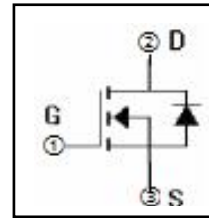


### Description

D12N06M is an N-channel enhancement mode power field-effect transistor. Using advanced trench technology design, providing excellent R<sub>DS(on)</sub> and low gate charge. The product can be used in a wide variety of application. The package form is TO-252. Which accords with the RoHS standard.



$V_{DSS} = 60V$   
 $R_{DS(on)} (TYP) = 0.056\Omega$   
 $I_D = 12A$

### Features

- Low On Resistance
- Low Gate Charge
- Fast Switching
- Low Reverse Transfer Capacitances
- 100% Single Pulse Avalanche Energy Test
- 100%  $\Delta V_{DS}$  Test

### Applications:

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply



### Electrical Characteristics

**Absolute Maximum Rating** ( $T_c=25^\circ\text{C}$ , unless otherwise noted)

PARAMETER	SYMBOL	VALUE	UNIT
Maximum Drain-Source DC Voltage	$V_{DSS}$	60	V
Maximum Gate-Drain Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current(continuous)	$I_D$ ( $T=25^\circ\text{C}$ ) ( $T=100^\circ\text{C}$ )	12	A
		8	A
Drain Current(Pulsed) <sup>(Note 1)</sup>	$I_{DM}$	36	A
Total Dissipation	$T_a=25^\circ\text{C}$	$P_{tot}$	1.15 W
	$T_c=25^\circ\text{C}$	$P_{tot}$	32.5 W
Junction Temperature	$T_j$	150	$^\circ\text{C}$
storage Temperature	$T_{stg}$	-55 ~ 150	$^\circ\text{C}$
High Temperature(tin solder)	$T_L$	300	$^\circ\text{C}$

### Thermal Characteristics

PARAMETER	SYMBOL	VALUE	UNIT
Thermal Resistance Junction to Case-sink (Note 2)	$R_{thJC}$	3.85	$^\circ\text{C/W}$
Thermal Resistance Junction to Ambient (Note 2)	$R_{thJA}$	108.7	$^\circ\text{C/W}$

# D12N06M

## Electrical Characteristics (Tc=25°C, unless otherwise noted)

PARAMETER	SYMBOL	Test Condition	VALUE			UNIT
			MIN	TYP	MAX	
Off Characteristics						
Drain-source Breakdown Voltage	V <sub>DS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	60	--	--	V
Drain-to-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V, T <sub>C</sub> =25℃	--	--	1	μA
		V <sub>DS</sub> =48V, V <sub>GS</sub> =0V, T <sub>C</sub> =125℃	--	--	100	μA
Gate-to-Source Forward Leakage	I <sub>GSSF</sub>	V <sub>GS</sub> =20V, V <sub>DS</sub> =0V	--	--	100	nA
Gate-to-Source Reverse Leakage	I <sub>GSSR</sub>	V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V	--	--	-100	nA
On Characteristics <sup>(Note 3)</sup>						
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.3	2.0	V
Drain-source on Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =4A	--	56	80	mΩ
Dynamic Characteristics <sup>(Note 4)</sup>						
Forward Transfer conductance	g <sub>fs</sub>	V <sub>DS</sub> =15V, I <sub>D</sub> =2A	--	3.0	--	S
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =30V, f=1.0MHz	--	247	--	pF
Output Capacitance	C <sub>oss</sub>		--	34	--	
Reverse Transfer Capacitance	C <sub>rss</sub>		--	19.5	--	
Switching Characteristics <sup>(note4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> =1.5A, V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, R <sub>GEN</sub> =1Ω	--	6	--	nS
Turn-on Rise Time	t <sub>r</sub>		--	15	--	nS
Turn-off Delay Time	t <sub>d(off)</sub>		--	15	--	nS
Turn-off Fall Time	t <sub>f</sub>		--	10	--	nS
Total Gate Charge	Q <sub>g</sub>	I <sub>D</sub> =3A, V <sub>DD</sub> =30V, V <sub>GS</sub> =4.5V	--	6	--	nC
Gate-to-Source Charge	Q <sub>gs</sub>		--	1	--	
Gate-to-Drain("Miller")Charge	Q <sub>gd</sub>		--	1.3	--	
Drain-Source Diode Characteristics						
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>FSD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =12A	--	--	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		--	--	12	A

### Notes:

- 1: Repetitive rating, pulse width limited by maximum junction temperature.
- 2: Surface mounted on FR4 Board,  $t \leq 10sec$ .
- 3: Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
- 4: Guaranteed by design, not subject to production .

