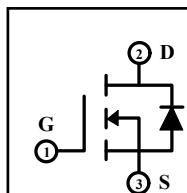


20A 500V N-channel Enhancement Mode Power MOSFET

1 Description

These silicon N-channel enhanced vdmofets, is obtained by the self-aligned planar technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. Which accords with the RoHS standard.



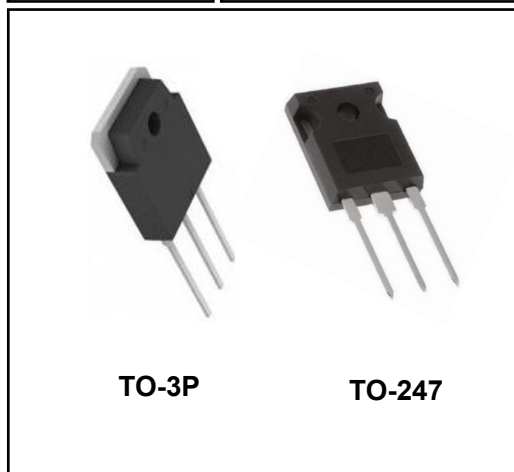
$V_{DSS} = 500V$
 $R_{DS(on)(TYP)} = 0.24\Omega$
 $I_D = 20A$

2 Features

- Fast switching
- Low on resistance($R_{dson} \leq 0.3\Omega$)
- Low gate charge(Typ: 52nC)
- Low reverse transfer capacitances(Typ: 16pF)
- 100% single pulse avalanche energy test
- 100% ΔV_{DS} test

3 Applications

- Used in various power switching circuit for system miniaturization and higher efficiency.
- Power switch circuit of adaptor and charger.



4 Electrical Characteristics

4.1 Absolute Maximum Rating ($T_c=25^\circ C$, unless otherwise noted)

Parameter	Symbol	Rating	Units
Drain-to-Source Voltage	V_{DSS}	500	V
Gate-to-Source Voltage	V_{GSS}	± 30	V
Continuous Drain Current	I_D	$T_C=25^\circ C$	20
		$T_C=100^\circ C$	12.5
Pulsed Drain Current ⁽¹⁾	I_{DM}	80	A
Single Pulse Avalanche Energy ⁽⁴⁾	E_{AS}	1500	mJ
Repetitive Avalanche Energy ⁽⁴⁾	E_{AR}	90	mJ
Repetitive Avalanche Current ⁽⁴⁾	I_{AR}	4.3	A
Peak Diode Recovery dv/dt ⁽⁵⁾	dv/dt	5	V/ns
Power Dissipation	P_{tot}	$T_a=25^\circ C$	2
		$T_C=25^\circ C$	230
Junction Temperature Range	T_j	-55~150	$^\circ C$
Storage Temperature Range	T_{stg}	-55~150	$^\circ C$
Maximum Temperature for soldering	T_L	300	$^\circ C$

4.2 Thermal Characteristics

Parameter	Symbol	Rating	Unit
Thermal Resistance, Junction to Case-sink	R_{thJC}	0.54	$^\circ C/W$
Thermal Resistance, Junction to Ambient	R_{thJA}	62.5	$^\circ C/W$

4.3 Electrical Characteristics (T_c=25°C, unless otherwise noted)

Parameter	Symbol	Test Condition	Value			Units
			Min	Typ	Max	
Off Characteristics						
Drain-to-Source Breakdown Voltage	BV _{DSS}	I _D =250μA, V _{GS} =0V	500	--	--	V
Drain-to-Source Leakage Current	I _{DSS}	V _{DS} =500V, V _{GS} =0V, T _C =25°C	--	--	1	μA
		V _{DS} =400V, V _{GS} =0V, T _C =125°C	--	--	100	μA
Gate-to-Source Leakage Current	I _{GSS}	V _{GS} =±30V	--	--	±100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2	--	4	V
Drain-to-Source on-state Resistance	R _{DS(on)}	V _{GS} =10V, I _D =10A	--	0.24	0.3	Ω
Forward Transfer Conductance	g _{fs}	V _{DS} =15V, I _D =10A	--	18	--	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz	--	2919	--	pF
Output Capacitance	C _{oss}		--	277	--	
Reverse Transfer Capacitance	C _{rss}		--	16	--	
Switching Characteristics						
Turn-on Delay Time	t _{d(on)}	I _D =20A, V _{DD} =250V, R _G =10Ω	--	34	--	nS
Turn-on Rise Time	t _r		--	65	--	
Turn-off Delay Time	t _{d(off)}		--	82	--	
Turn-off Fall Time	t _f		--	45	--	
Total Gate Charge	Q _g	I _D =20A, V _{DD} =400V, V _{GS} =10V	--	52	--	nC
Gate-to-Source Charge	Q _{gs}		--	12.6	--	
Gate-to-Drain("Miller") Charge	Q _{gd}		--	18.6	--	
Drain-Source Diode Characteristics						
Diode Forward Voltage ⁽³⁾	V _{FSD}	V _{GS} =0V, I _S =20A	--	--	1.5	V
Diode Forward Current	I _S		--	--	20	A
Reverse Recovery Time ⁽³⁾	t _{rr}	T _J =25°C, I _S =20A, di _F /dt=100A/μS, V _{GS} =0V	--	535	--	nS
Reverse Recovery Charge ⁽³⁾	Q _{rr}		--	5671	--	nC
Reverse Recovery Current ⁽³⁾	I _{RRM}		--	21.2	--	A

Notes:

- 1: Repetitive rating, pulse width limited by maximum junction temperature.
- 2: Surface mounted on FR4 Board, t_s≤10sec.
- 3: Pulse width ≤ 300μs, duty cycle ≤ 2%.
- 4: L=10mH, I_D=17.3A, Start T_J=25°C.
- 5: I_{SD}=20A, di/dt≤100A/μs, V_{DD}≤BV_{DSS}, Start T_J=25°C.

