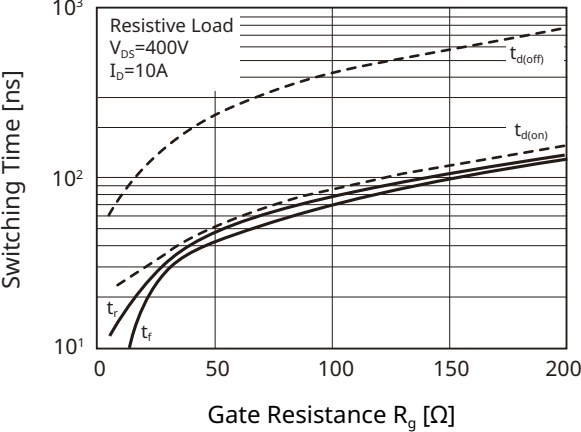


Fig 17. Switching Loss - R_g

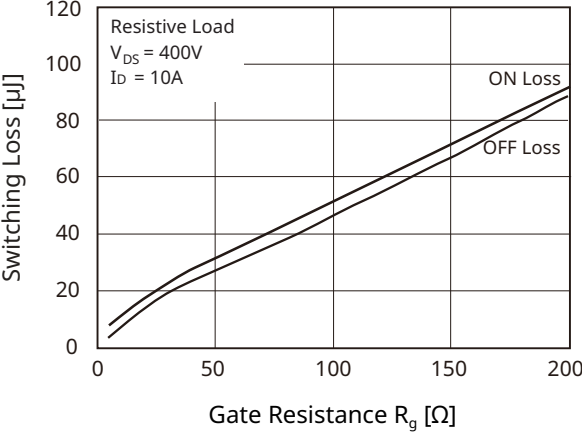
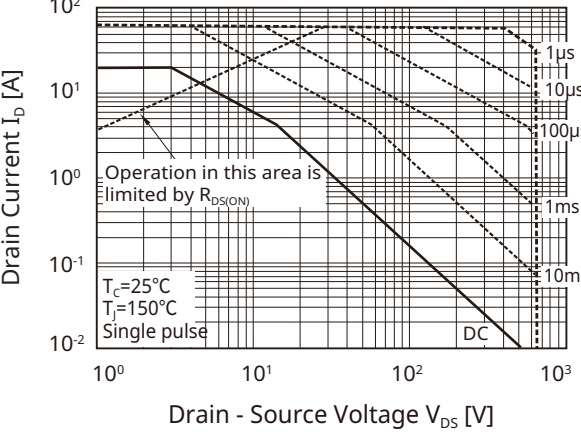


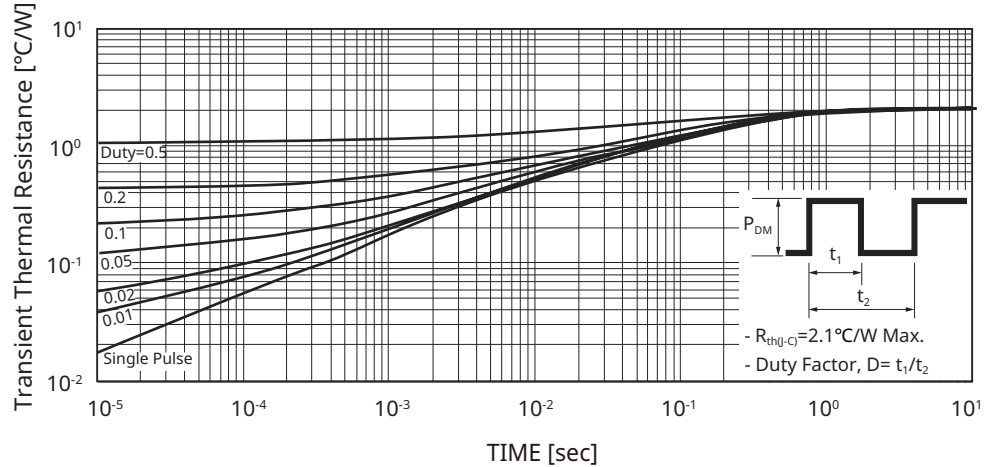
Fig 18. Safe Operation Area



PRODUCT DATASHEET

N-Ch Super Junction MOSFET - KP190N65FM3

Fig 19. Transient Rth Curve (J-C)