## Typical characteristics diagrams

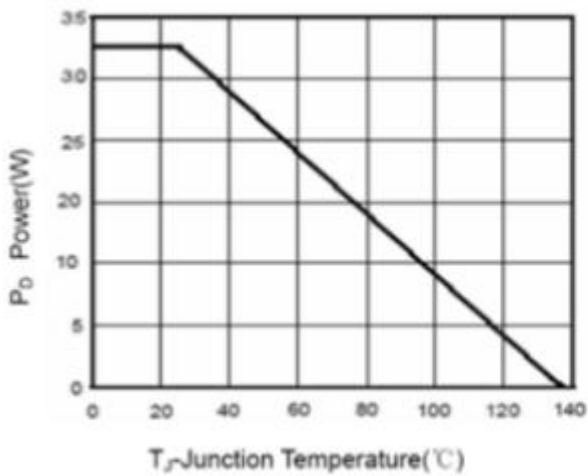


Figure 1 Power Dissipation

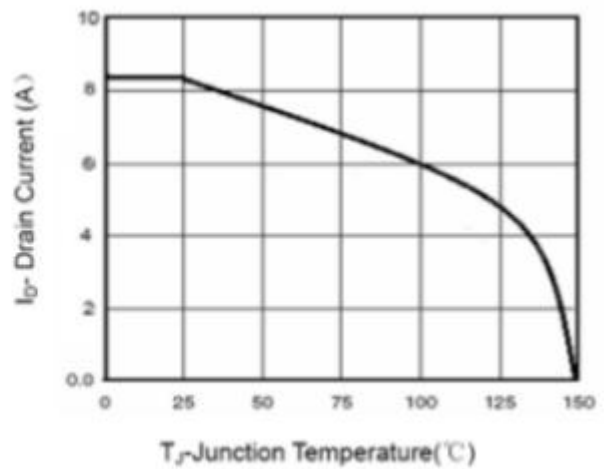


Figure 2 Drain Current

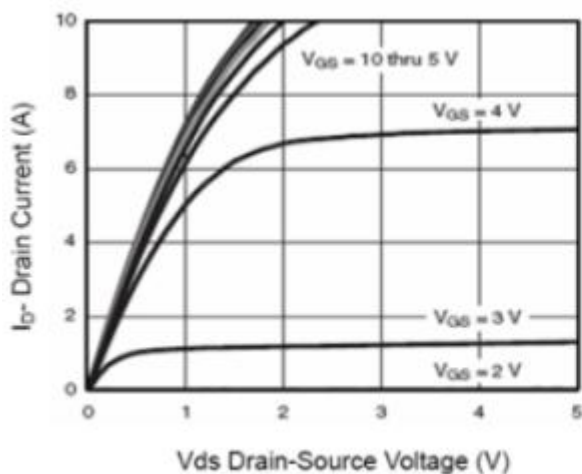


Figure 3 Output Characteristics

