

## 90A 150V N-channel Enhancement Mode Power MOSFET

### 1 Description

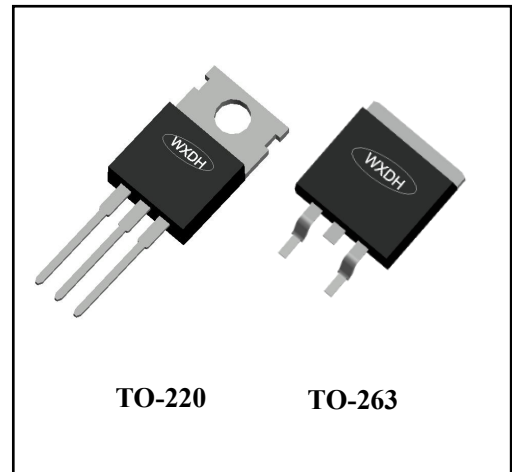
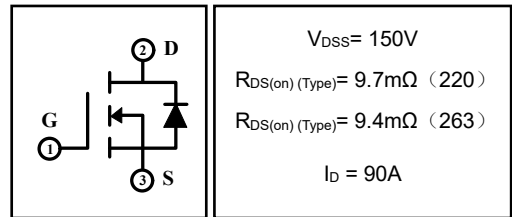
This N-channel enhancement mode power MOSFET utilizes advanced Split Gate Trench technology, which provides excellent  $R_{DS(on)}$  and low Gate charge at the same time. Which accords with the RoHS standard.

### 2 Features

- Low on resistance
- Low gate charge
- High avalanche current
- Fast switching
- Low reverse transfer capacitances
- 100% single pulse avalanche energy test
- 100%  $\Delta V_{DS}$  test

### 3 Applications

- Power switching applications
- Motor control and drive
- Battery management
- UPS(Uninterruptible Power Supplies)



### 4 Electrical Characteristics

#### 4.1 Absolute Maximum Ratings (Tc=25°C, unless otherwise noted)

Parameter	Symbol	Rating	Units	
Drain-Source Voltage	$V_{DSS}$	150	V	
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V	
Drain Current(continuous) <sup>(3)</sup>	$I_D$	90	A	
Drain Current(continuous)(T=100°C) <sup>(3)</sup>	$I_D$	63	A	
Drain Current(Pulsed) <sup>(4)</sup>	$I_{DM}$	303	A	
Single Pulse Avalanche Energy <sup>(5)</sup>	$E_{AS}$	125	mJ	
Maximum Power Dissipation	T <sub>a</sub> =25°C	$P_D$	2.5	W
	T <sub>c</sub> =25°C	$P_D$	214	W
Operating Junction Temperature Range	T <sub>J</sub>	-55~175	°C	
Storage Temperature Range	T <sub>stg</sub>	-55~175	°C	

#### 4.2 Thermal Characteristics

Parameter	Symbol	Rating	Unit
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	0.7	°C/W
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	60	°C/W

**4.3 Electrical Characteristics** (T<sub>c</sub>=25°C, unless otherwise noted)

Parameter	Symbol	Test Condition	Value			Units
			Min	Typ	Max	
<b>Off Characteristics</b>						
Drain-source Breakdown Voltage	V <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	150	--	--	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =150V, V <sub>GS</sub> =0V, T <sub>C</sub> =25°C	--	--	1	μA
		V <sub>DS</sub> =150V, V <sub>GS</sub> =0V, T <sub>C</sub> =100°C	--	--	100	μA
Gate-to-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	--	--	±100	nA
<b>On Characteristics</b>						
Gate threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2	3	4	V
Drain-Source on-state Resistance	R <sub>DS(on)</sub> (TO-220)	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	--	9.7	11.5	mΩ
	R <sub>DS(on)</sub> (TO-263)	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	--	9.4	11	mΩ
Gate Resisitance	R <sub>G</sub>	V <sub>DD</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	--	2.8	--	Ω
<b>Dynamic Characteristics</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =75V, f=1MHz	--	3368	--	pF
Output Capacitance	C <sub>oss</sub>		--	241	--	
Reverse Transfer Capacitance	C <sub>rss</sub>		--	6.8	--	
<b>Switching Characteristics</b>						
Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> =20A, V <sub>DS</sub> =75V, V <sub>GS</sub> =10V, R <sub>GEN</sub> =10Ω	--	18	--	nS
Turn-on Rise Time	t <sub>r</sub>		--	8.3	--	
Turn-off Delay Time	t <sub>d(off)</sub>		--	25	--	
Turn-off Fall Time	t <sub>f</sub>		--	9.3	--	
Total Gate Charge	Q <sub>g</sub>	I <sub>D</sub> =20A, V <sub>DS</sub> =75V, V <sub>GS</sub> =10V	--	43	--	nC
Gate-to-Source Charge	Q <sub>gs</sub>		--	15	--	
Gate-to-Drain("Miller") Charge	Q <sub>gd</sub>		--	7.1	--	
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage <sup>(3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =30A	--	0.85	1.2	V
Diode Forward Current	I <sub>S</sub>		--	--	90	A
Reverse Recovery Time <sup>(3)</sup>	t <sub>rr</sub>	T <sub>J</sub> =25°C, I <sub>F</sub> =20A, dI <sub>F</sub> /dt=100A/μs, V <sub>R</sub> =75V	--	83	--	nS
Reverse Recovery Charge <sup>(3)</sup>	Q <sub>rr</sub>		--	165	--	nC

