SEMICONDUCTOR

D16N04Q

20A 40V N-Channel Enhancement Mode Power MOSFET

Features

- High Reliability Capability
- Extremely low on-resistance RDS(on)
- Excellent gate charge x RDS(on) product(FOM)

Product Summary			
V_{DS}	$R_{DS(on)}$ (mΩ) Typ	I_D (A)	Qg (Typ)
40V	15.6 @ 10V 9A	20	20nc

Mechanical Data

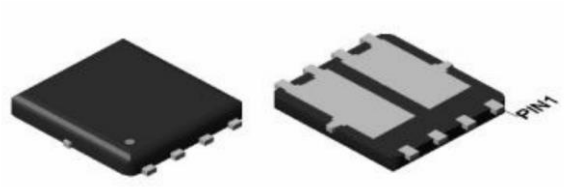
- Case:DFN3×3 Package

DFN3×3

D16N04G

Application

- Charger
- DC/DC converter
- Ideal for high-frequency switching and synchronous rectification



Top View **Bottom View**

Ordering Information

Part No.	Package Type	Package	Quality(box)
D16N04Q	DFN3×3	Tape & Reel	5000

Block Diagram

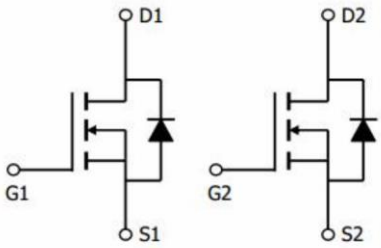


Table1 Absolute Maximum Ratings (T_C=25°C, unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C=25°C	I_D	20	A
	T_C=100°C		13	
Pulsed Drain Current (Note 1)		I_{DM}	80	A
Single Pulse Avalanche Energy(Note 2)		E_{AS}	46	mJ
Power Dissipation	T_C=25°C	P_D	12	W
Operating Junction and Storage Temperature		T_J/T_{STG}	-55~+150	°C

Table 2.Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62	°C/W
Thermal resistance Junction to Case	$R_{\theta JC}$	10	°C/W

Table 3. Electrical Characteristics (T_J=25°C, unless otherwise specified)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V,I_D=250μA	40	-	-	V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=40V,V_{GS}=0V	-	-	1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=20V,V_{DS}=0V	-	-	100	nA
	Reverse		V_{GS}=-20V,V_{DS}=0V	-	-	-100	nA
On Characteristics(Note 3)							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=250μA	1.0	1.5	2.5	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V,I_D=9A	-	15.6	21	mΩ
Dynamic Characteristics(Note 4)							
Input Capacitance		C_{ISS}	V_{DS}=20V,V_{GS}=0V,f=1MHz	-	716	-	pF
Output Capacitance		C_{OSS}		-	78	-	pF
Reverse Transfer Capacitance		C_{RSS}		-	63	-	pF
Switching Characteristics (Note 4)							
Turn-On Delay Time		td(on)	V_{DS}=20V,I_D=5A V_{GS}=10V,R_L=3Ω,	-	11	-	ns
Turn-On Rise Time		t_R		-	9	-	ns
Turn-Off Delay Time		td(off)		-	33	-	ns
Turn-Off Fall Time		tf		-	17	-	ns
Total Gate Charge		Q_G	V_{DS}=20V,I_D=5A, V_{GS}=10V	-	20	-	nC
Gate-Source Charge		Q_{GS}		-	4	-	nC
Gate-Drain Charge		Q_{GD}		-	4	-	nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_S=10A	-	-	1.2	V
Maximum Continuous Drain-Source Diode Forward Current		I_S		-	-	20	A
Reverse Recovery Time		trr	V_{GS}=0V, I_F=10A dI$_F$/dt=100A/μs	-	23	-	ns
Reverse Recovery Charge		Q_{RR}		-	11	-	nC

Notes：1 Repetitive Rating:Pulse width limited by maximum junction temperature
2 L=0.5mH, R_G=25Ω,,Starting T_J=25°C
3 Pulse Test: Pulse width ≤300μS, Duty cycle≤2%
4 Guaranteed by design,not subject to production

