

General Description

These P-channel enhancement mode power field-effect transistor, Used advanced trench technology design, provided excellent $R_{DS(on)}$ and low gate charge. Which accords with the RoHS standard.



Product Summary			
V _{DS}	R _{DS(on)} (mΩ)Typ	I _D (A)	Q _g (Typ)
-40V	28 @ -10V, -15A	-15	16nc

Features

- Fast switching
- Low gate charge and input capacitance
- 100% avalanche tested
- Rohs compliant

Mechanical Data

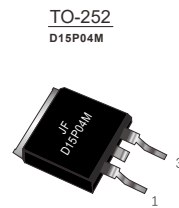
- Case: TO-252 Package

Application

- Switching power supply
- DC-DC Converters
- Automotive electronics applications

Ordering Information

Part No.	Package Type	Package	Quality(box)
D15P04M	TO-252	Tape & Reel	2500



Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

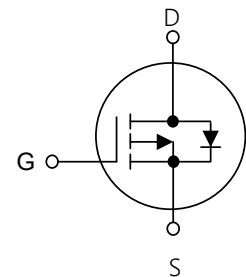


Table1 Absolute Maximum Ratings (T_c=25° C, unless otherwise specified)

Parameters	Symbol	Value	Unit
Drain-Source Voltage	V _{DS}	-40	V
Gate-Source Voltage	V _{GS}	±20	V
Contionous Drain Current	I _D	T _C =25°C	-15
		T _C =100°C	-12
Pulsed Drain Current (Note 1)	I _{DM}	-35	A
Continuous Avalanche Energy(Note 2)	E _{AR}	30	mJ
Avalanche Current(Note 1)	I _{AR}	-12	A
Power Dissipation T _c =25°C	P _D	40	W
Operating Junction and Storage Temperature	T _J /T _{STG}	-55 ~ +175	°C

Table 2. Thermal Characteristics

Parameters	Symbol	Value	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	75	$^{\circ}\text{C}/\text{W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	3.75	$^{\circ}\text{C}/\text{W}$

Table 3. Electrical Characteristics ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

Parameters	Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu\text{A}$	-40			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=-40V, V_{GS}=0V$			-1	μA
Gate-Source Leakage Current	Forward	I_{GSS}			100	nA
	Reverse				-100	nA
On Characteristics(Note 4)						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$	-1.0	-2.0	-3.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-10A$		50	70	$\text{m}\Omega$
		$V_{GS}=-10V, I_D=-15A$		28	39	$\text{m}\Omega$
Dynamic Characteristics(Note 5)						
Input Capacitance	C_{ISS}	$V_{DS}=-25V, V_{GS}=0V, f=1\text{MHz}$		840		pF
Output Capacitance	C_{OSS}			92		pF
Reverse Transfer Capacitance	C_{RSS}			60		pF
Switching Characteristics (Note 5)						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=-20V, R_L=1.6\Omega, V_{GS}=-10V, R_G=3\Omega$		6		ns
Turn-On Rise Time	t_r			9		ns
Turn-Off Delay Time	$t_{d(off)}$			45		ns
Turn-Off Fall Time	t_f			41		ns
Total Gate Charge	Q_G	$V_{DS}=-20V, I_D=-15A, V_{GS}=-10V$		16		nC
Gate-Source Charge	Q_{GS}			3.8		nC
Gate-Drain Charge	Q_{GD}			3.5		nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=-15A$			-1.2	V
Maximum Continuous Drain-Source Diode Forward Current(Note 4)	I_S				-15	A

- Notes: 1 Repetitive Rating:Pulse width limited by maximum junction temperature
 2 $L=0.5\text{mH}, I_D=-11A, V_{DD}=-30V, V_{GATE}=-40V, \text{Starting } T_J=25^{\circ}\text{C}$
 3 $I_{SD} \leq I_D, di/dt \leq 200\text{A}/\mu\text{S}, V_{DD} \leq BV_{DSS}, \text{starting } T_J=25^{\circ}\text{C}$
 4 Pulse Test: Pulse width $\leq 300\mu\text{S}, \text{Duty cycle} \leq 2\%$
 5 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