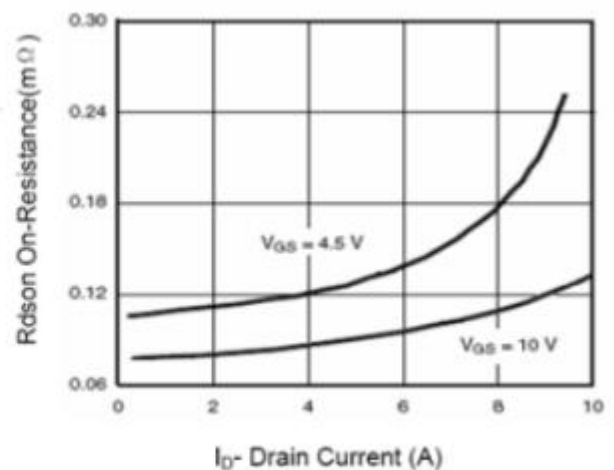


Figure 4 Drain-Source On-Resistance

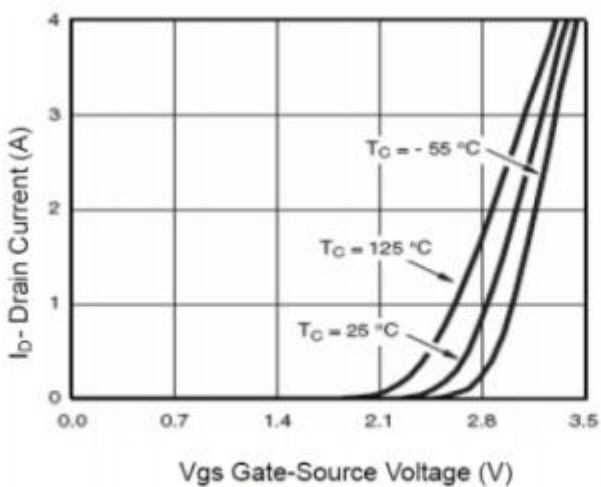


Figure 5 Transfer Characteristics

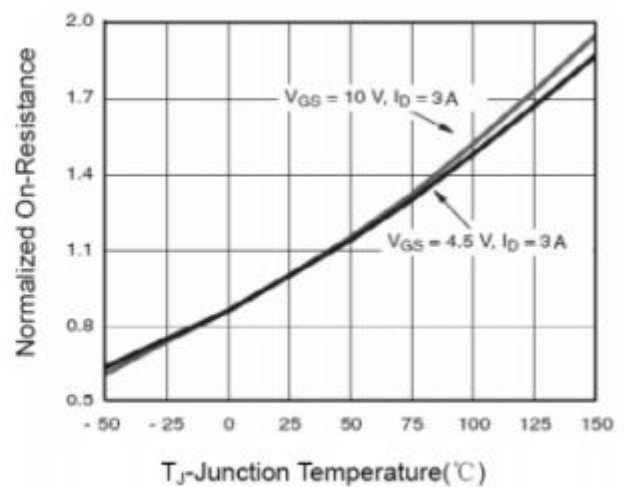
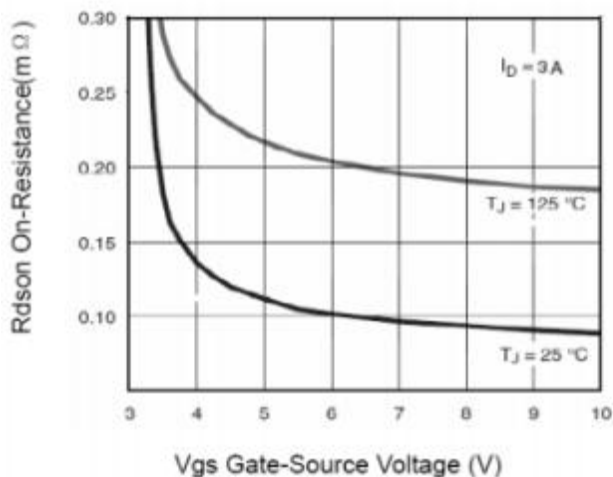
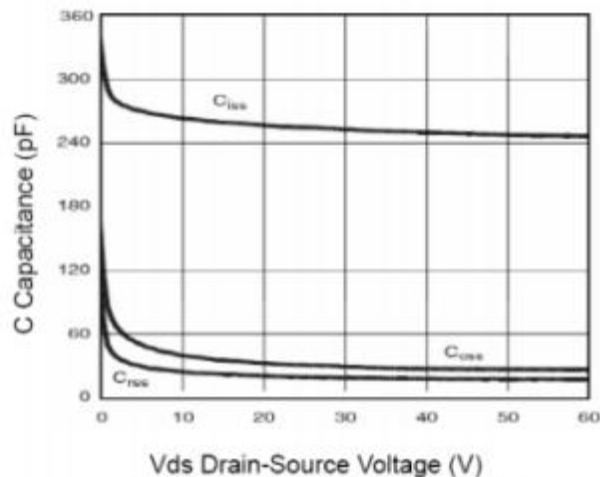