**Notes:**

- 1: Repetitive rating, pulse width limited by maximum junction temperature.
- 2: Surface mounted on FR4 Board, t<sub>s</sub>≤10sec.
- 3: Pulse width ≤ 300μs, duty cycle ≤ 2%.
- 4: L=0.5mH, V<sub>DD</sub>=80V, V<sub>GS</sub>=10V, V<sub>GATE</sub>=150V, Start T<sub>J</sub>=25°C.

**5 Typical characteristics diagrams**

Fig 1. Typical Output Characteristics

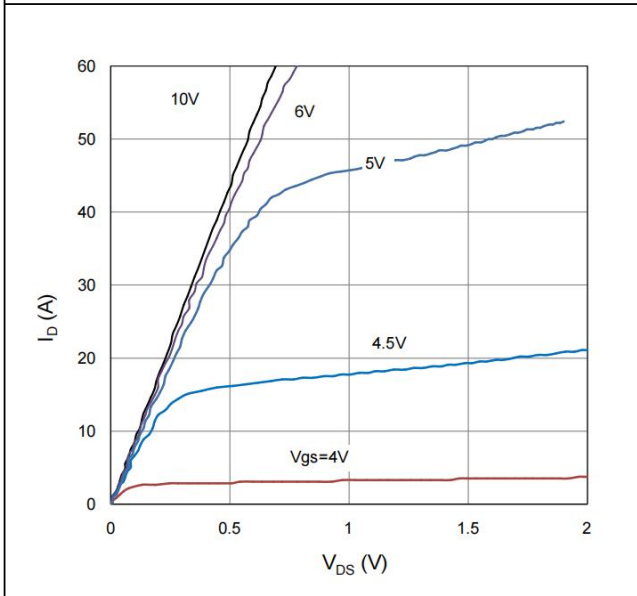


Figure 2. On-Resistance vs. Gate-Source Voltage

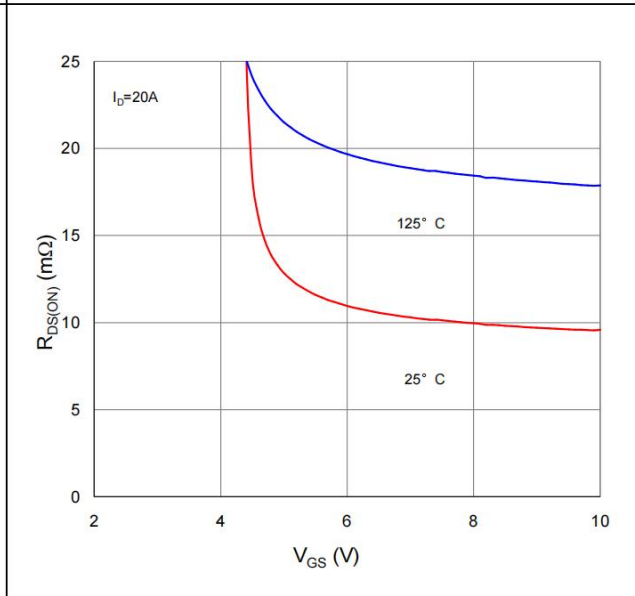


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

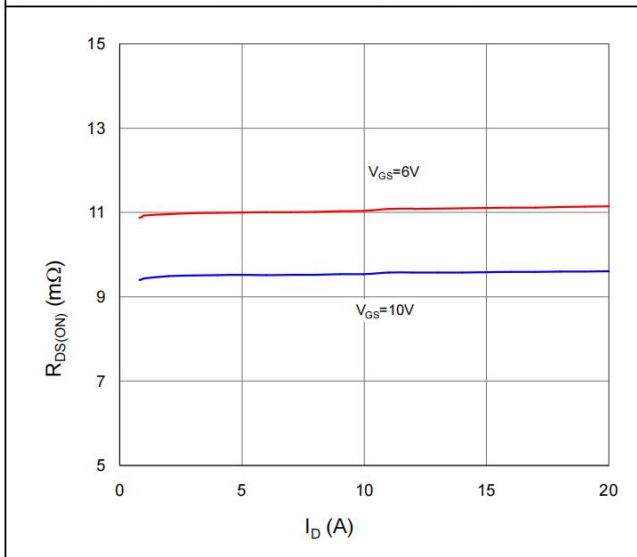
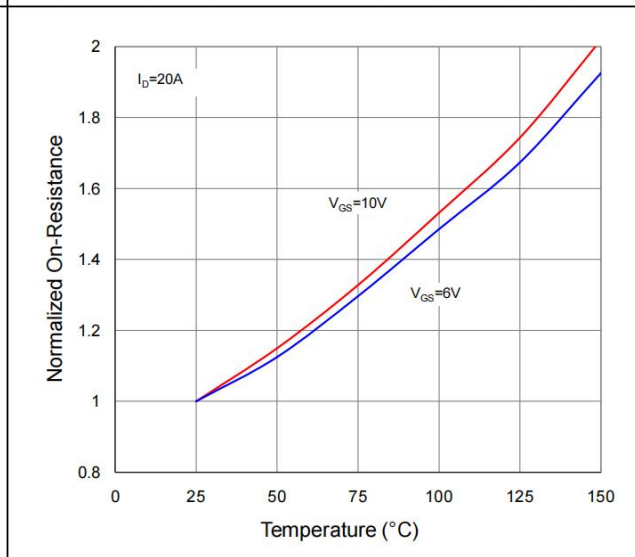