5 Typical characteristics diagrams

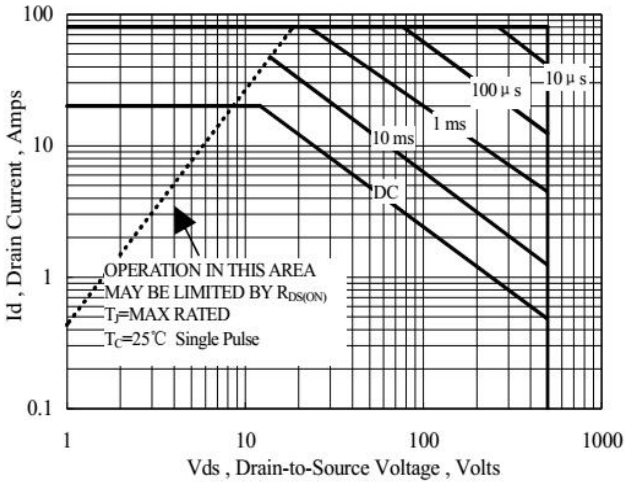


Figure 1 Maximum Forward Bias Safe Operating Area

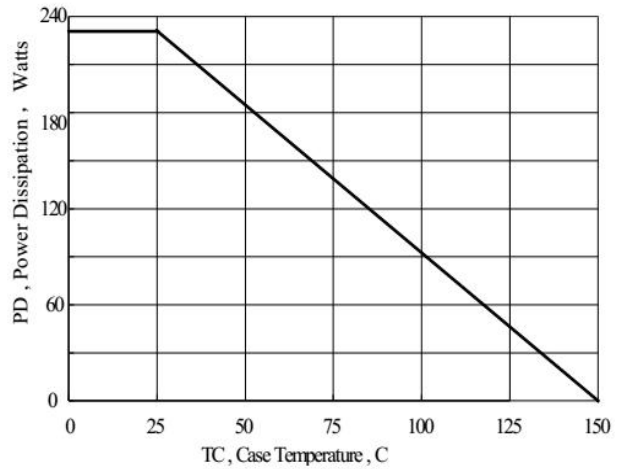


Figure 2 Maximum Power Dissipation vs Case Temperature

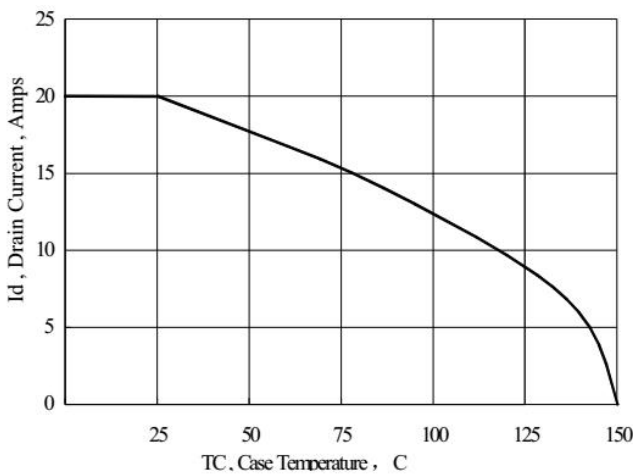


Figure 3 Maximum Continuous Drain Current vs Case Temperature

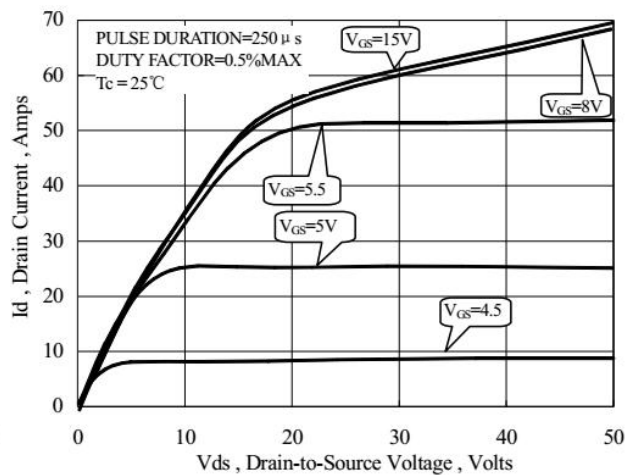


Figure 4 Typical Output Characteristics

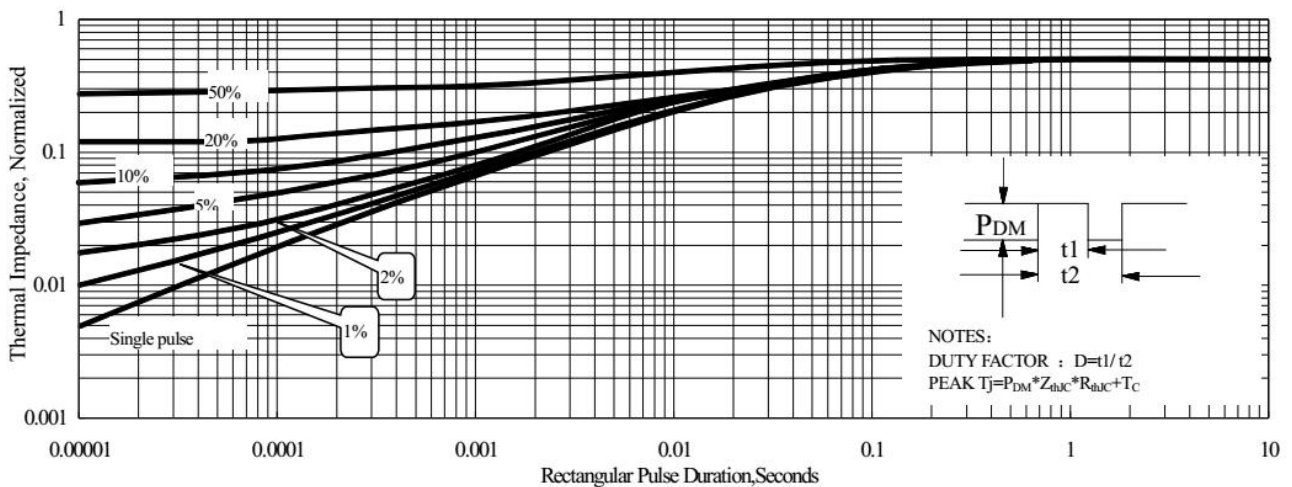