Figure 6 Drain-Source On-Resistance

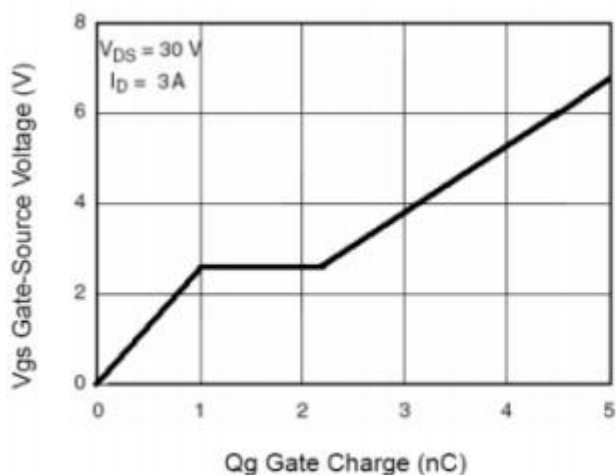
## Typical characteristics diagrams(continues)



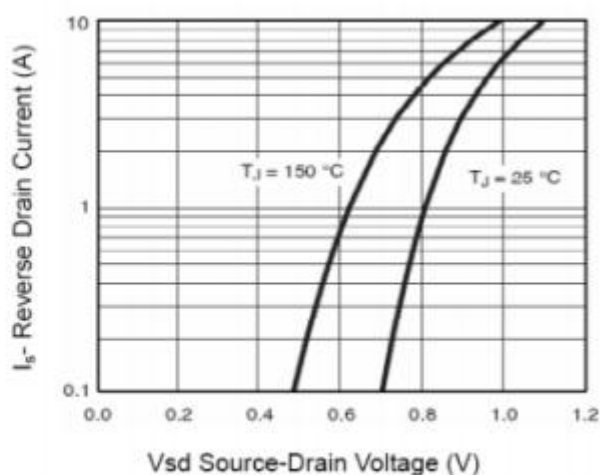
**Figure 7 Rdson vs Vgs**



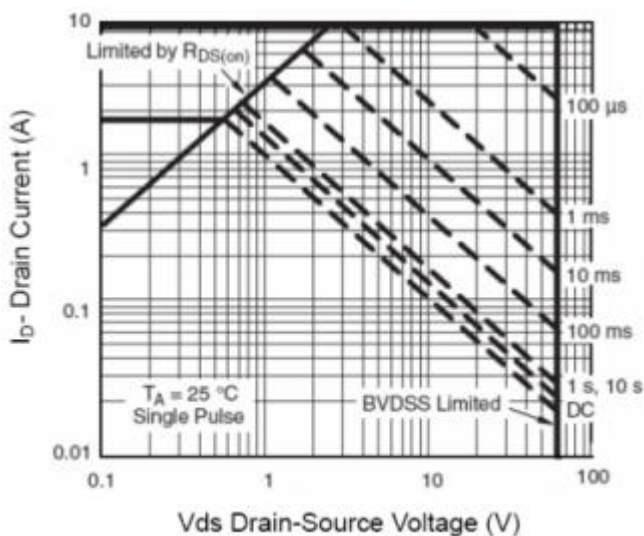
**Figure 8 Capacitance vs Vds**



**Figure 9 Gate Charge**

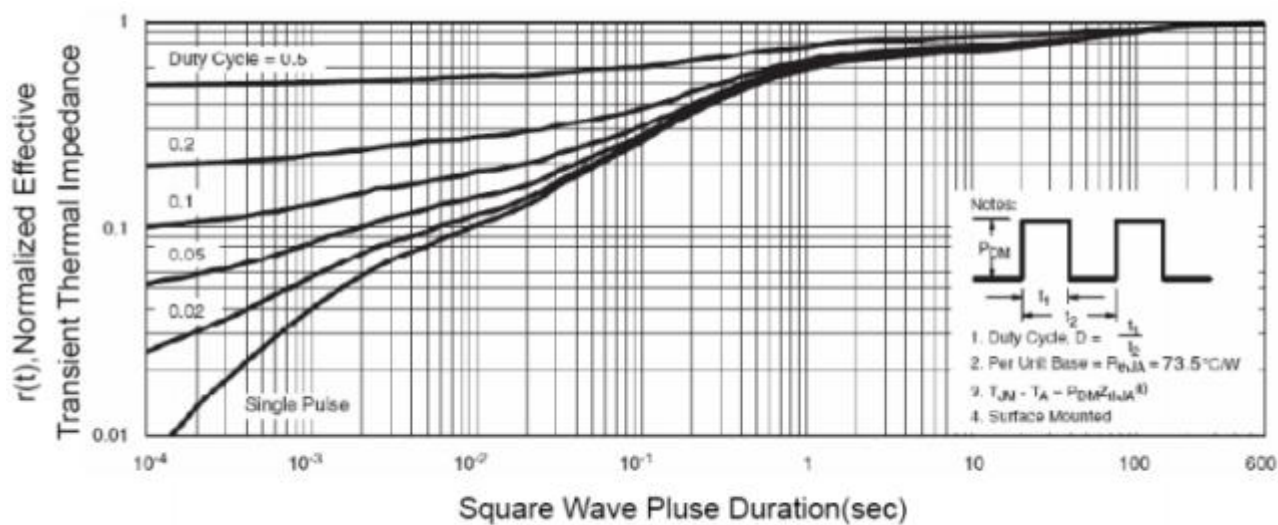