Figure 4. Normalized On-Resistance vs. Junction Temperature



5 Typical characteristics diagrams(continues)

Figure 5. Typical Transfer Characteristics

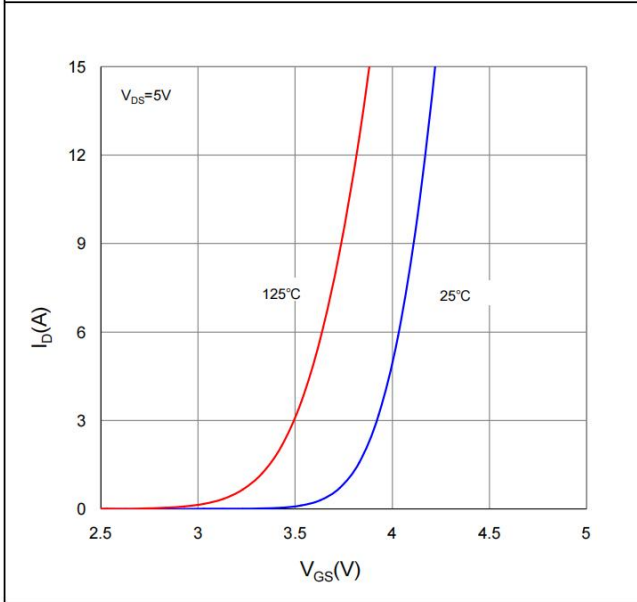


Figure 6. Typical Source-Drain Diode Forward Voltage

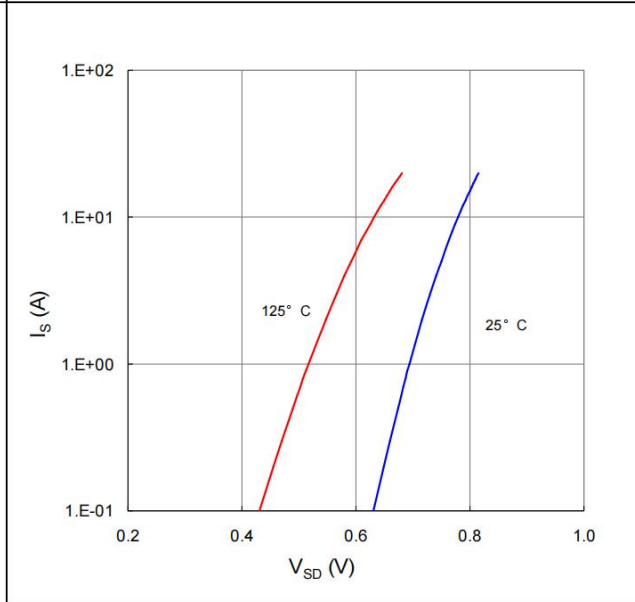


Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

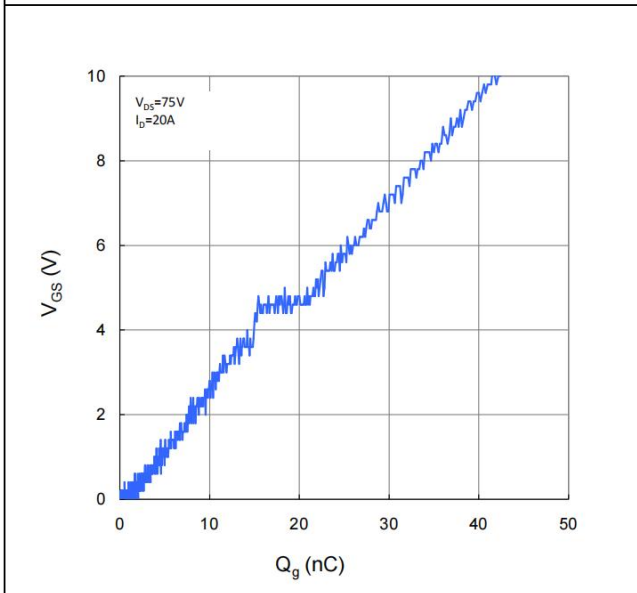
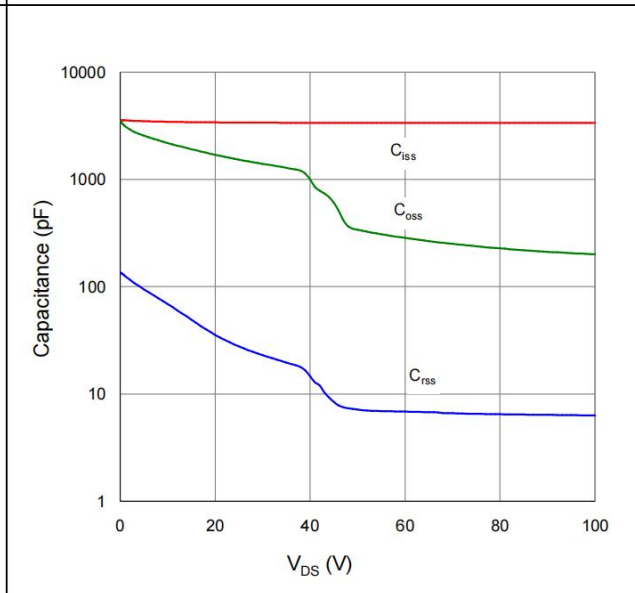