Figure 1. Output Characteristics

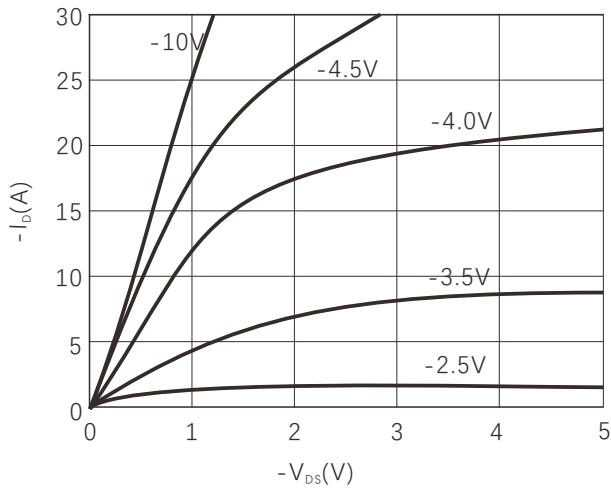


Figure 2. Transfer Characteristics

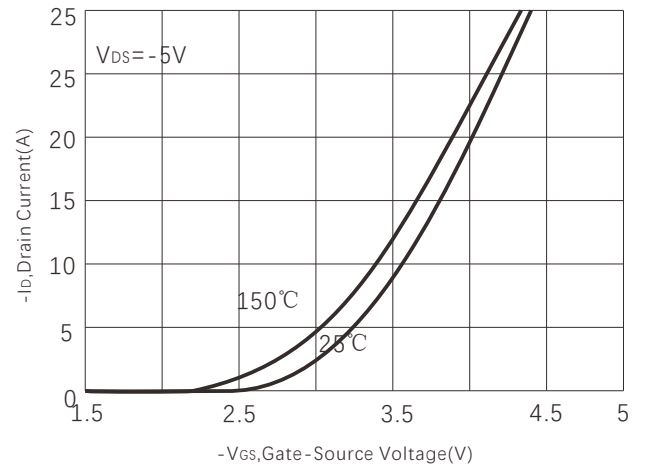


Figure 3. V_{TH} vs Junction Temperature

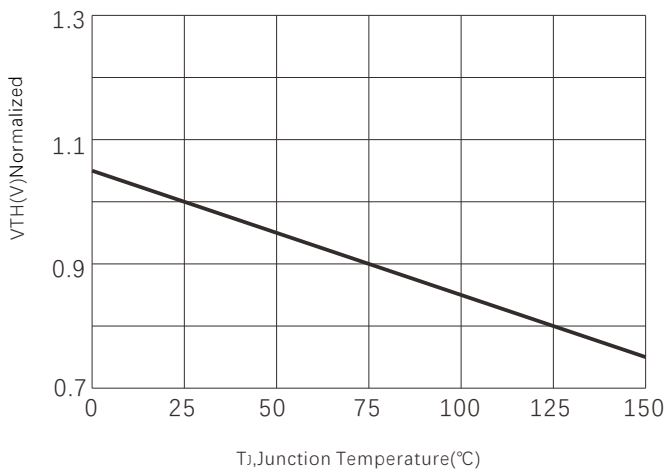


Figure 4. Capacitance