**Figure 10 Source- Drain Diode Forward**



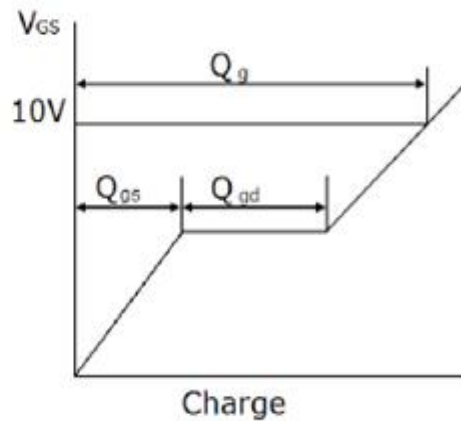
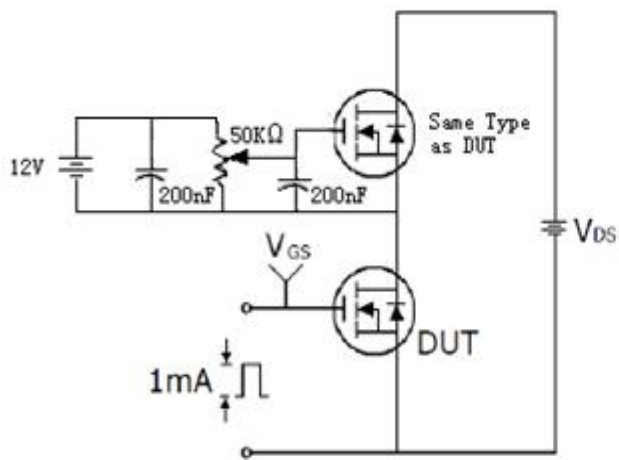
**Figure 11 Safe Operation Area**

## Typical characteristics diagrams(continues)

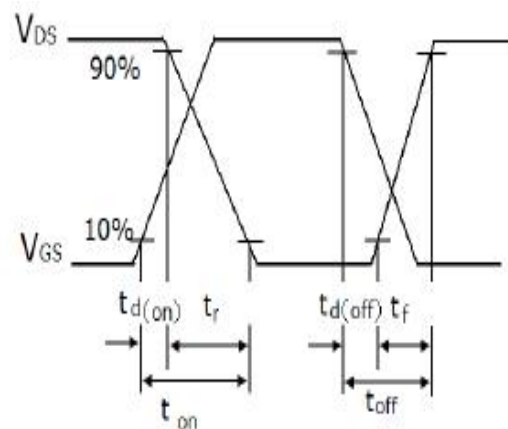
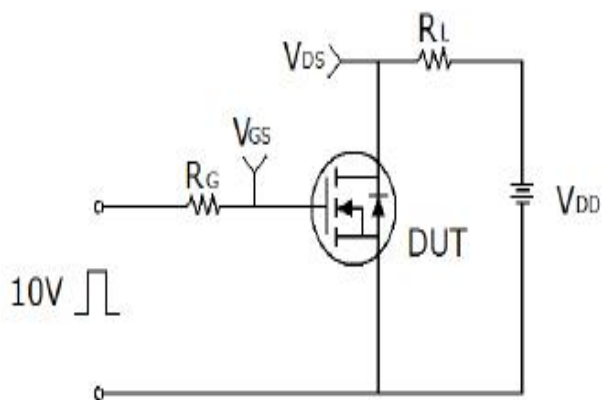