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage



**5 Typical characteristics diagrams(continues)**

Figure 9. Maximum Safe Operating Area

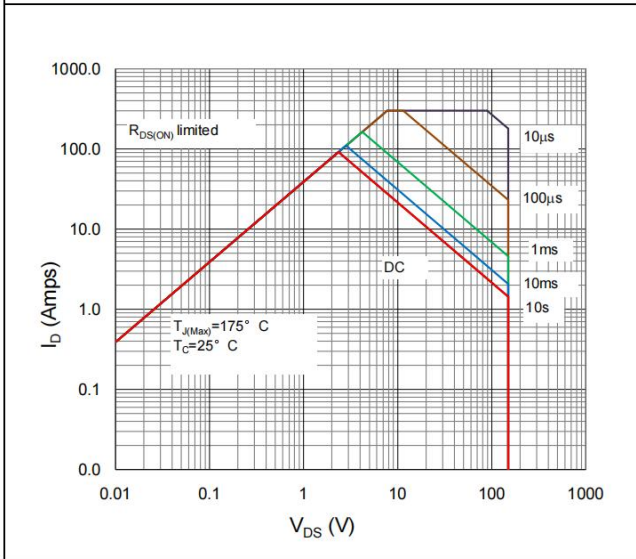


Figure 10. Maximum Drain Current vs. Case Temperature

