650V 90A N-Channel Super Junction Power MOSFET

Description:

This series of power MOSFET use N channel Multi-EPI Super-Junction technology and design to provide better characteristics, such as fast switching time, low Ciss and Crss, low on resistance and excellent avalanche characteristics,making it especially suitable for applications which require superior power density and outstanding efficiency.

Product Summary

V_{DS}	$R_{DS(on)}$(mΩ)Typ	I_D(A)	Qg(Typ)
650V	28 @ 10V,30A	90	183nc

Features:

- Ultra low on-resistance
- New revolutionary high voltage technology
- Ultra low gate charge and input capacitance
- 100% avalanche tested
- Rohs compliant

TO-247

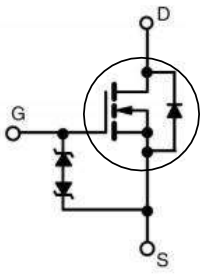
Mechanical Data:

- Case:TO-247 Package

Applications:

- Electronic switch in
  Swithing power supply
  UPS
  PV & wind power inverter
  Lighting

Block Diagram



Pin Definition:

1. Gate
2. Drain
3. Source

Ordering Information

Part No.	Package Type	Package	Quality(box)
KWSJ90NE65PR	TO-247	Tube	600

Table1 Absolute Maximum Ratings (T_C=25℃, unless otherwise specified)

Parameters		Symbol	KWSJ90NE65PR	Unit
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage		V_{GS}	±30	V
Contionous Drain Current	T_C=25°C	I_D	90	A
	T_C=100°C		60	
Pulsed Drain Current (Note 2)		I_{DM}	350	A
Single Pulse Avalanche Energy(Note 3)		E_{AS}	2430	mJ
Avalanche Current(Note 1)		I_{AR}	7	A
Repetitive Avalanche Energy(Note 1)		E_{AR}	1.4	mJ
Power Dissipation T_C=25°C		P_D	460	W
Operating Junction and Storage Temperature		T_J/T_{STG}	-55 ~ +150	℃

Table 2.Thermal Characteristics

Parameters	Symbol	KWSJ90NE65PR	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62	℃/W
Thermal resistance Junction to Case	$R_{\theta JC}$	0.27	℃/W

Table 3. Electrical Chatacteristics (T_J=25℃, unless otherwise specified)

Parameters		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V,I_D=250μA	650			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=650V,V_{GS}=0V			60	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=30V,V_{DS}=0V			10	μA
	Reverse		V_{GS}=-30V,V_{DS}=0V			-10	μA
On Characteristics(Note 4)							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=250μA	2.5		4.5	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V,I_D=30A		28	33	mΩ
Dynamic Characteristics(Note 5)							
Input Capacitance		C_{ISS}	V_{DS}=100V,V_{GS}=0V,f=1MHz		9380		pF
Output Capacitance		C_{OSS}			300		pF
Reverse Transfer Capacitance		C_{RSS}			8.2		pF
Switching Characteristics (Note 5)							
Turn-On Delay Time		td(on)	V_{DD}=300V,I_D=30A, V_{GS}=10V,R_G=25Ω		123		ns
Turn-On Rise Time		tr			125		ns
Turn-Off Delay Time		td(off)			625		ns
Turn-Off Fall Time		tf			143		ns
Total Gate Charge		Q_G	V_{DS}=480V,I_D=30A, V_{GS}=10V		190		nC
Gate-Source Charge		Q_{GS}			46		nC
Gate-Drain Charge		Q_{GD}			73		nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage(Note 4)		V_{SD}	V_{GS}=0V,I_S=30A			1.2	V
Maximum Continuous Drain-Source Diode Forward Current		I_S	Tj≤Tj,max			90	A
Reverse Recovery Time		trr	V_R=50V,I_F=30A dI$_F$/dt=100A/μs		230		ns
Reverse Recovery Charge		Q_{RR}			3.9		μC