**Figure 12 Normalized Maximum Transient Thermal Impedance**

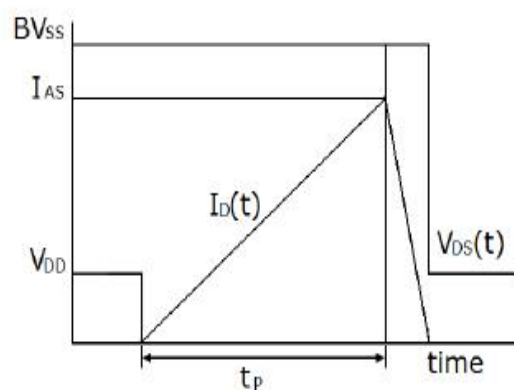
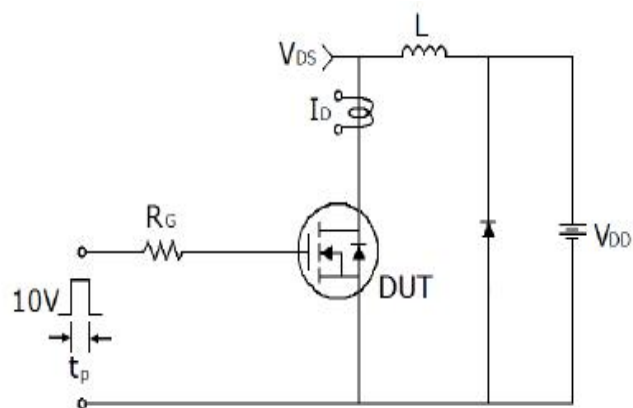
## Typical Test Circuit and Waveform