Typical Characteristics Diagrams

Figure 1.Output Characteristics

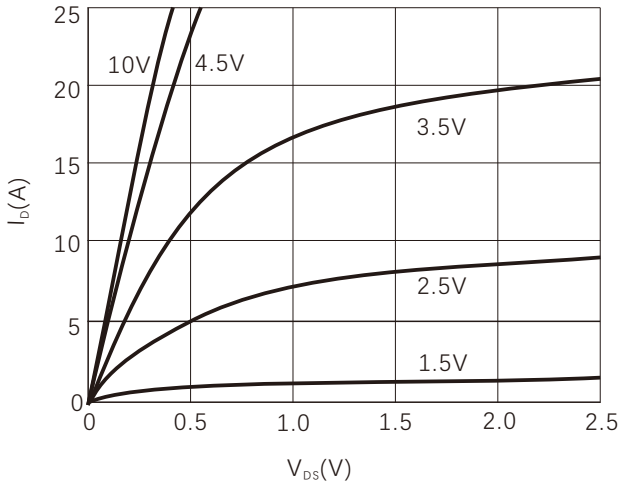


Figure 2. Transfer Characteristics

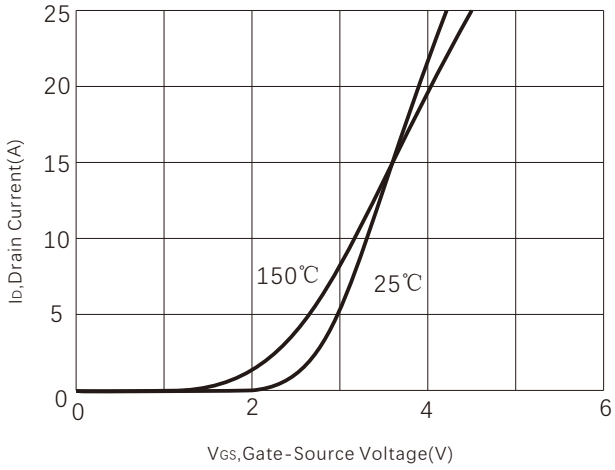


Figure3.Normalized $R_{DS(ON)}$ vs Temperature

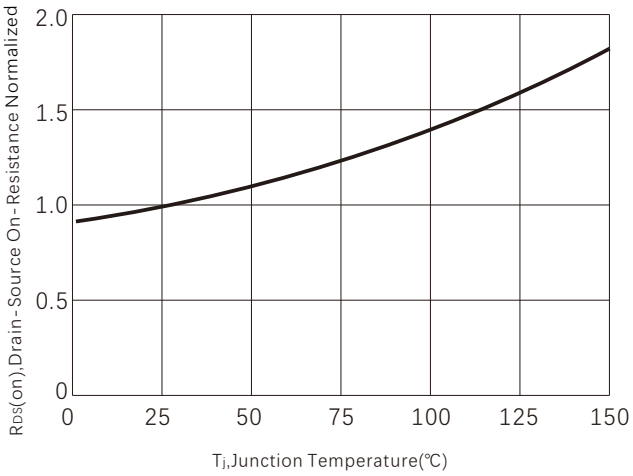


Figure 4. Capacitance

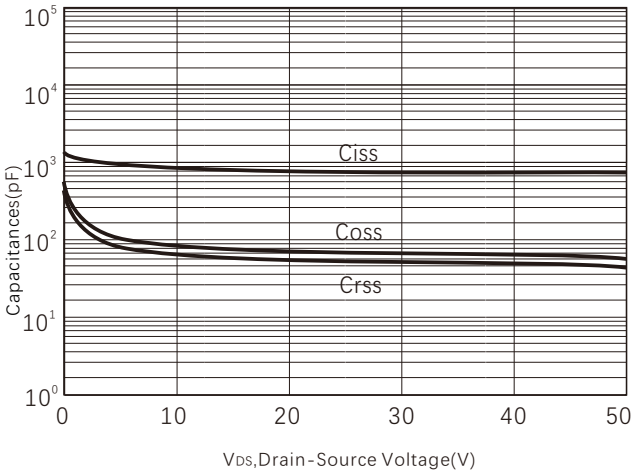