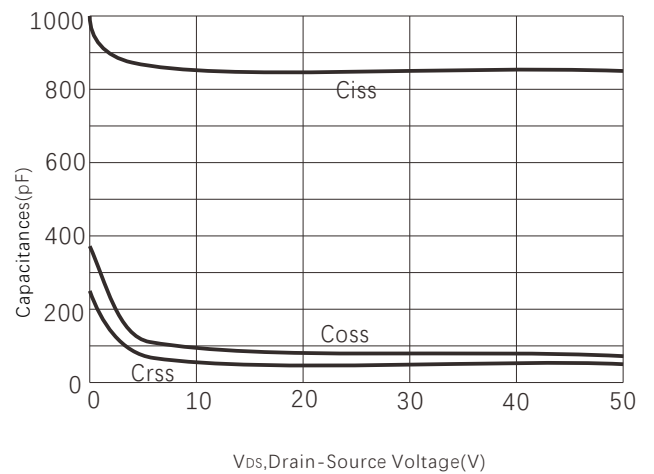


Figure 5. Gate charge

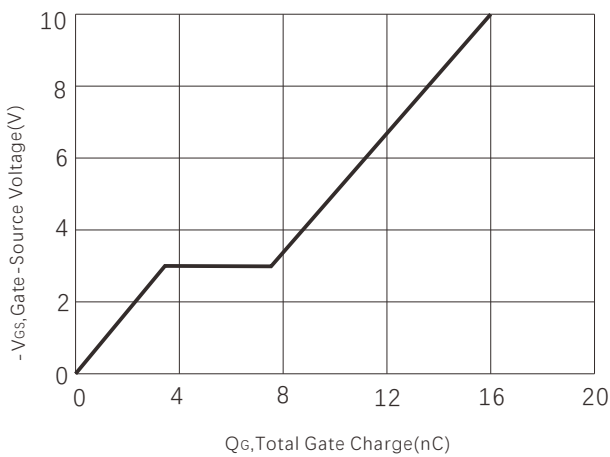


Figure 6. Drain Current

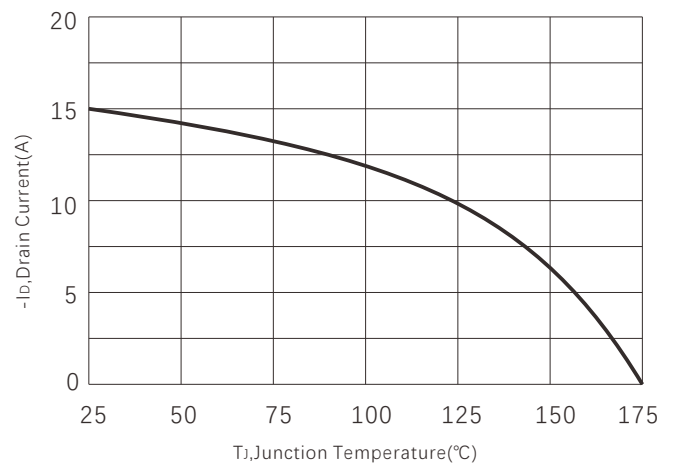


Figure 7. $R_{DS(ON)}$ vs Junction Temperature