Figure 5 Maximum Effective Thermal Impedance, Junction to Case

5 Typical characteristics diagrams(continues)

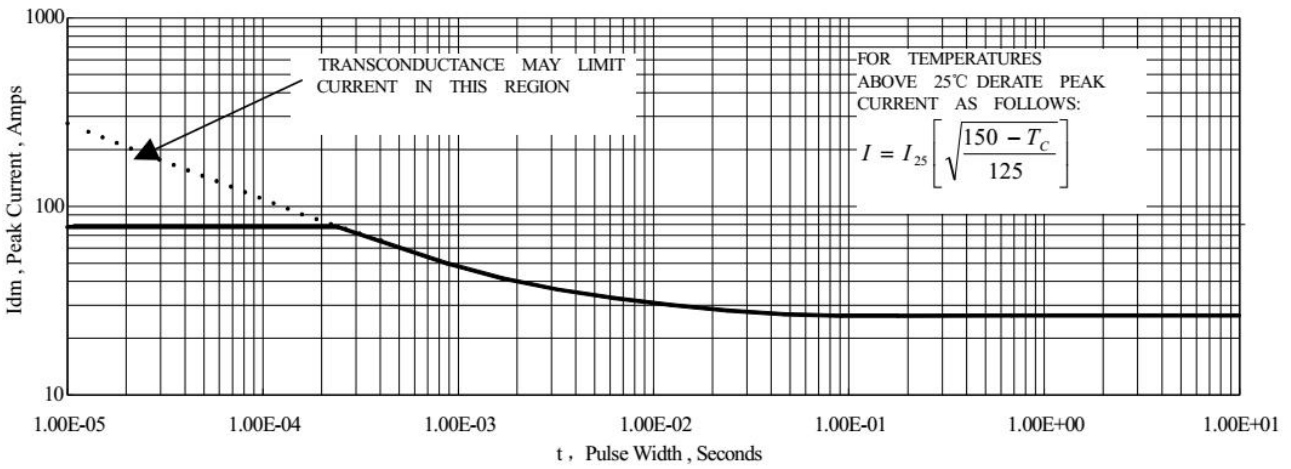


Figure 6 Maximum Peak Current Capability

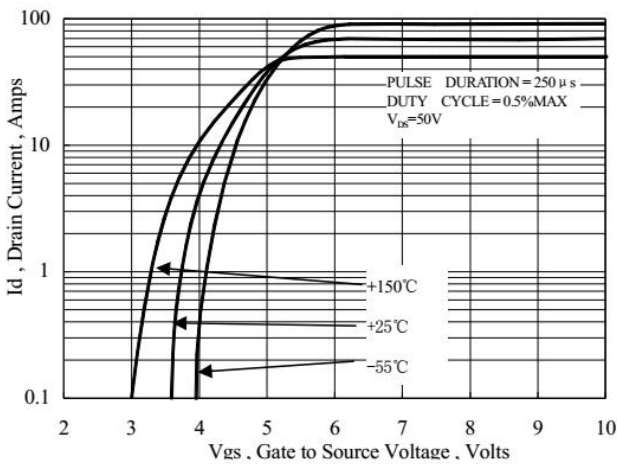


Figure 7 Typical Transfer Characteristics

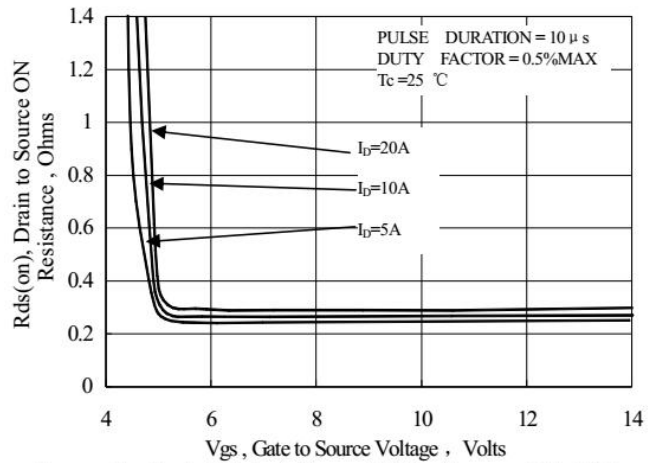


Figure 8 Typical Drain to Source ON Resistance vs Gate Voltage and Drain Current