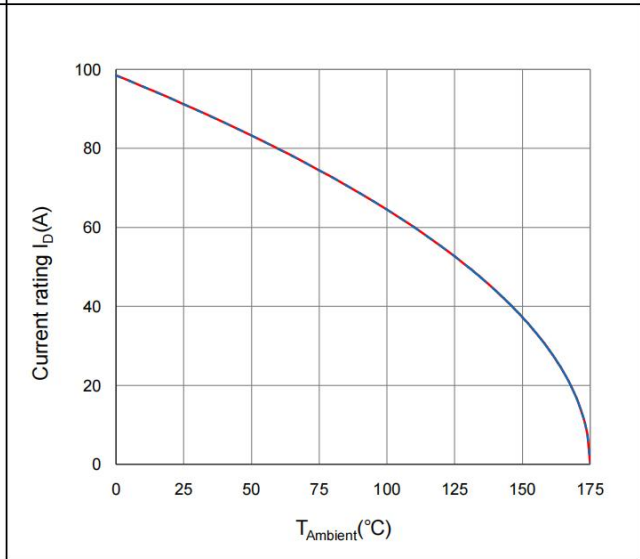
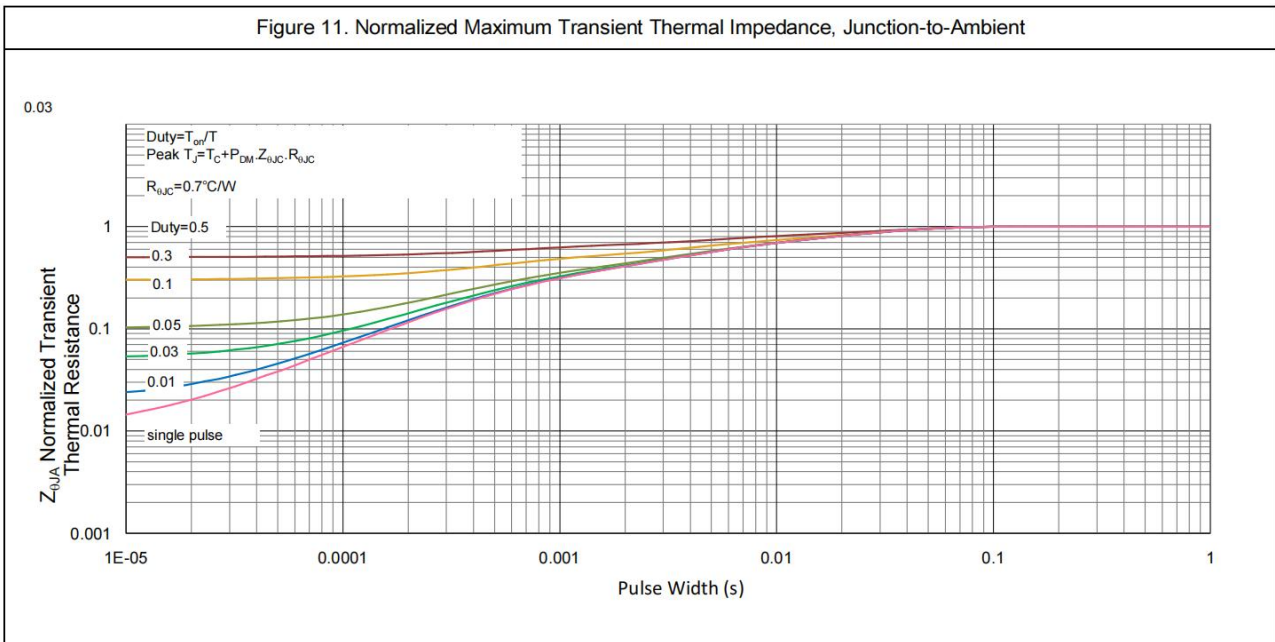
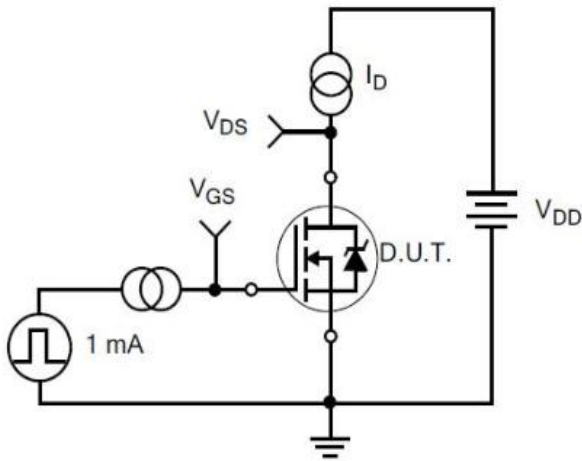


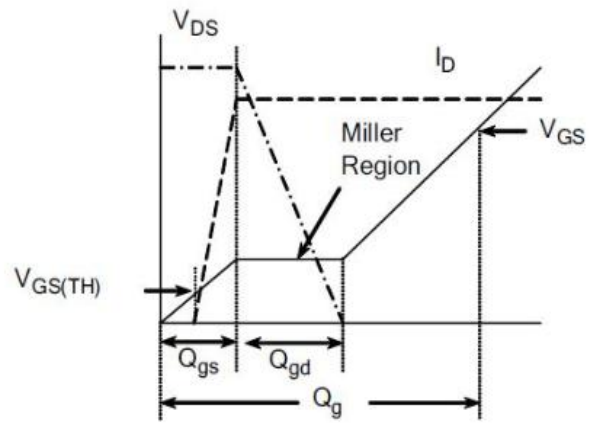
Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Ambient