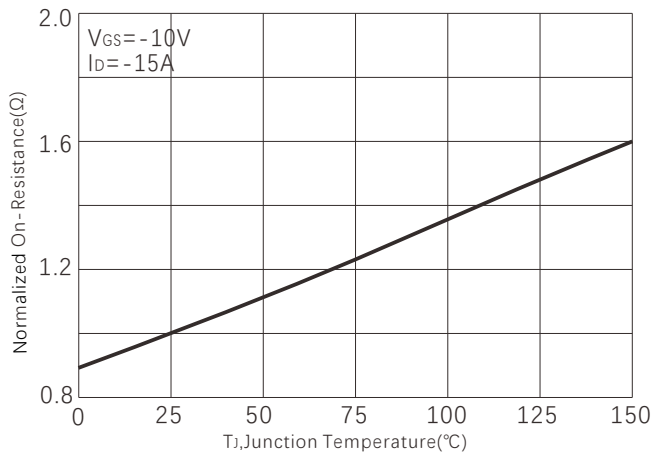


Figure 8. Power dissipation

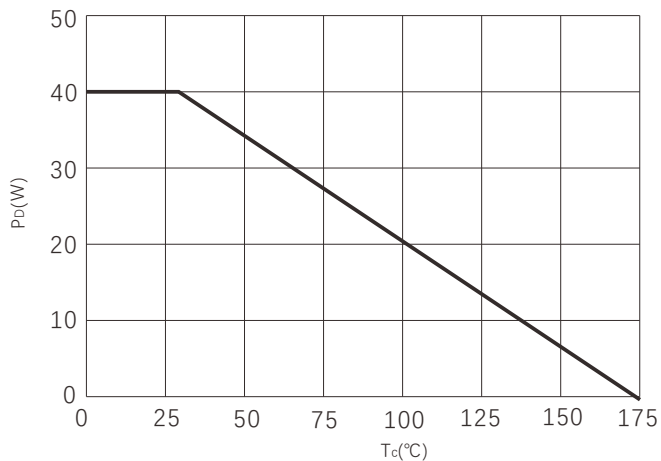


Figure 9. Safe operating area

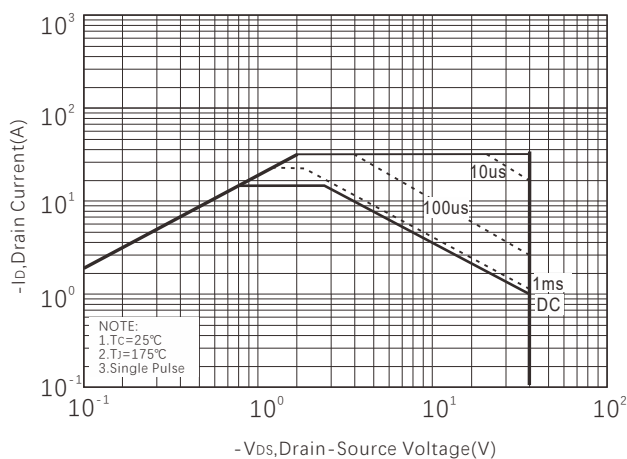
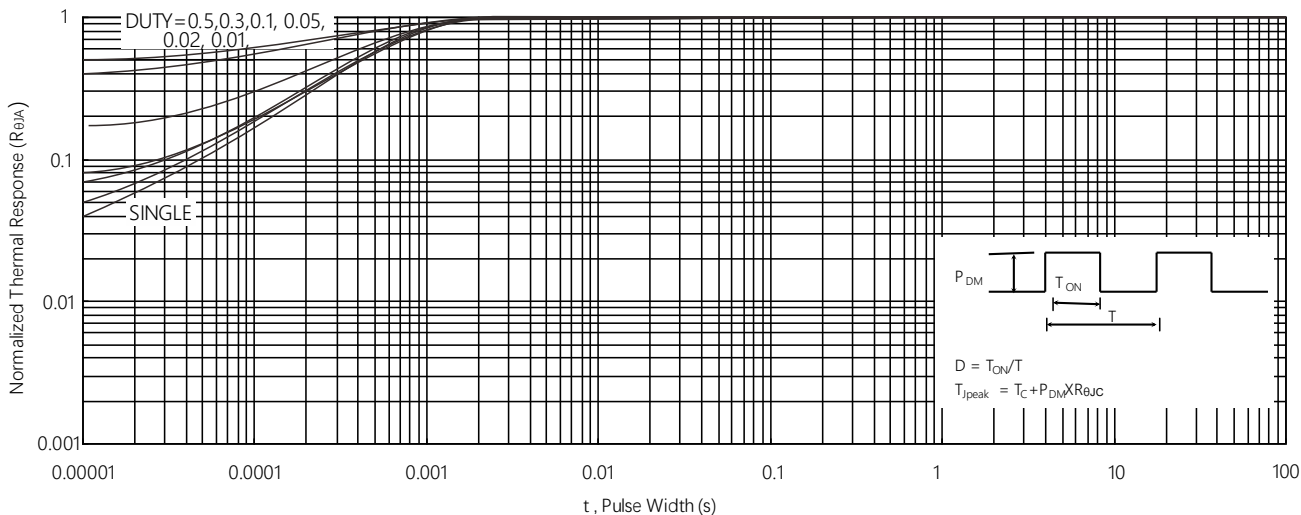
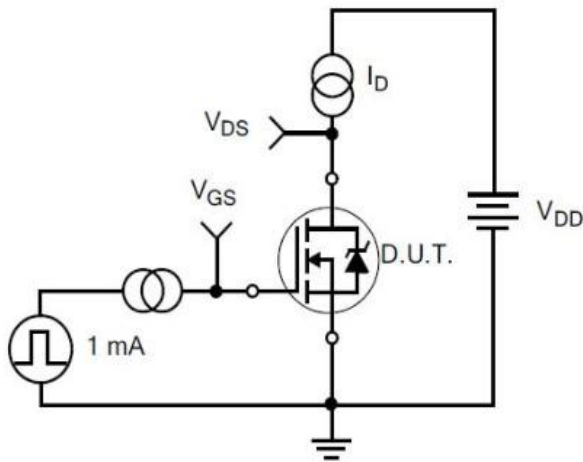