PRODUCT DATASHEET

N-Ch Super Junction MOSFET - KP190N65FM3

Fig 20. Gate Charge

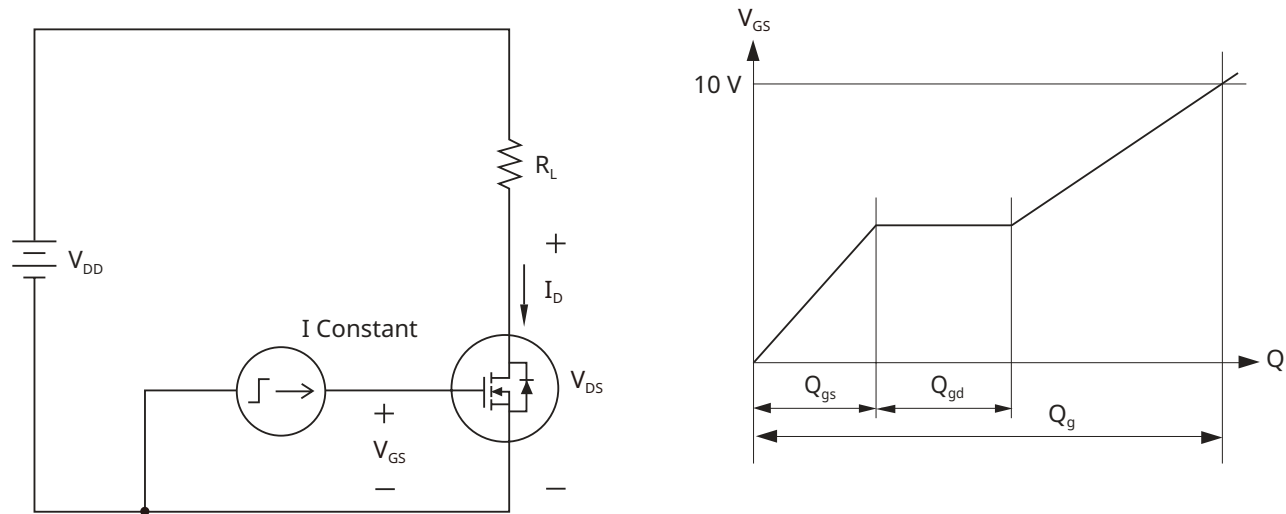