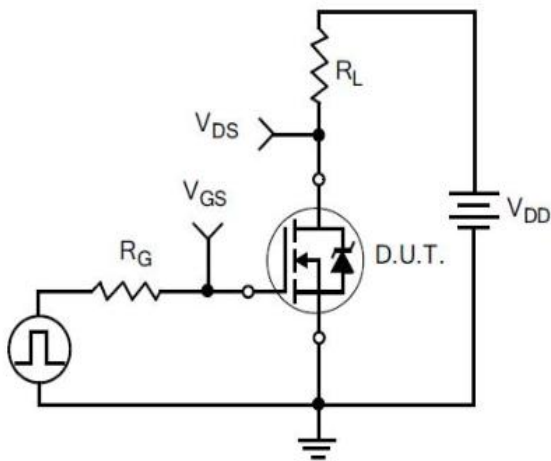
**6 Typical Test Circuit and Waveform**



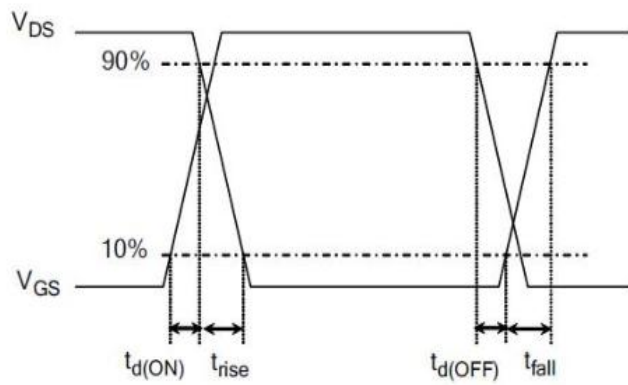
1) Gate Charge Test Circuit



2) . Gate Charge Waveform

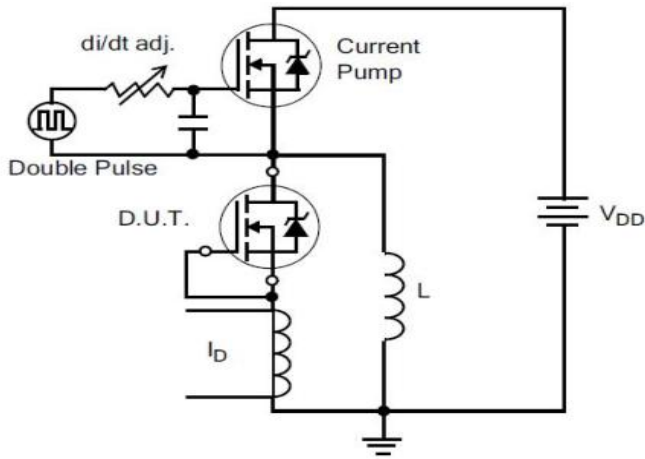


3) Resistive Switching Test Circuit

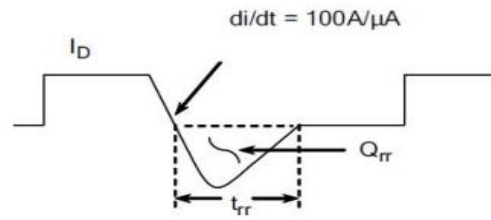


4) Resistive Switching Waveforms

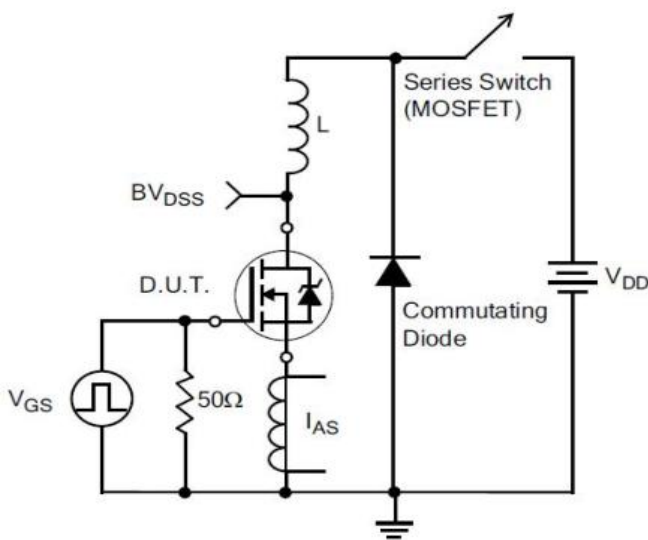
**6 Typical Test Circuit and Waveform(continues)**



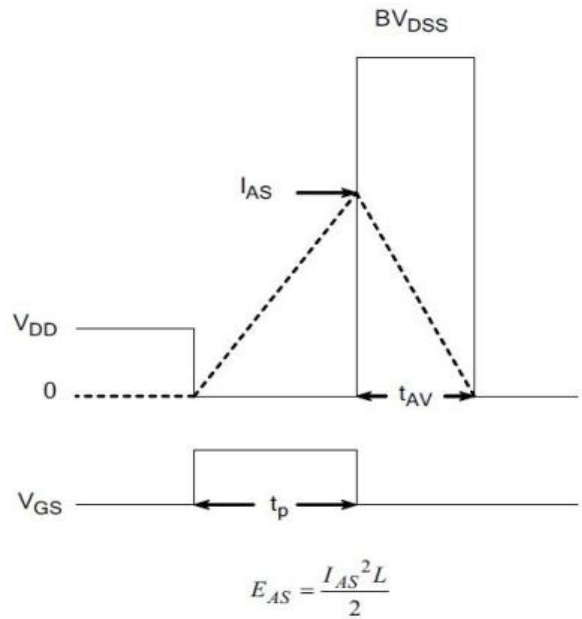
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