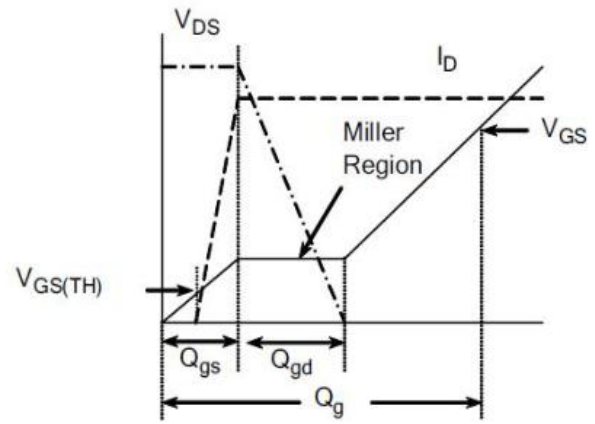
Figure 10. Normalized Maximum Transient Thermal Impedance



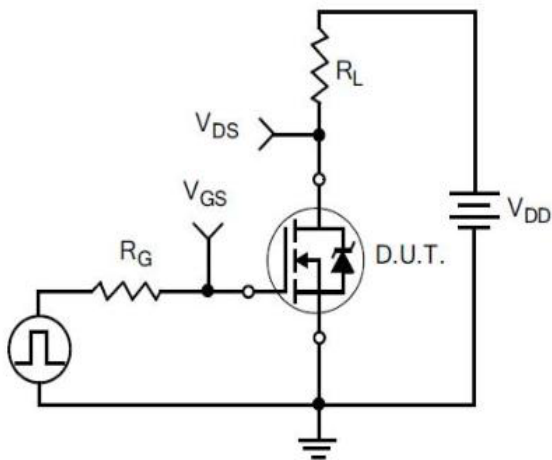
Typical Test Circuit



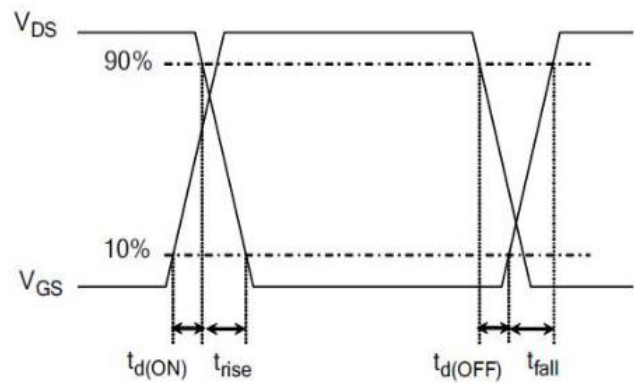
1) Gate Charge Test Circuit



2) Gate Charge Waveform

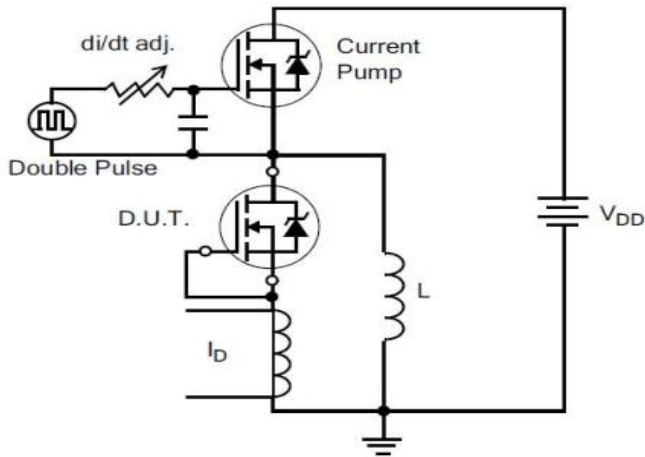