Fig 21. Single Pulsed Avalanche Energy

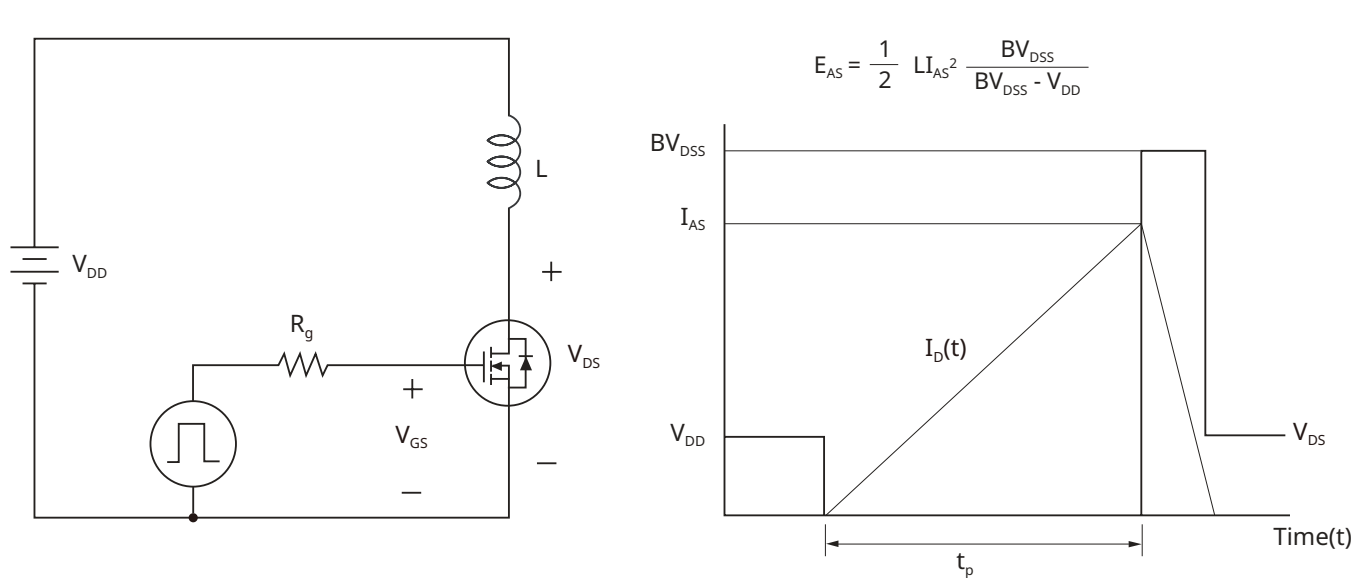
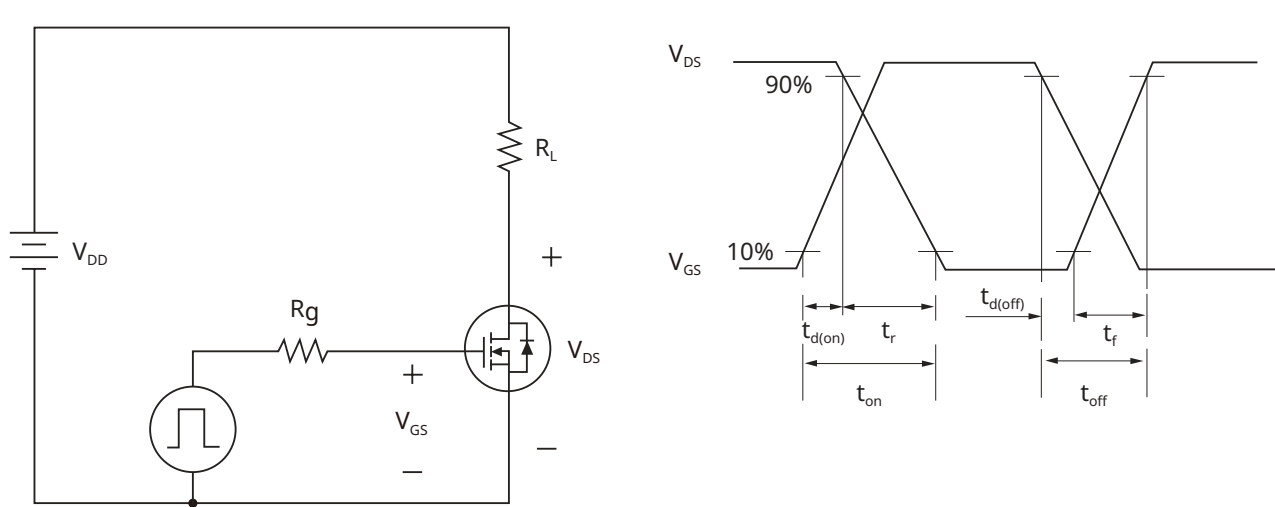