Figure 5.Gate charge

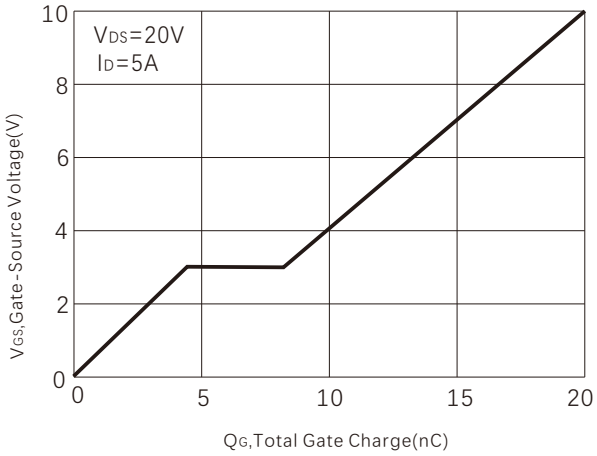


Figure 6.Source-Drain Diode Forward Voltage

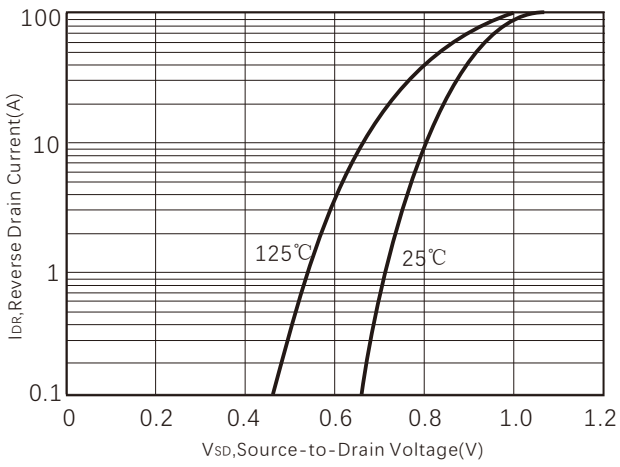


Figure7.Maximum Drain Current vs Temperature

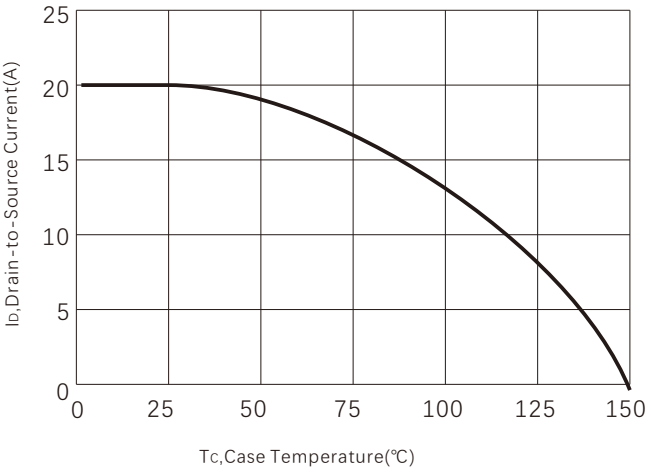


Figure 8. BV_{DSS} vs Junction Temperature

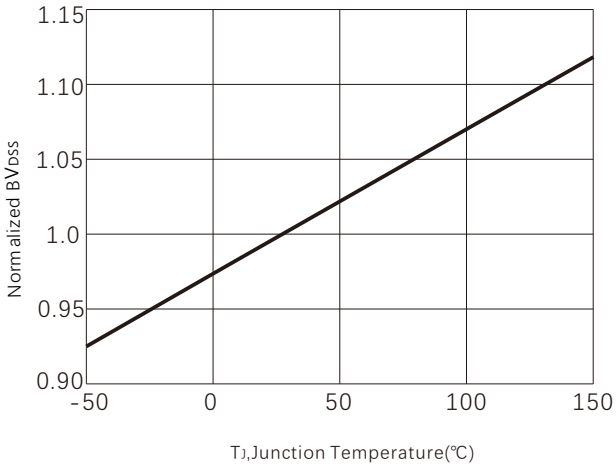


Figure 10.