Notes：1 Repetitive Rating:Pulse width limited by maximum junction temperature
2 Pulse width tp limited by Tj,max
3 V_{DD}=200V,I_{AS}=9A,L=60mH,R_G=25Ω,starting T_J=25℃
4 Pulse Test: Pulse width ≤300μS,Duty cycle≤2%5
Guaranteed by design,not subject to production

Typical Characteristics Diagrams

Figure 1.Output Characteristics

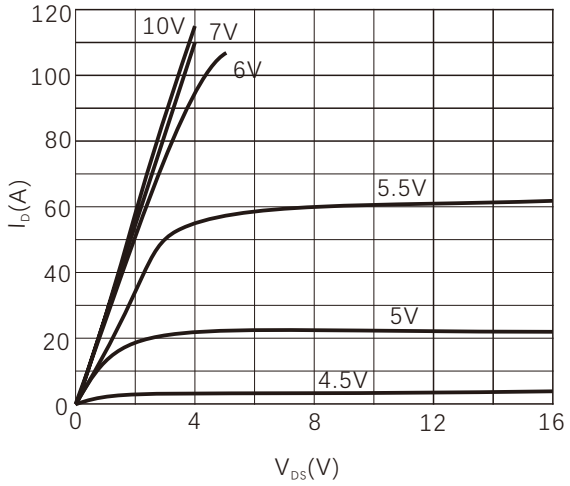


Figure 2. Transfer Characteristics

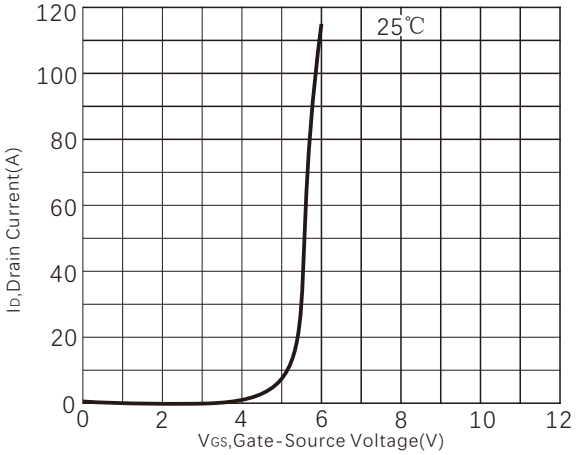


Figure 3.On-Resistance vs.Drain Current

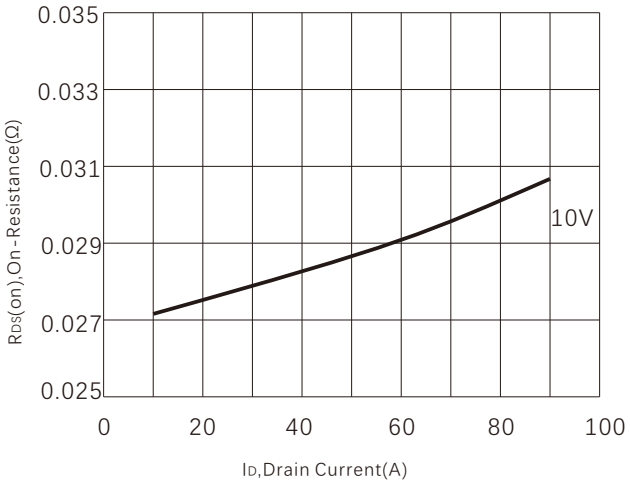


Figure 4. Capacitance

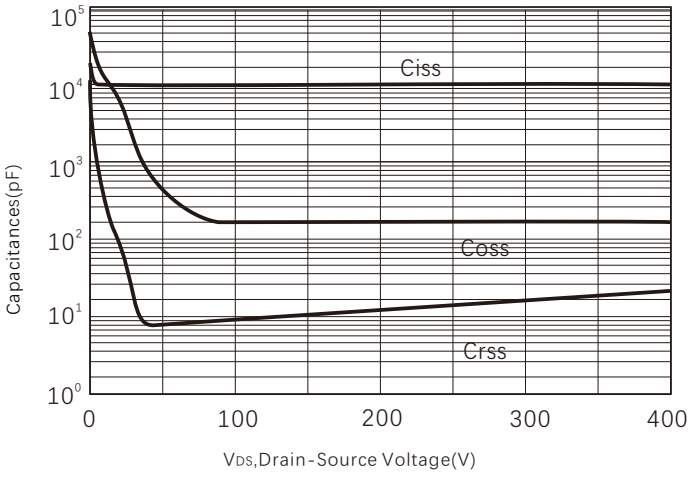


Figure 5.Gate charge