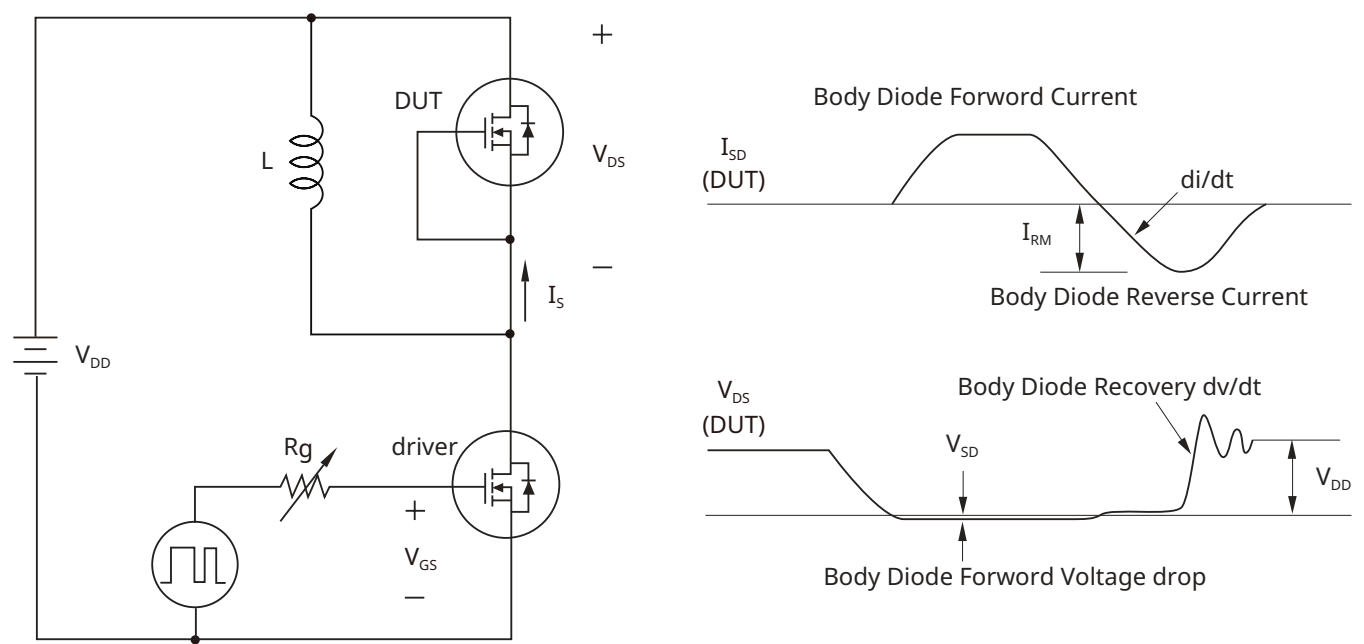
Fig 22. Resistive Load Switching



PRODUCT DATASHEET

N-Ch Super Junction MOSFET - KP190N65FM3

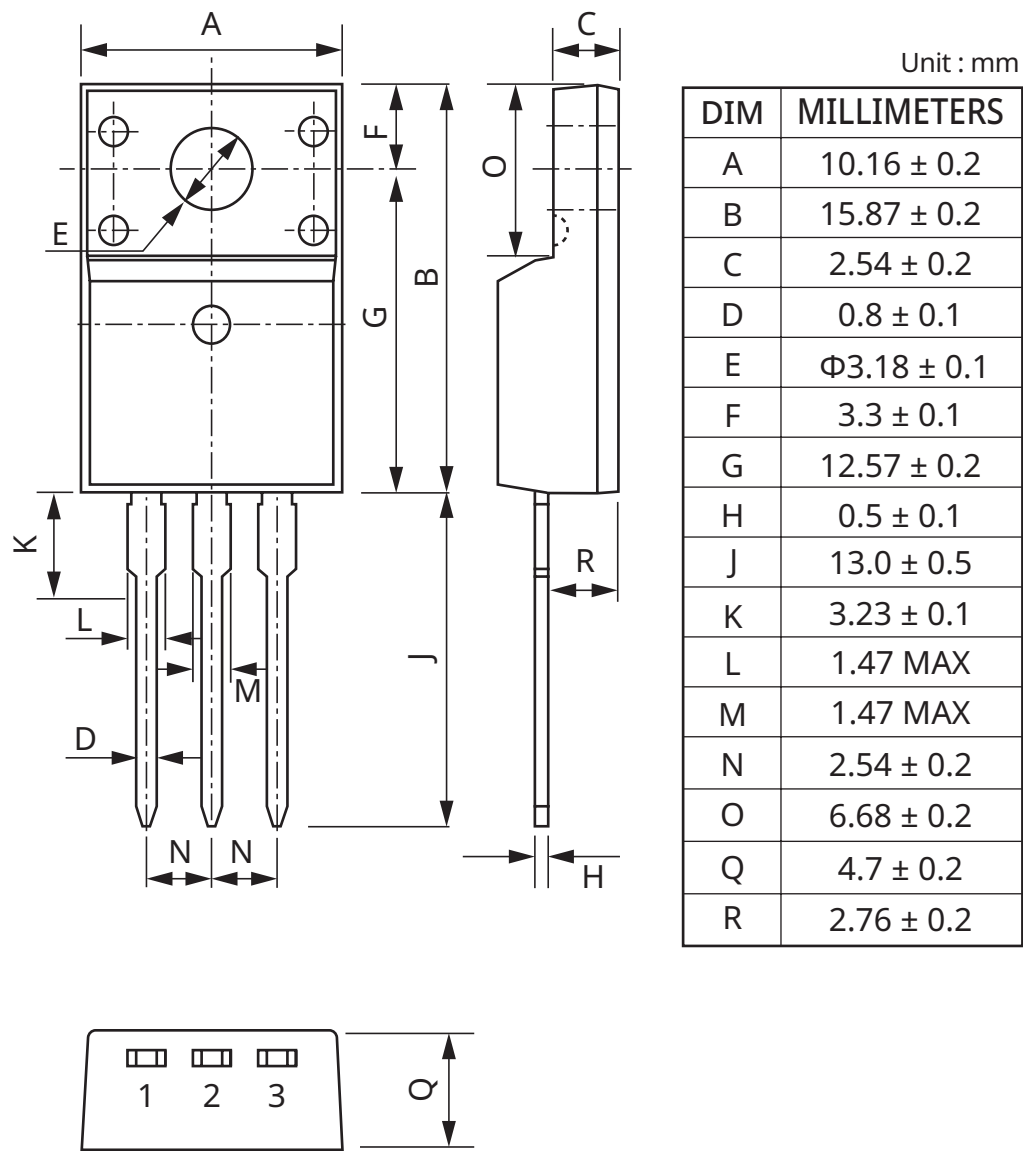
Fig 23. Source - Drain Diode Reverse Recovery and dv/dt