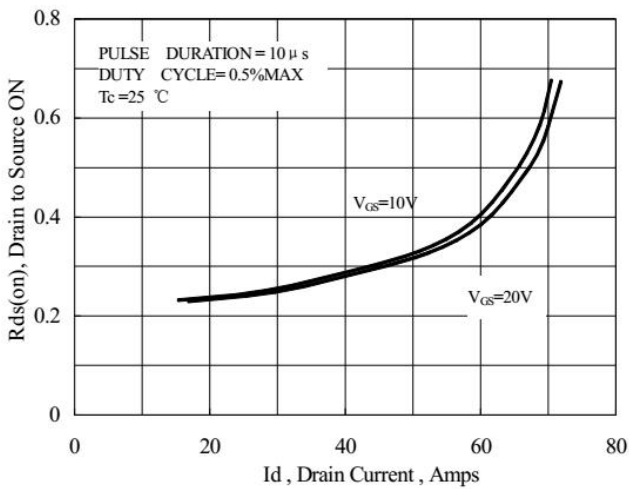


Figure 9 Typical Drain to Source ON Resistance vs Drain Current

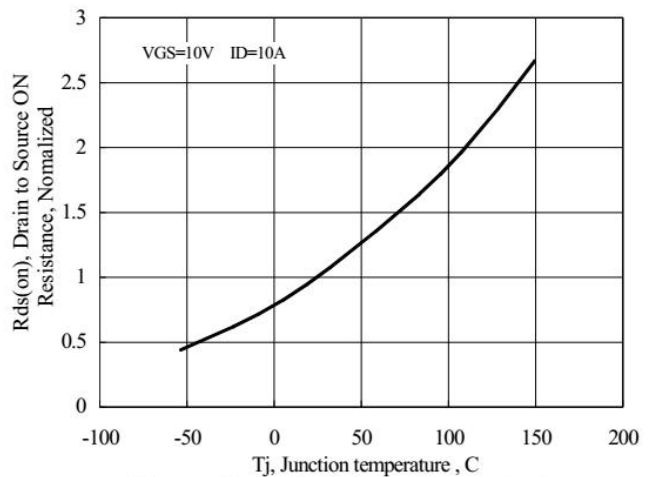


Figure 10 Typical Drain to Source on Resistance vs Junction Temperature

5 Typical characteristics diagrams(continues)

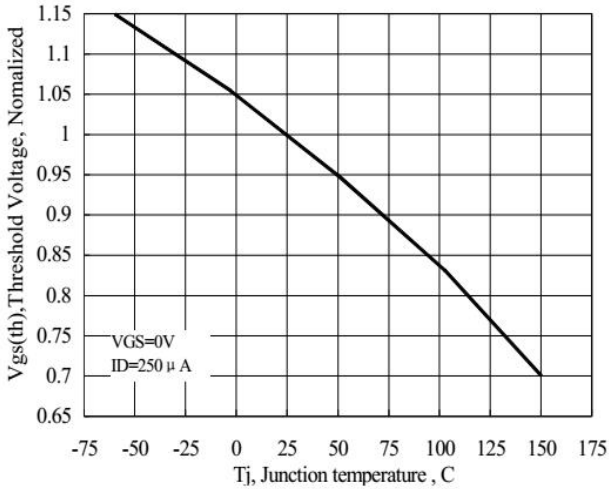


Figure 11 Typical Theshold Voltage vs Junction Temperature

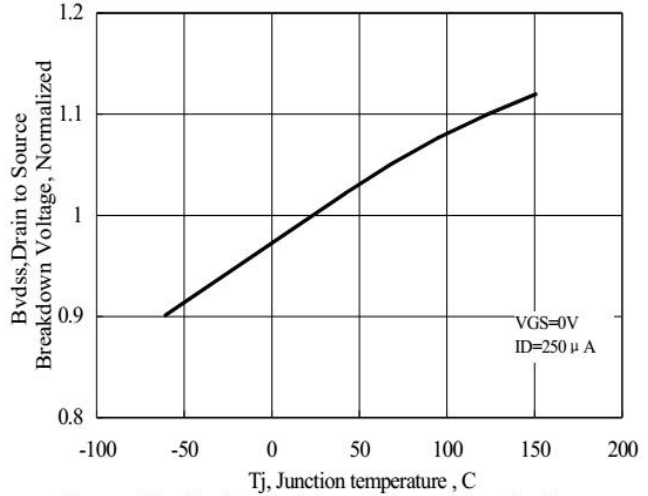


Figure 12 Typical Breakdown Voltage vs Junction Temperature