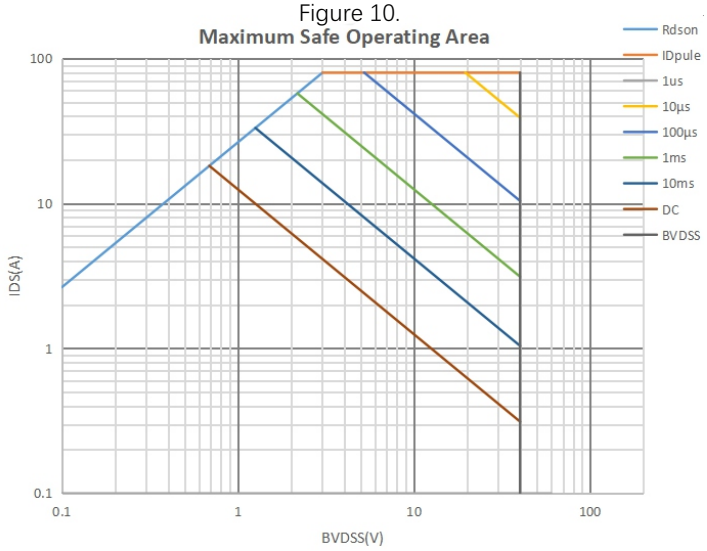
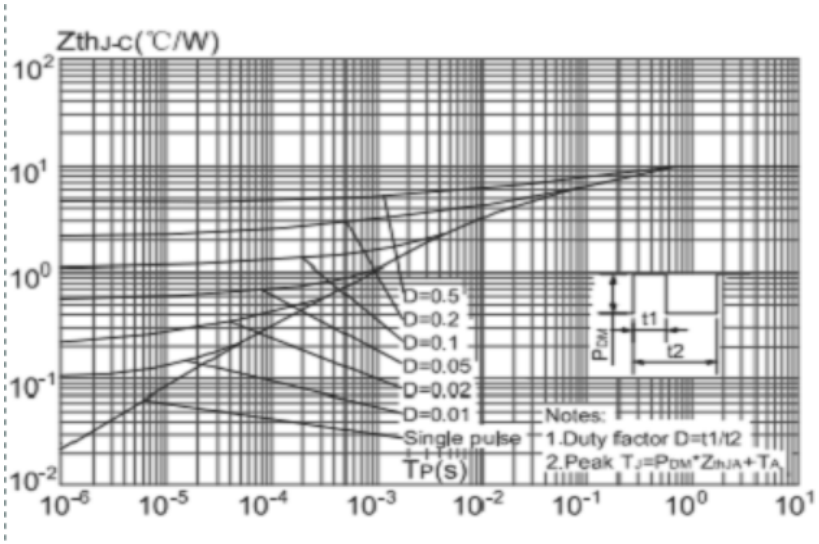
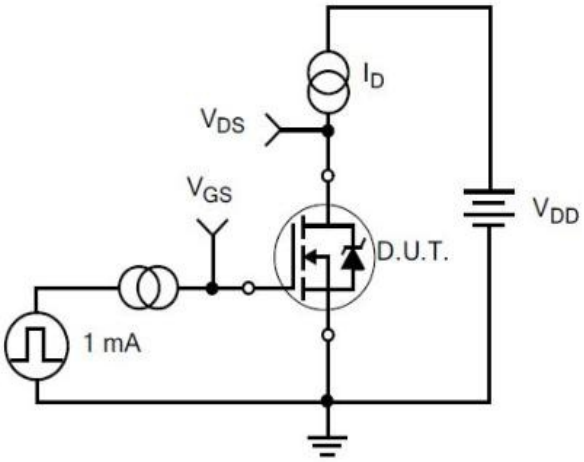


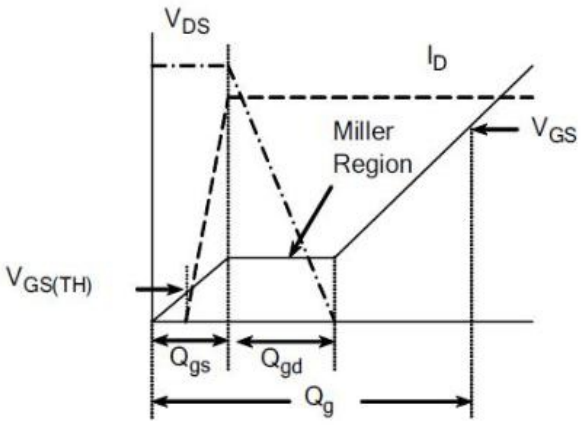
Figure 11. Maximum Transient Thermal Impedance