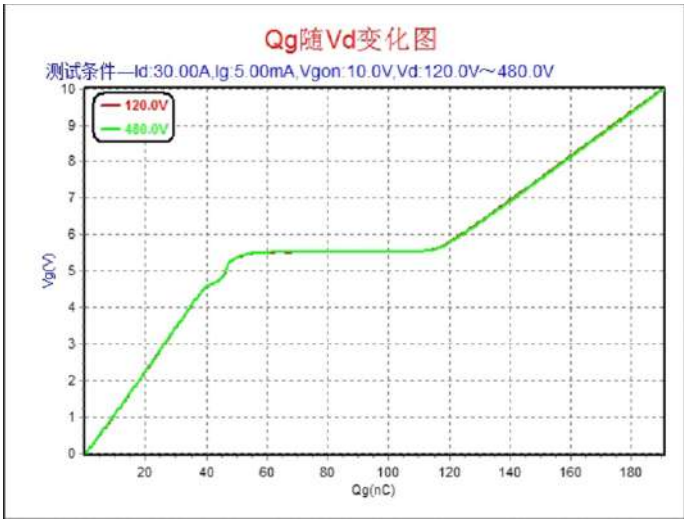


Figure 6.Source-Drain Diode Forward Voltage

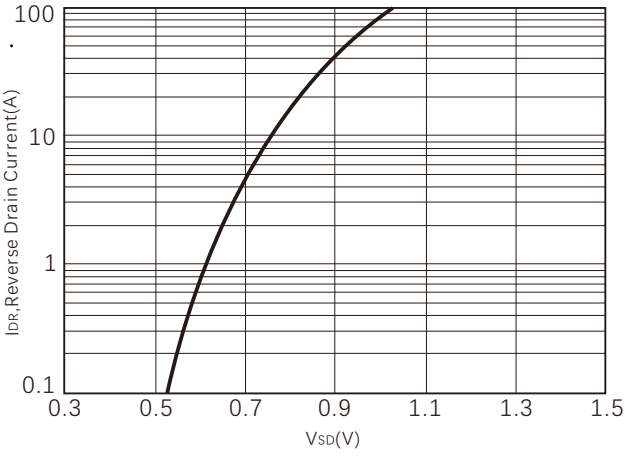


Figure7.Normalized $R_{DS(ON)}$ vs Junction Temperature

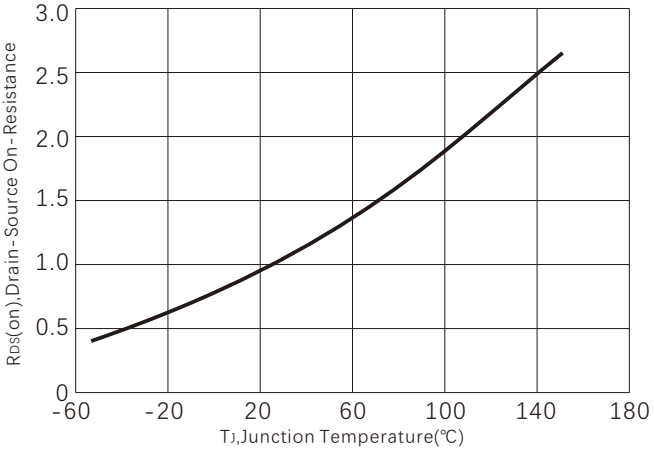


Figure 8.BV_{DSS} vs Junction Temperature

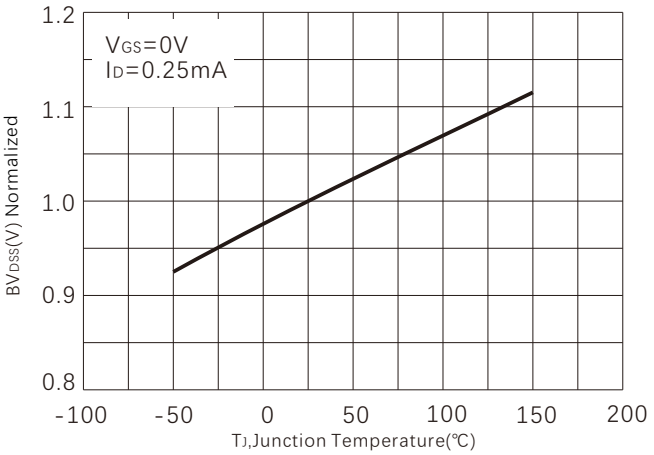