3) Resistive Switching Test Circuit

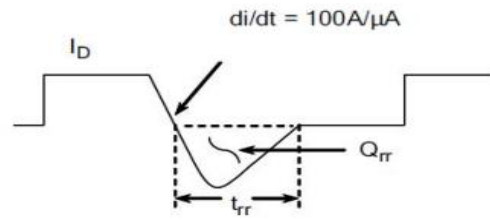


4) Resistive Switching Waveforms

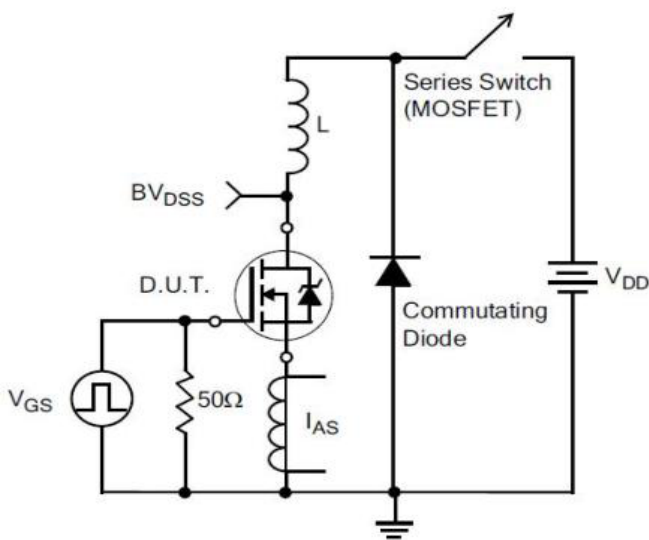
Typical Test Circuit



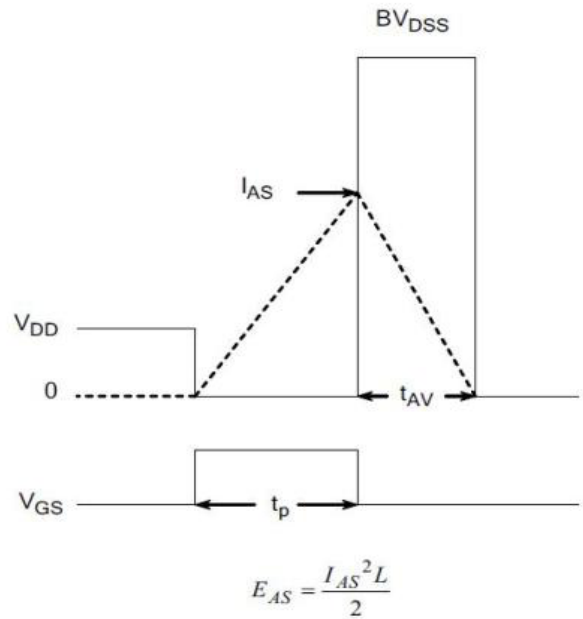
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