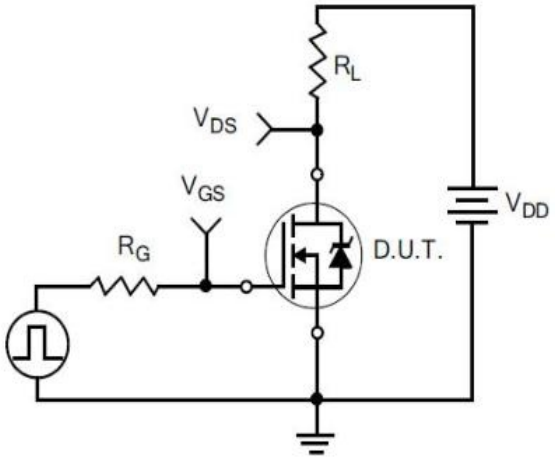
Typical Test Circuit



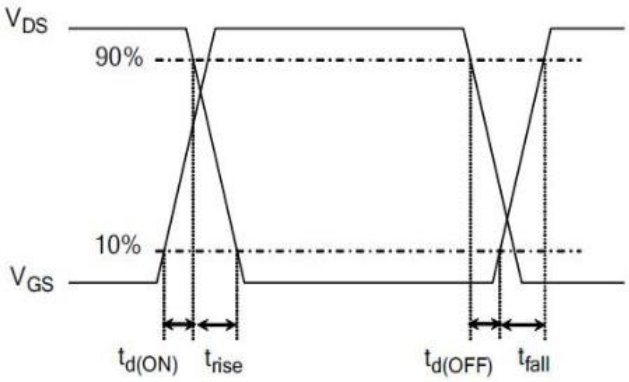
1) Gate Charge Test Circuit



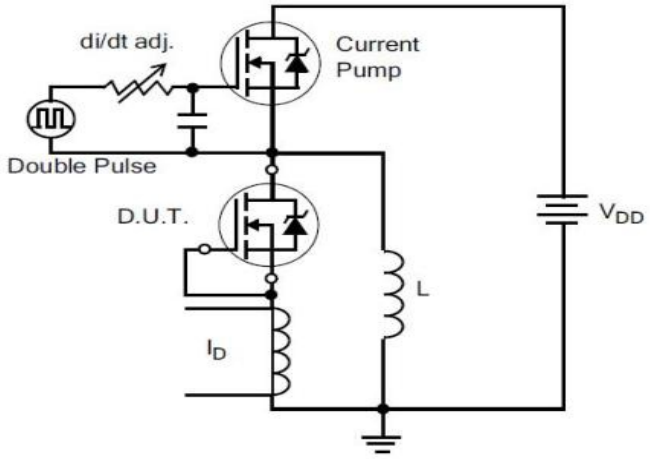
2) . Gate Charge Waveform



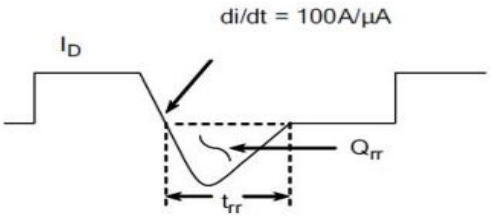
3) Resistive Switching Test Circuit