Figure 9. Safe operating area

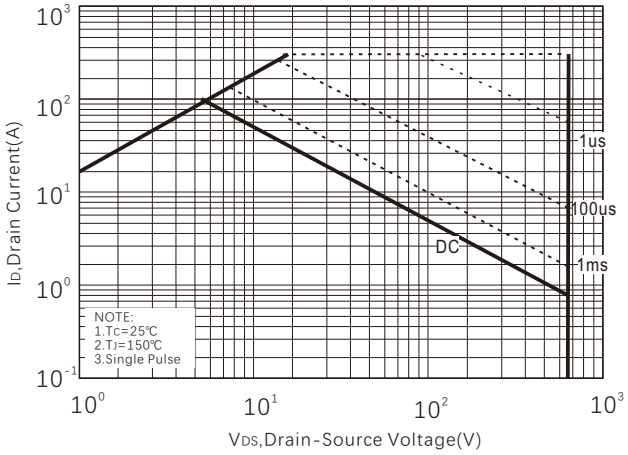


Figure 10. Power dissipation

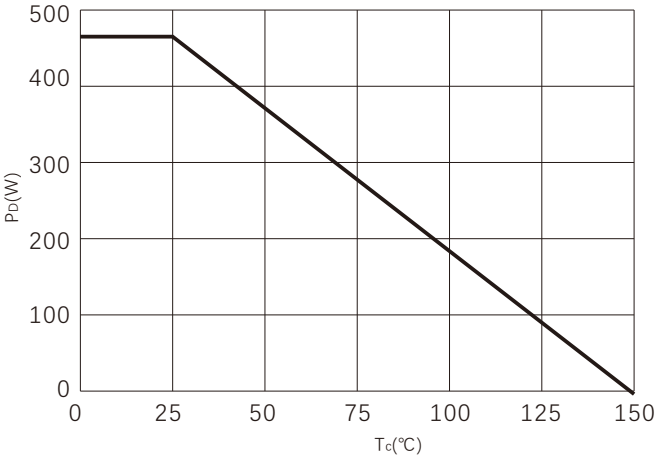
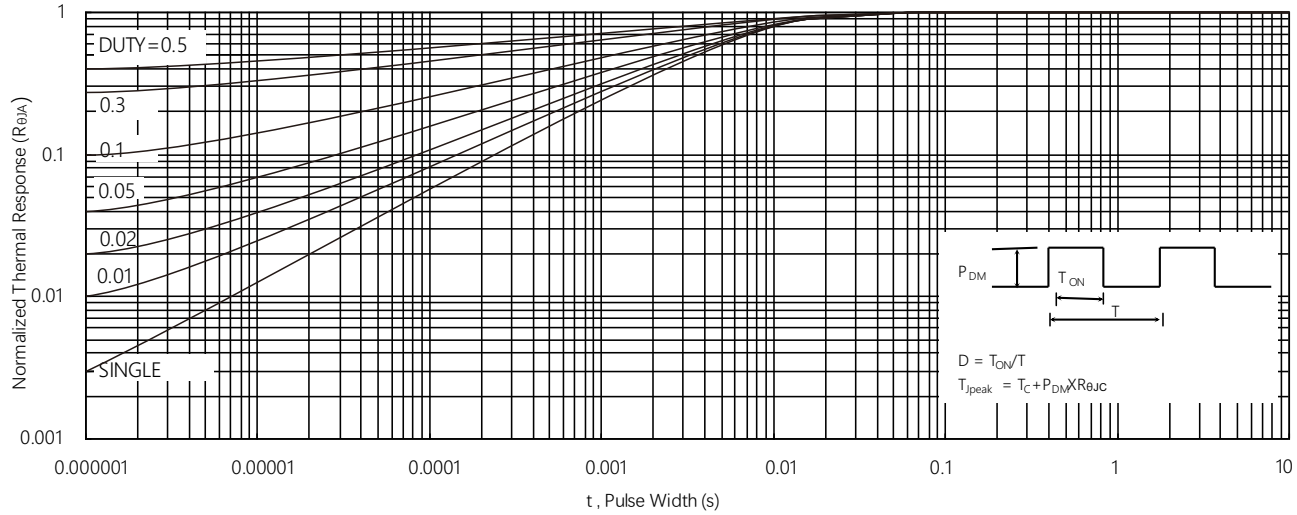
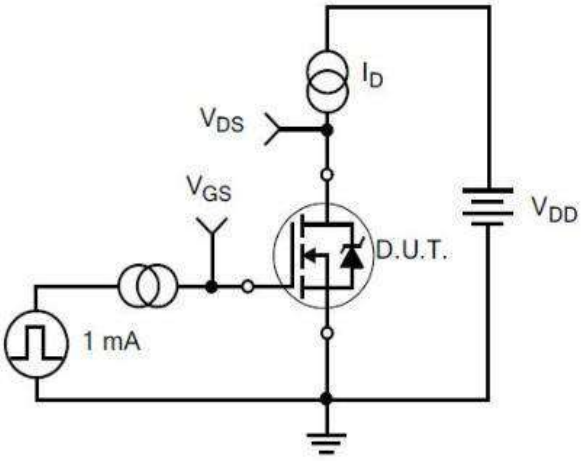


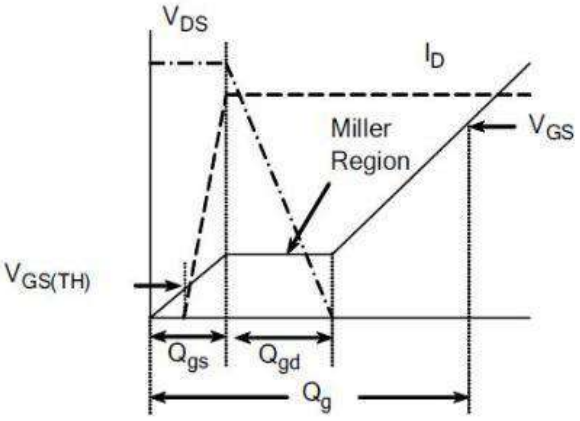
Figure 11.Normalized Maximum Transient Thermal Impedance