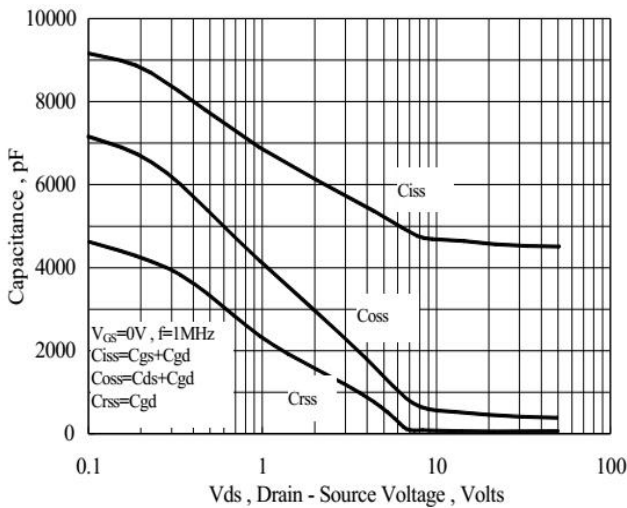


Figure 13 Typical Capacitance vs Drain to Source Voltage

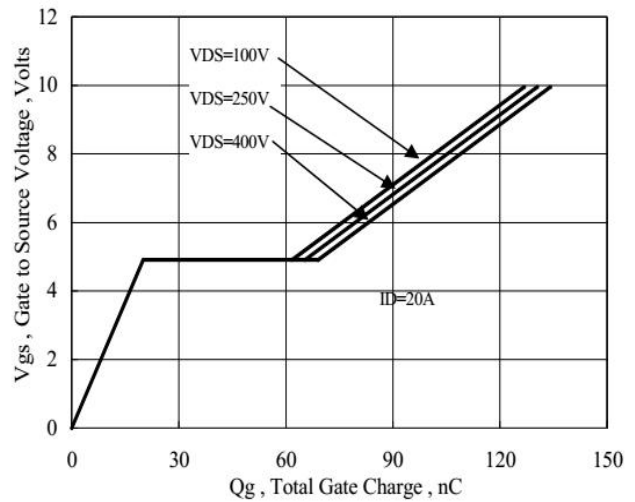


Figure 14 Typical Gate Charge vs Gate to Source Voltage

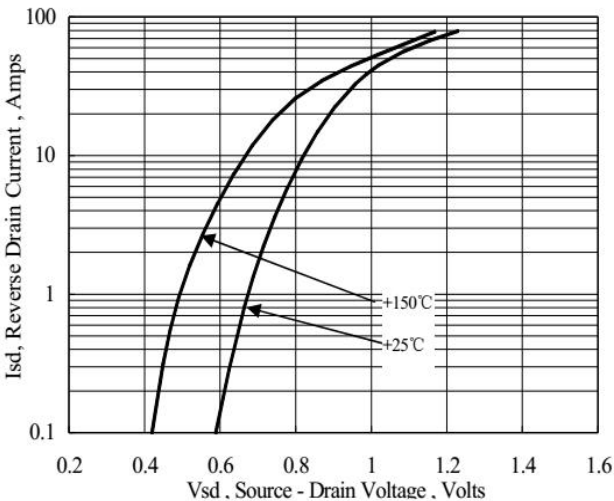


Figure 15 Typical Body Diode Transfer Characteristics

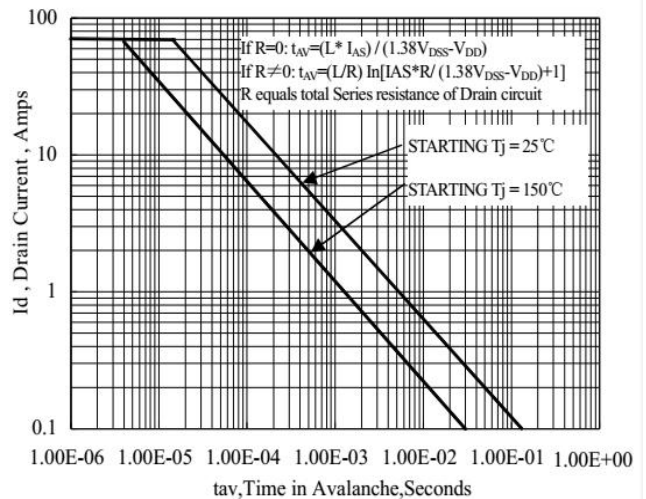
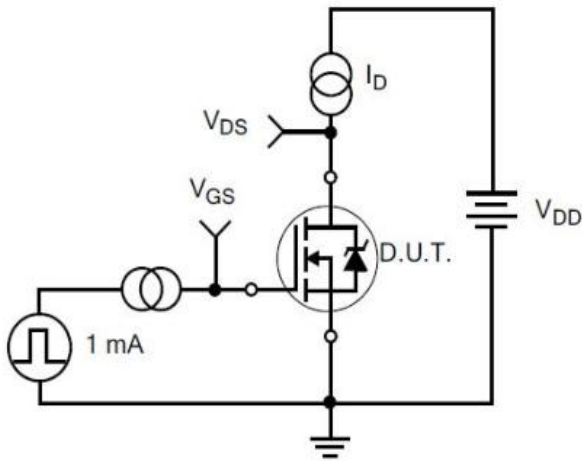
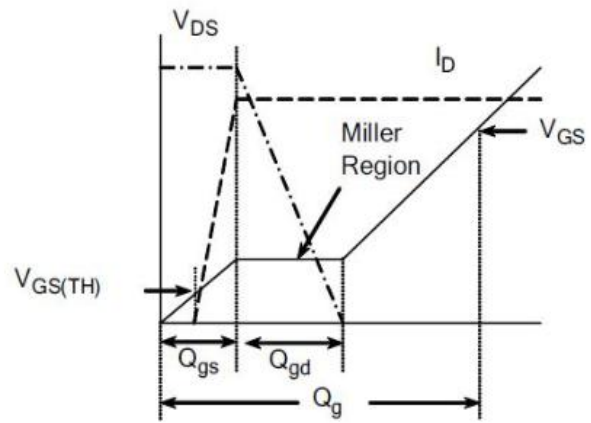