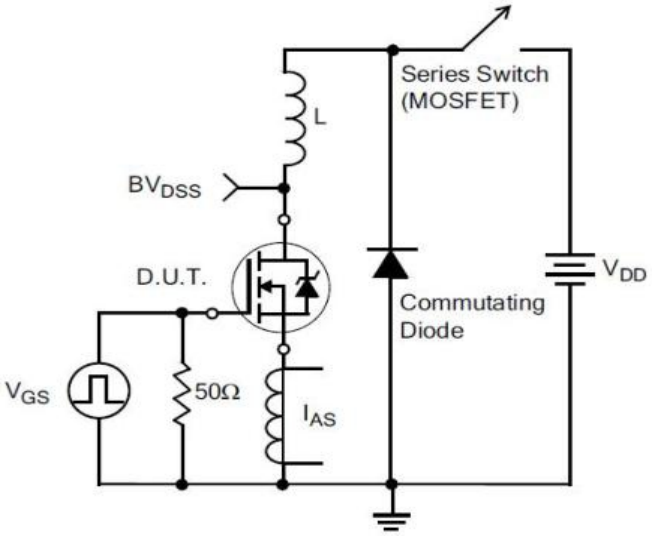
4) Resistive Switching Waveforms



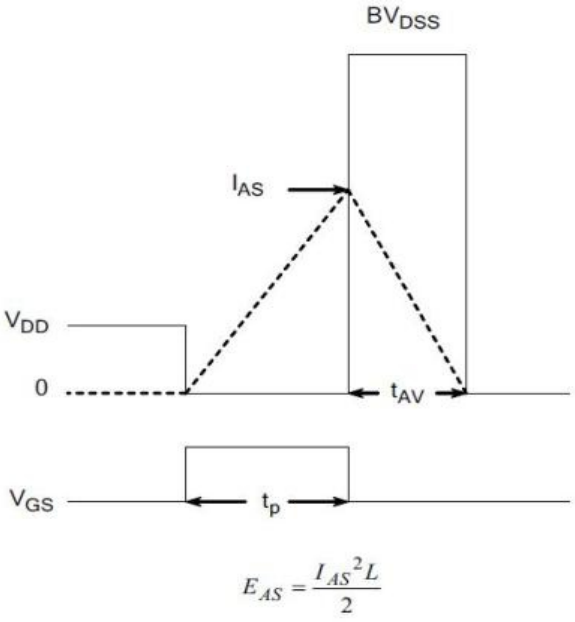
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



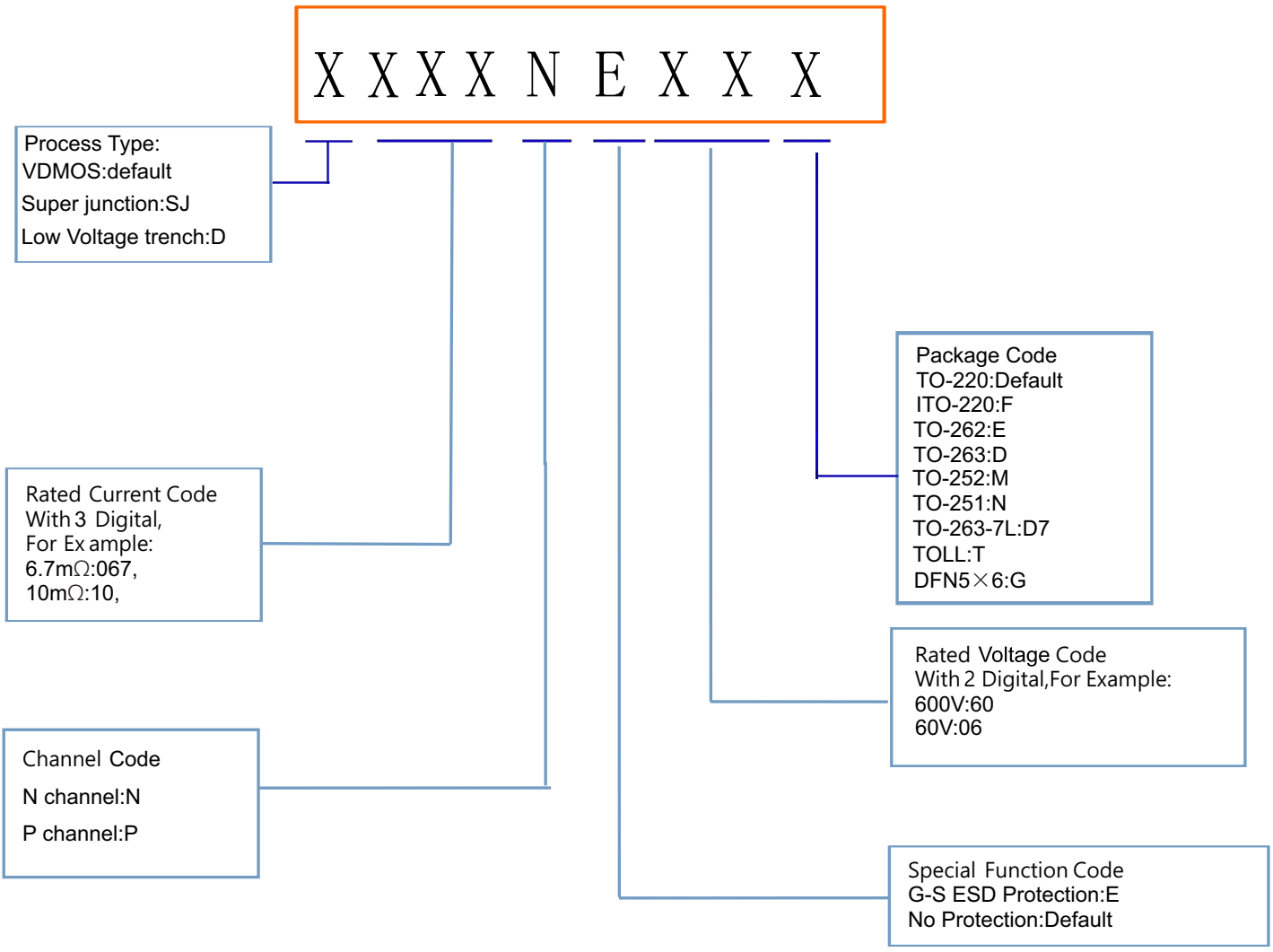
7) . Unclamped Inductive Switching Test Circuit