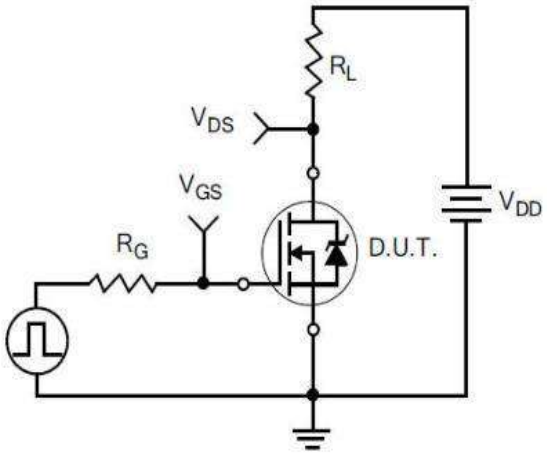
Typical Test Circuit



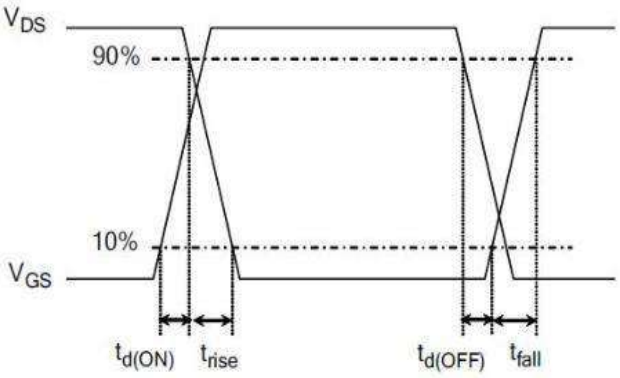
1) Gate Charge Test Circuit



2) . Gate Charge Waveform

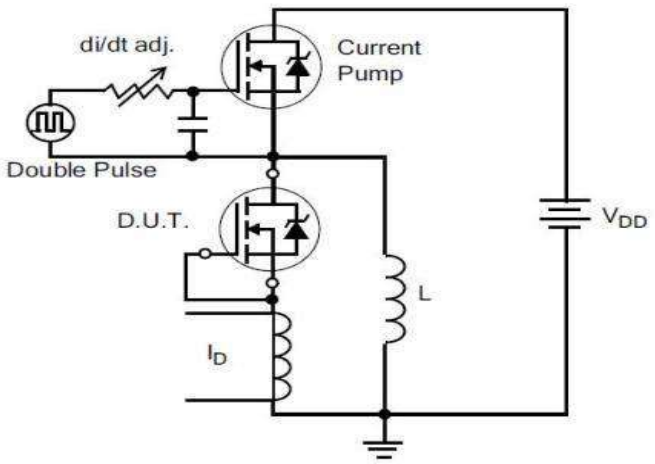


3) Resistive Switching Test Circuit

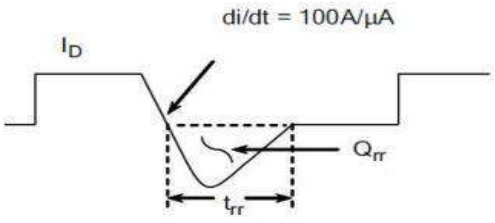


4) Resistive Switching Waveforms

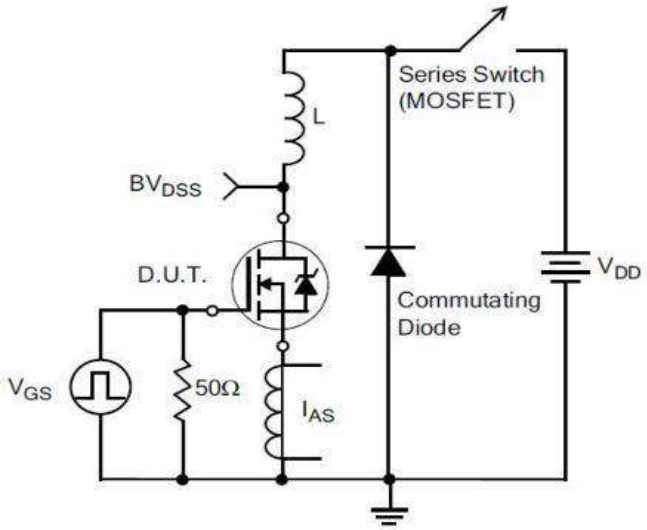
Typical Test Circuit



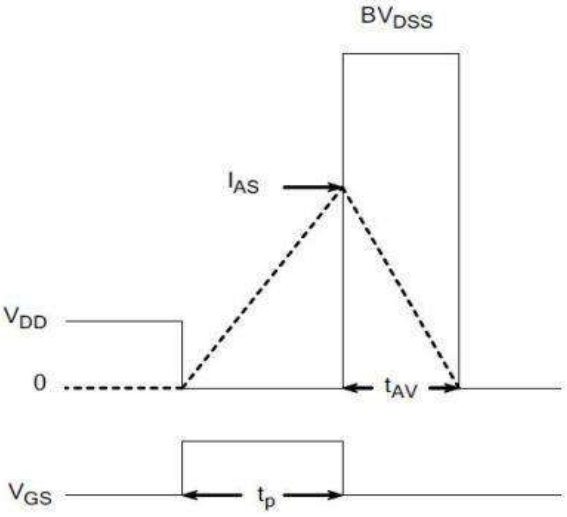
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