1) Gate charge test circuit & Waveform

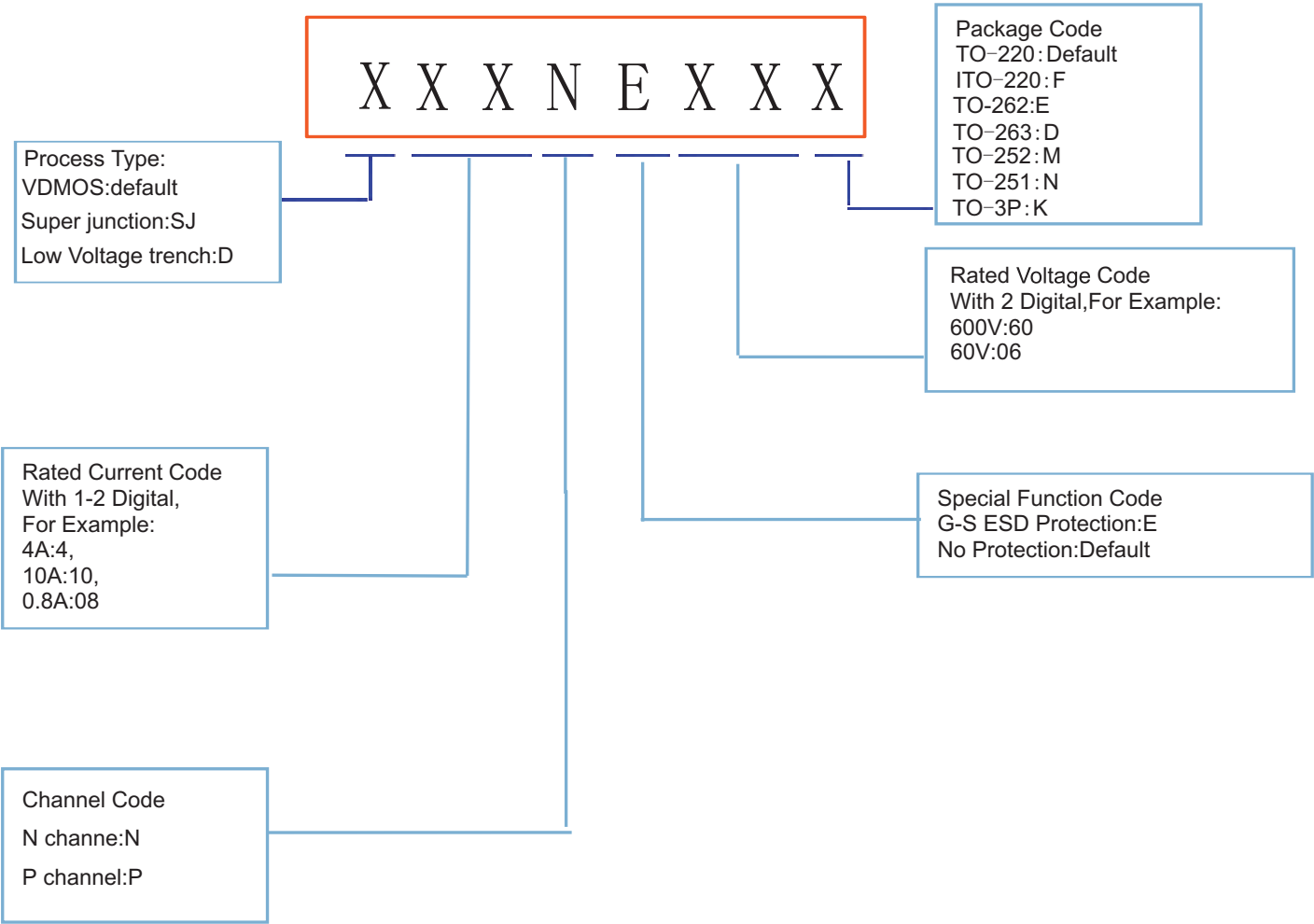


2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms

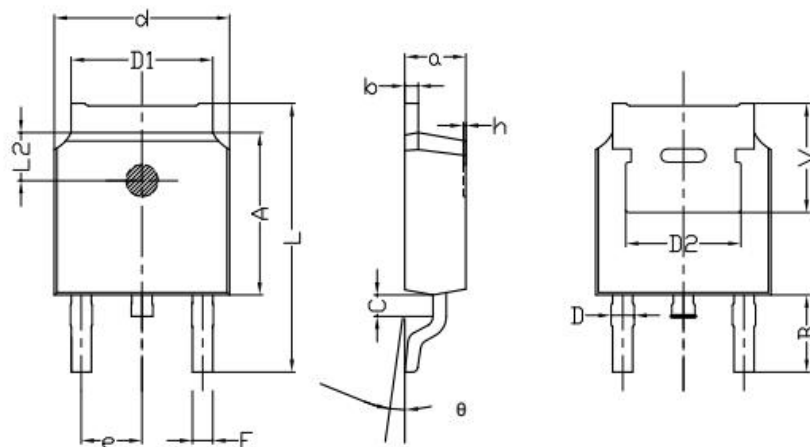
Product Names Rules





## Dimensions

### TO-252 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
a	2.20	2.40	0.087	0.095
b	0.46	0.58	0.018	0.023
c	0.70	0.90	0.028	0.035
D	0.80	1.00	0.032	0.039
d	6.30	6.70	0.248	0.264
D1	5.00	5.50	0.197	0.217
D2	TYP 4.83		TYP 0.190	
A	5.80	6.20	0.228	0.244
e	2.19	2.39	0.086	0.094
L	9.40	10.40	0.370	0.409
B	2.6	3.2	0.102	0.126
L2	1.5	1.8	0.059	0.071
θ	0	8	0	8
h	0	0.3	0	0.012
V	5.25	5.85	0.207	0.230