Figure 16 Unclamped Inductive Switching Capability

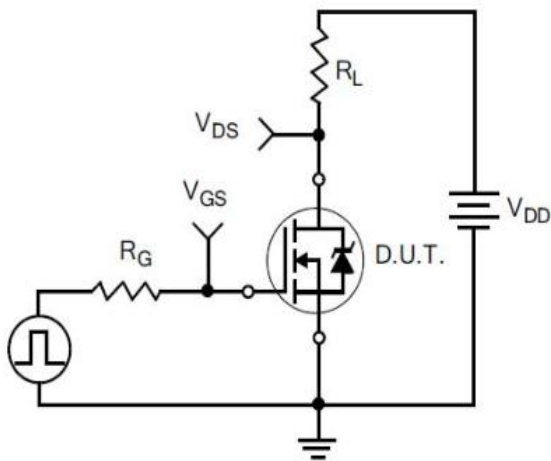
6 Typical Test Circuit and Waveform



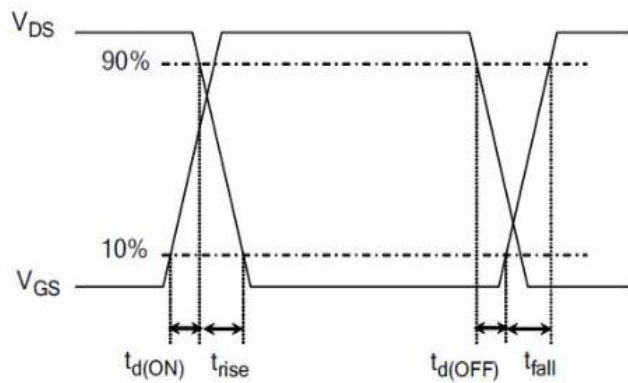
1) Gate Charge Test Circuit



2) Gate Charge Waveform

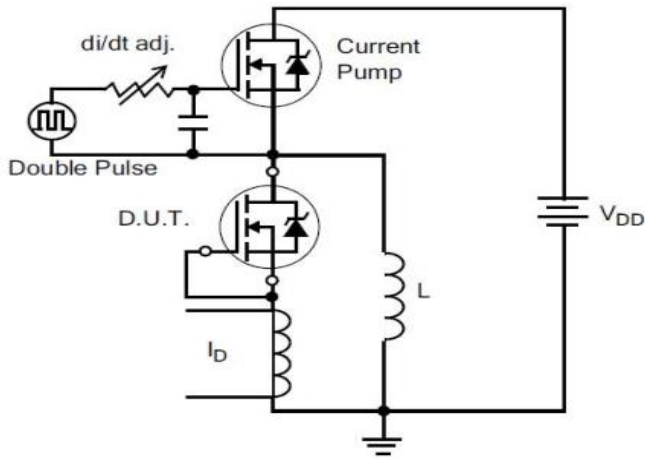


3) Resistive Switching Test Circuit

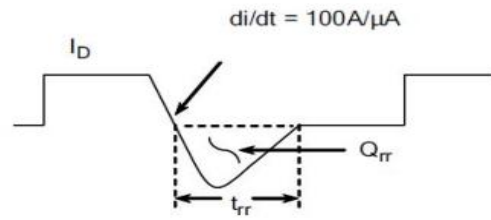


4) Resistive Switching Waveforms

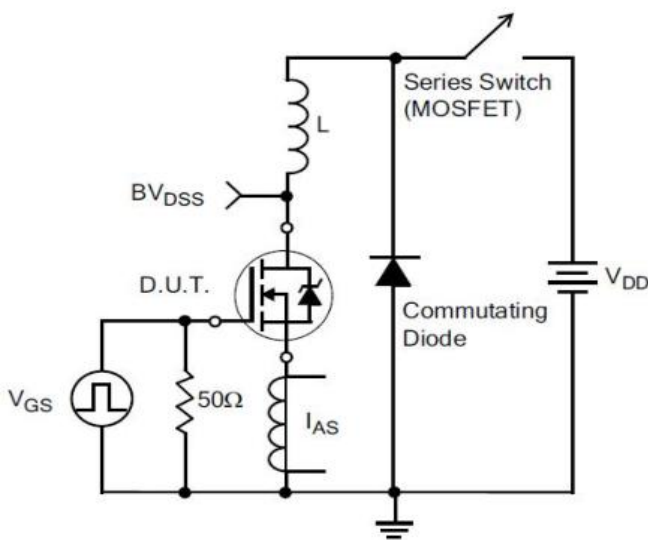
6 Typical Test Circuit and Waveform(continues)



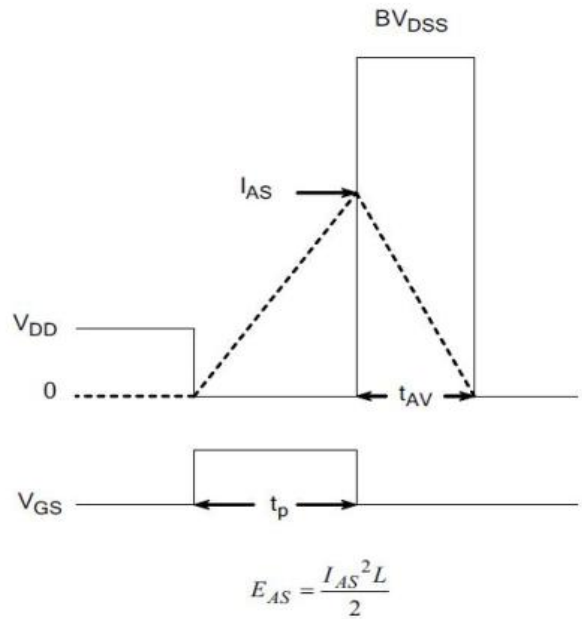
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