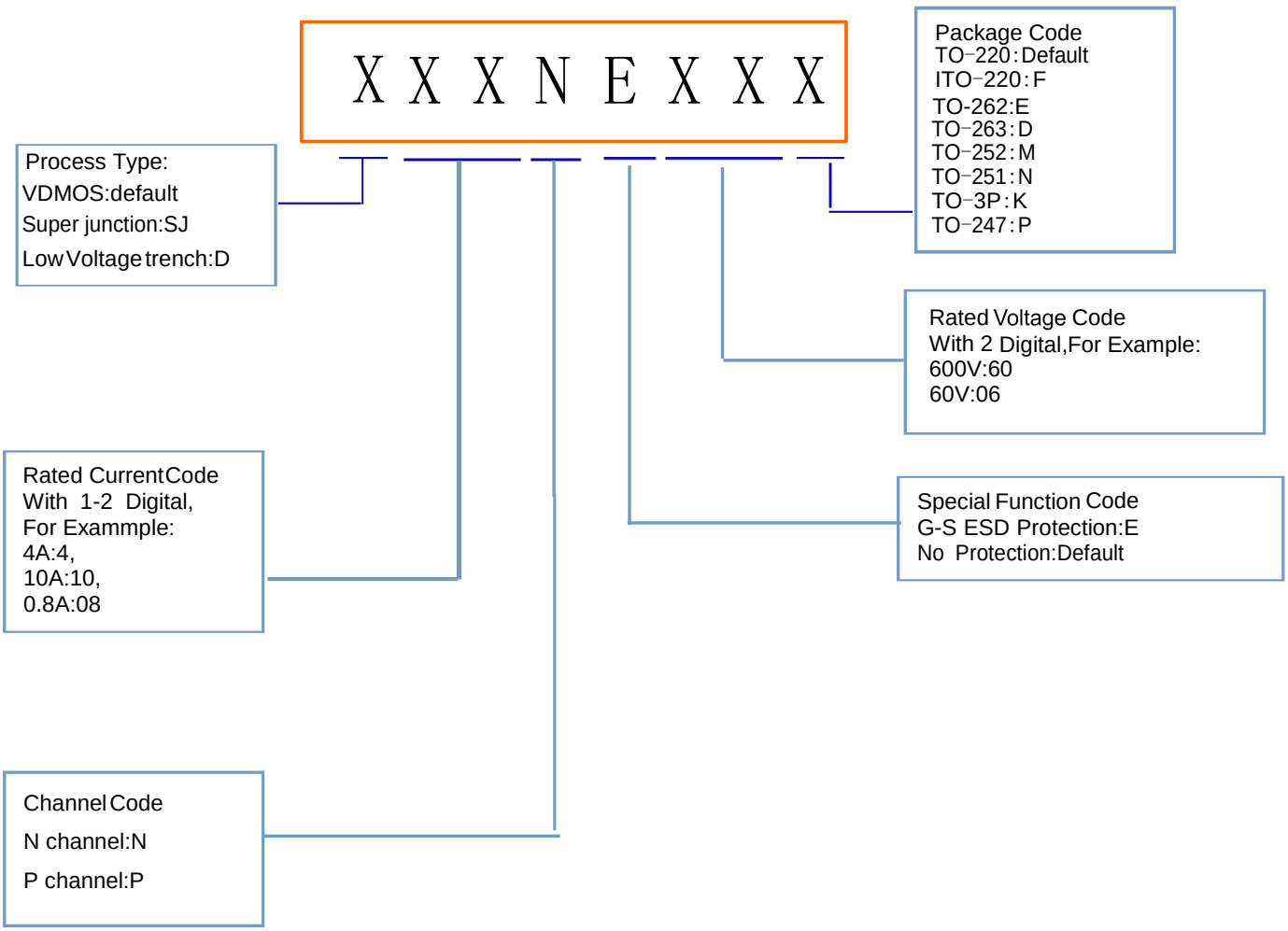


7) . Unclamped Inductive Switching Test Circuit

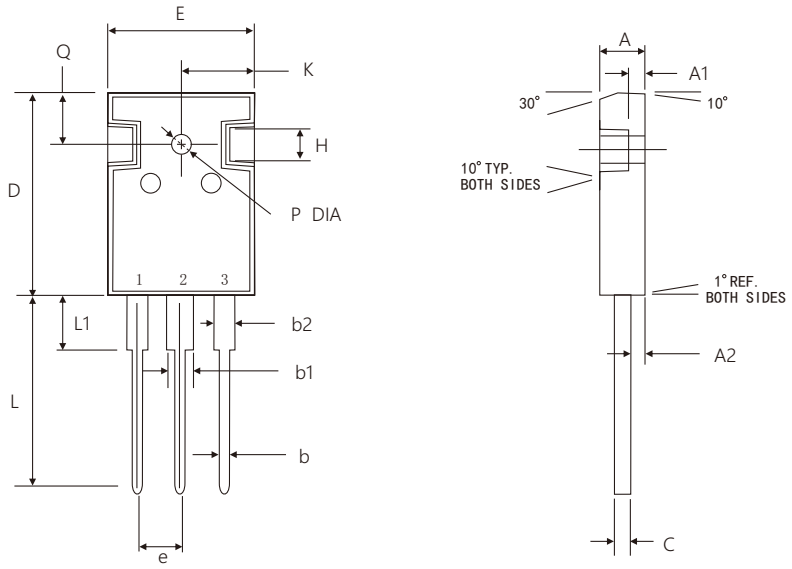


$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

8) Unclamped Inductive Switching Waveforms


X X X N E X X X
Process Type:
VDMOS:default
Super junction:SJ
Low Voltage trench:D
Package Code
TO-220:Default
ITO-220:F
TO-262:E
TO-263:D
TO-252:M
TO-251:N
TO-3P:K
TO-247:P
Rated Voltage Code
With 2 Digital,For Example:
600V:60
60V:06
Special Function Code
G-S ESD Protection:E
No Protection:Default
Rated CurrentCode
With 1-2 Digital,
For Exammple:
4A:4,
10A:10,
0.8A:08
Channel Code
N channel:N
P channel:P

TO-247 PACKAGE OUTLINE DIMENSIONS



TO-247AB		
Dim	Min	Max
A	4.70	5.30
A1	1.80	2.20
A2	2.24	2.58
b	1.00	1.40
b1	2.60	3.60
b2	1.60	2.60
C	0.40	0.80
D	20.00	22.00
L	19.60	20.40
e	5.20	5.70
L1	3.80	4.50
P	3.00	3.70
Q	5.40	6.40
K	7.40	8.20
H	4.6TYP	

Dimensions in millimeters