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

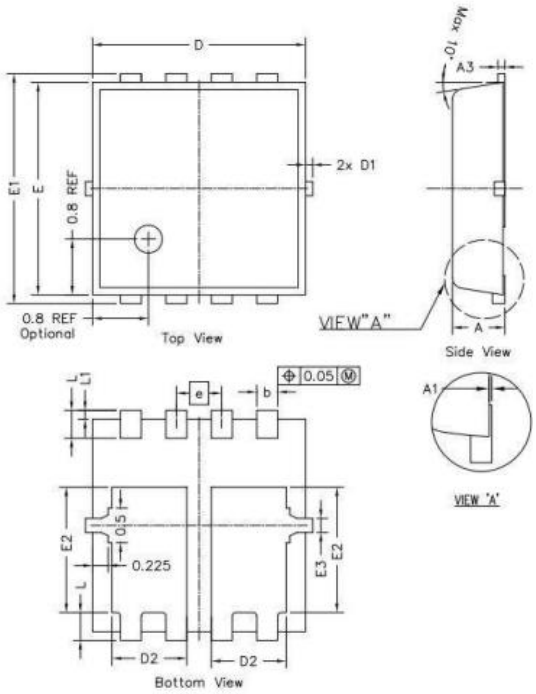
8) Unclamped Inductive Switching Waveforms

Product Names Rules



Dimensions

DFN3×3 PACKAGE OUTLINE DIMENSIONS



SYMBOLS	DIMENSION IN MM			DIMENSION IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.700	0.750	0.800	0.028	0.030	0.031
A1	---	---	0.050	-----	-----	0.002
A3	0.144	0.152	0.202	0.006	0.006	0.008
b	0.250	0.300	0.350	0.010	0.012	0.014
e	0.65 BSC			0.026 BSC		
D	2.950	3.050	3.150	0.116	0.120	0.124
E	2.950	3.050	3.150	0.116	0.120	0.124
D1	---	---	0.125	-----	-----	0.005
E1	3.200	3.300	3.400	0.126	0.130	0.134
D2	0.970	1.070	1.170	0.038	0.042	0.046
E2	1.700	1.800	1.900	0.067	0.071	0.075
E3	0.150	0.200	0.250	0.006	0.008	0.010
L	0.300	0.400	0.500	0.012	0.016	0.020
L1	0.075	0.125	0.175	0.003	0.005	0.007

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