PRODUCT DATASHEET

N-Ch Super Junction MOSFET - KP190N65FM3

PACKAGE INFORMATION(TO-220IS(1))



PRODUCT DATASHEET

N-Ch Super Junction MOSFET - KP190N65FM3

ORDERING INFORMATION

Part Number	Status	Compliance		Packing Type	Reel Size	Quantity
		AEC-Q	Halogen Free			
KP190N65FM3-U/PF	Active	-	-	Tube	-	50

PRECAUTION ON USING KEC PRODUCTS

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.
3. On designing your application, please use product within the ranges guaranteed by KEC for maximum rating, operating supply voltage range, heat radiation characteristics and other characteristics. User shall be responsible for failure or damage when used beyond the guaranteed ranges.
4. The technical information described in this data is limited to showing representative characteristics and applied circuit examples of the products and it does not constitute the warranting of industrial property, the granting of relative rights, or the granting of any license.
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.
6. Although KEC is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors. Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. KEC shall have no responsibility for any damages arising out of the use of our Products beyond the rating specified by KEC.

For additional information,
please contact your local Sales Representative.

SOUTH KOREA (Headquarters)
KEC CORPORATION
PHONE : +82-2-2025-5000
sales@kec.co.kr

JAPAN
KEC JAPAN CO.,LTD.
PHONE : +81-03-5475-2691
kec_jp@kec.co.kr

SINGAPORE
KEC SINGAPORE PTE., LTD.
PHONE : +65-6748-7372(#102)
kec_sg@kec.co.kr

THAILAND
KEC THAILAND BANGKOK OFFICE
PHONE : +66-2-576-1484~5
kec_th@kec.co.kr

CHINA
KEC SHANGHAI CO.,LTD.
PHONE : +86-21-5490-2277
kec_sh@kec.co.kr

KEC SHENZHEN OFFICE
PHONE : +86-755-8830-8899
kec_hk@kec.co.kr

KEC TIANJIN OFFICE
PHONE : +86-21-5490-2277
kec_sh@kec.co.kr

HONG KONG
KEC HK CORP. LTD
PHONE : +852-2249-3734
kec_hk@kec.co.kr

TAIWAN
KEC TAIWAN CO.,LTD.
PHONE : +886-2-2515-8359
kec_twn@kec.co.kr

U.S.A
KEC AMERICA CORP.
PHONE : +1-714-259-0662
kec_a@kec.co.kr