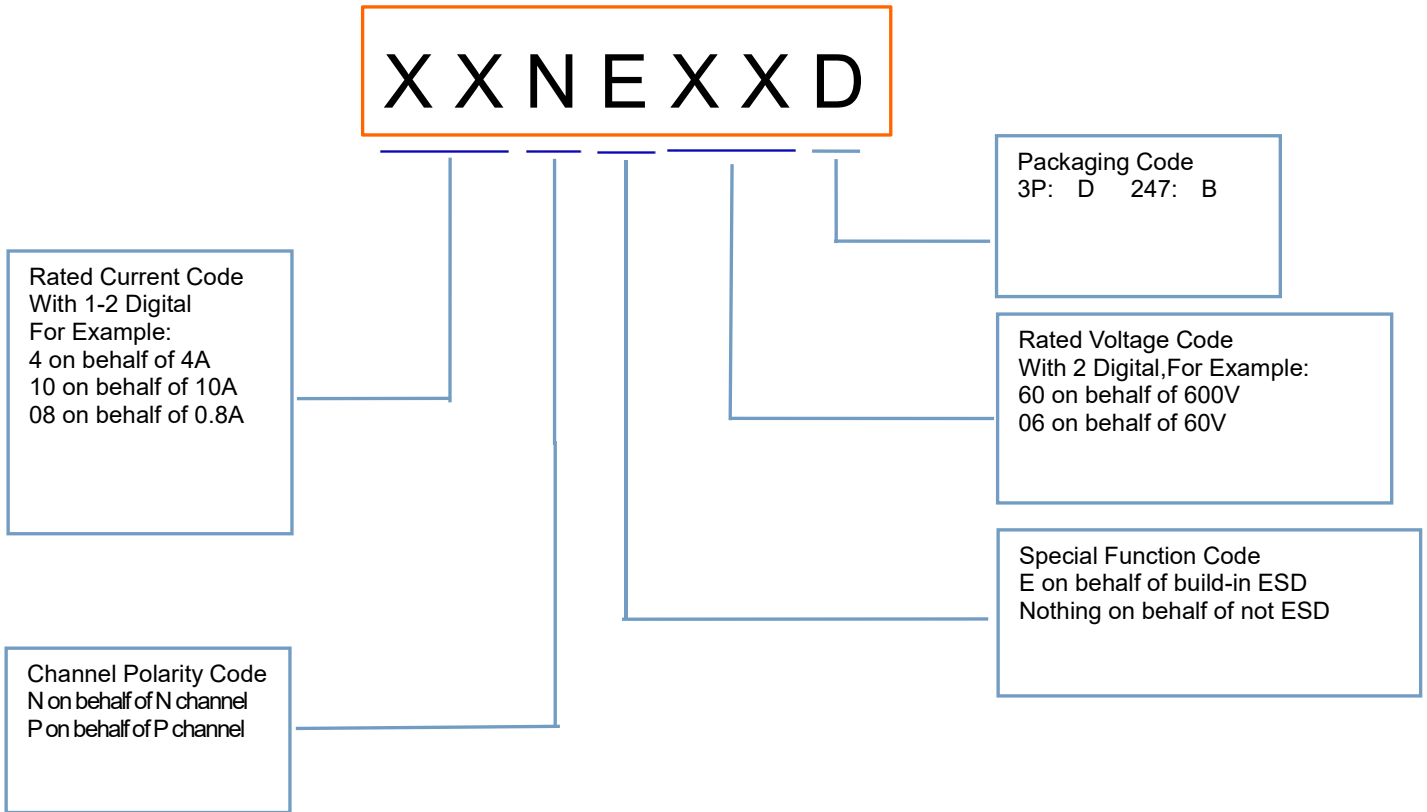


7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

7 Product Names Rules

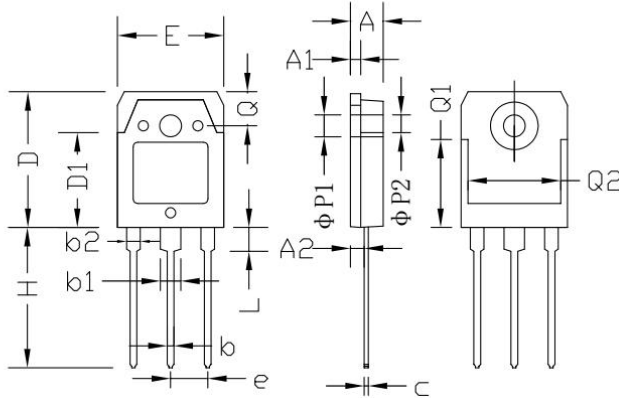


8 Product Specifications and Packaging Models

Product Model	Package Type	Mark Name	RoHS	Package	Quantity
20N50D	TO-3P	20N50D	Pb-free	Tube	300/box
20N50B	TO-247	20N50B	Pb-free	Tube	300/box

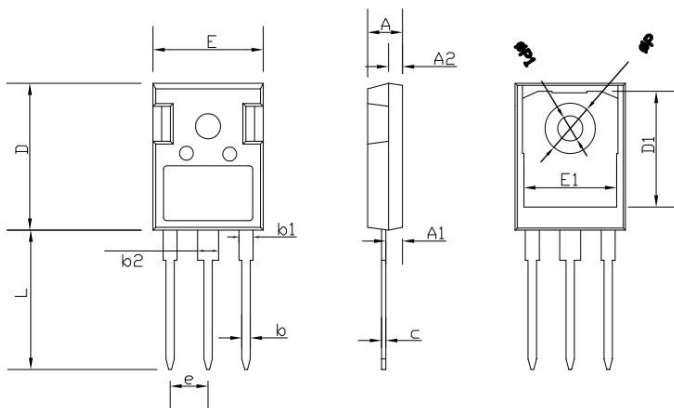
9 Dimensions

TO-3PN PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	4.60	5.00	0.181	0.197
A1	1.45	1.65	0.057	0.065
A2	2.20	2.60	0.087	0.102
b	0.80	1.20	0.032	0.047
b1	2.80	3.20	0.110	0.126
b2	1.80	2.20	0.071	0.087
C	0.55	0.75	0.022	0.030
D	19.20	19.70	0.756	0.776
D1	13.10	14.70	0.516	0.578
E	15.40	15.80	0.607	0.623
e	5.45 TYP		0.215 TYP	
H	19.80	20.20	0.780	0.826
L	3.30	3.70	0.130	0.146
ΦP1	3.20 TYP		0.126 TYP	
ΦP2	3.50 TYP		0.138 TYP	
Q	5.00 TYP		0.197 TYP	
Q1	12.40 TYP		0.488 TYP	
Q2	12.6	-	0.496	-

TO-247 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	4.90	5.10	0.193	0.201
A1	2.31	2.51	0.091	0.099
A2	1.90	2.10	0.075	0.083
b	1.16	1.26	0.046	0.050
b1	1.96	2.06	0.0772	0.0812
b2	2.96	3.06	0.117	0.121
c	0.59	0.66	0.0232	0.0260
D	20.90	21.10	0.8235	0.8313
D1	16.25	16.85	0.6403	0.6639
E	15.70	15.90	0.6186	0.6265
E1	13.10	13.50	0.5161	0.5319
e	5.44		0.2143	
L	19.80	20.10	0.7801	0.7919
ΦP	3.50	3.70	0.1379	0.1458
ΦP1	0	7.30	0	0.2876

10 Attentions

- Jiangsu Donghai Semiconductor Technology CO.,LTD. reserves the right to change the specification without prior notice! The customer should obtain the latest version of the information before making the order and verify that the information is complete and up to date.
- It is the responsibility of the purchaser for any failure or failure of any semiconductor product under certain conditions. It is the responsibility of the purchaser to comply with safety standards and to take safety measures in the system design and machine manufacturing of Donghai products in order to avoid potential risk of failure. Injury or property damage.
- Product promotion is endless, our company will be dedicated to provide customers with better products.

11 Appendix

Revision history:

Date	REV.	Description	Page
2017.07.01	1.0	Original	