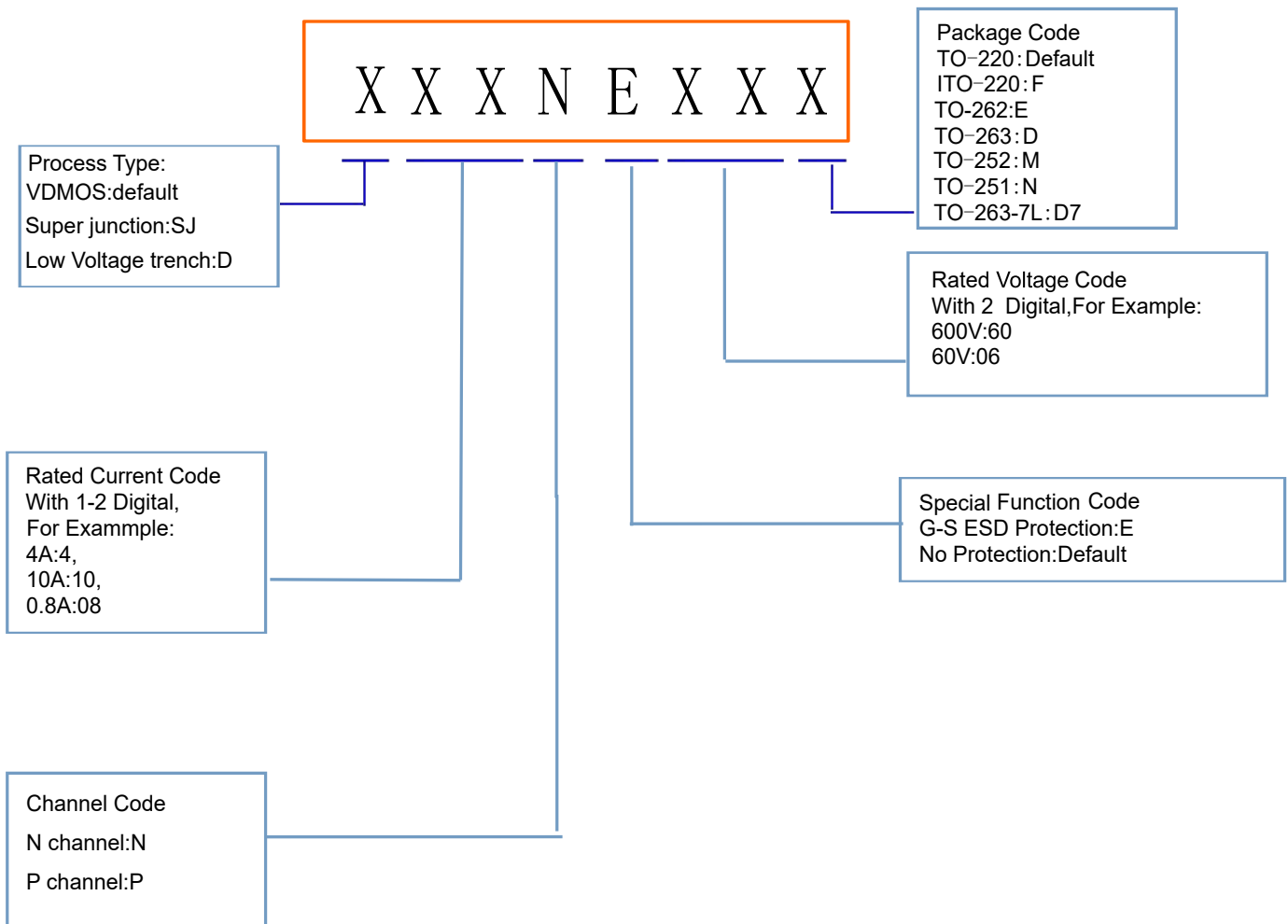


7) . Unclamped Inductive Switching Test Circuit



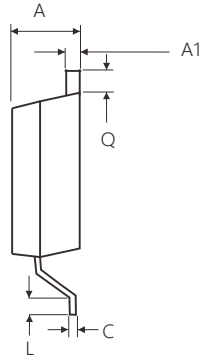
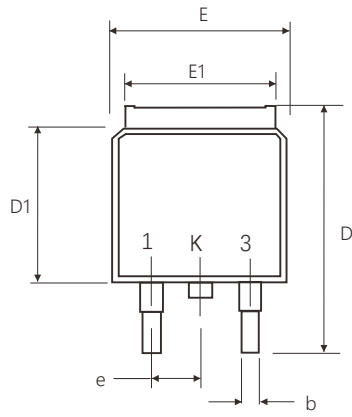
8) Unclamped Inductive Switching Waveforms

Product Names Rules



Dimensions

TO-252 PACKAGE OUTLINE DIMENSIONS



TO-252		
Dim	Min	Max
A	2.15	2.65
A1	0.42	0.58
e	2.14	2.40
b	0.64	0.89
Q	0.88	1.27
C	0.42	0.58
D	9.00	10.40
D1	5.60	6.22
E	6.20	6.73
E1	5.0	5.5
L	1.00	-

Dimensions in millimeters

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