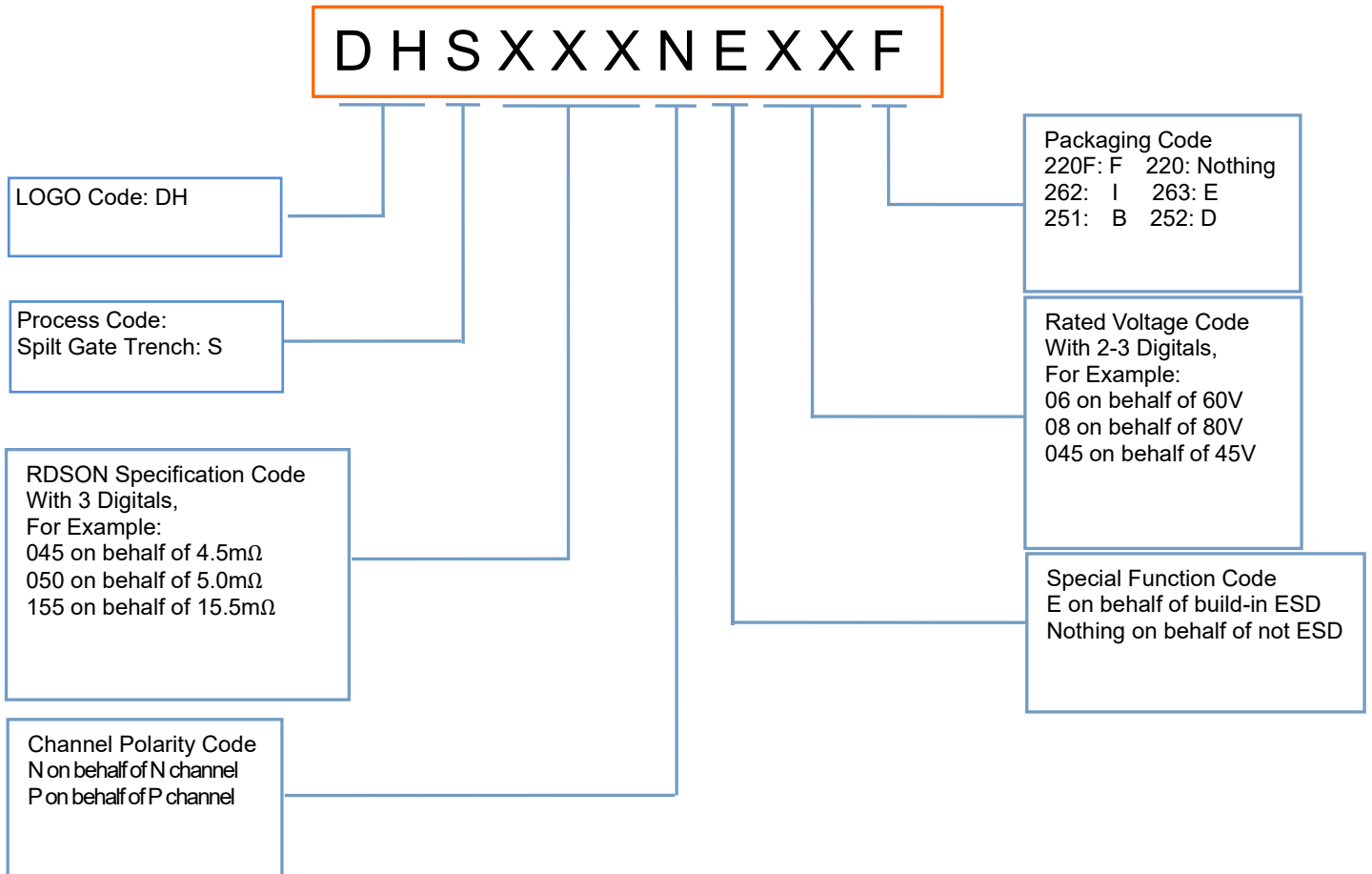


7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

## 7 Product Names Rules



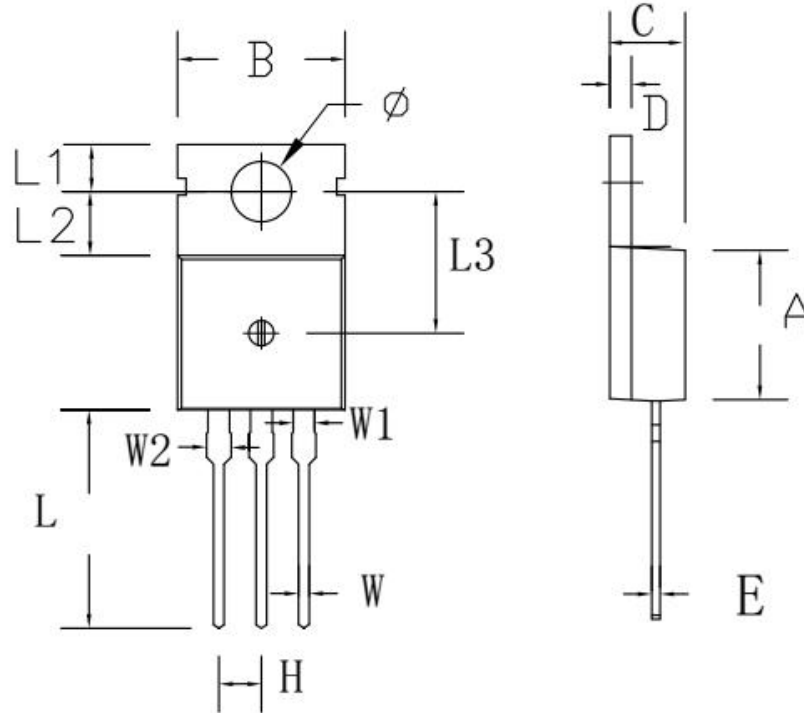
## 8 Product Specifications and Packaging Models

Product Model	Package Type	Mark Name	RoHS	Package	Quantity
DHS110N15	TO-220	DHS110N15	Pb-free	Tube	1000/box
DHS110N15E	TO-263	DHS110N15E	Pb-free	Tape & Reel	800/box



9 Dimensions

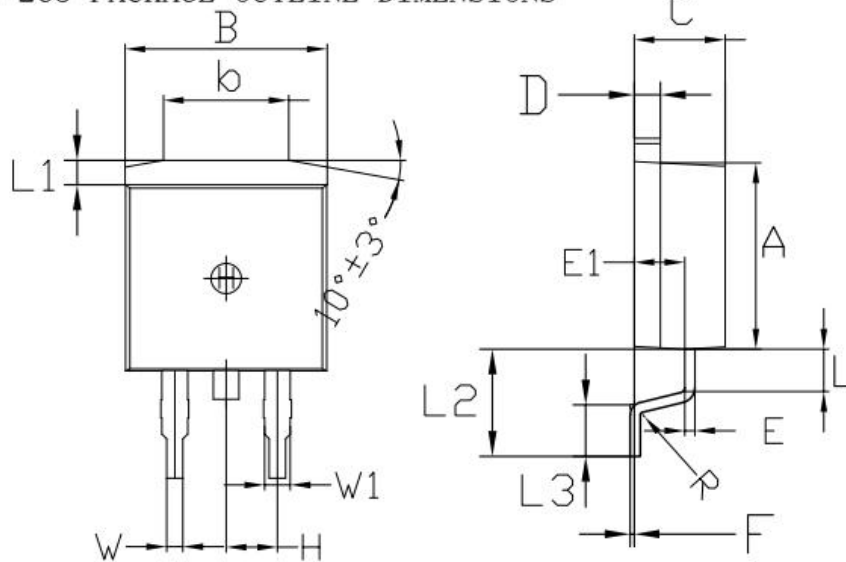
TO-220C PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	8.80	9.30	0.346	0.366
B	9.70	10.30	0.382	0.406
C	4.25	4.75	0.167	0.187
D	1.20	1.45	0.047	0.057
E	0.40	0.60	0.016	0.024
H	2.54 TYP		0.100 TYP	
W	0.60	0.95	0.024	0.037
W1	1.05	1.45	0.041	0.057
W2	1.20	1.60	0.047	0.063
L	12.60	13.40	0.496	0.528
L1	2.45	2.95	0.096	0.116
L2	3.45	3.95	0.136	0.156
L3	8.15	8.65	0.321	0.341
Φ	3.50	3.90	0.138	0.154

9 Dimensions(continues)

TO-263 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	8.80	9.30	0.346	0.366
B	9.70	10.30	0.382	0.406
C	4.25	4.75	0.167	0.187
D	1.20	1.45	0.047	0.057
E	0.40	0.60	0.016	0.024
L	1.90	2.30	0.075	0.091
L1	1.15	1.45	0.045	0.057
R	0.24	0.26	0.0095	0.0102
W	0.80	0.82	0.0315	0.0323
W1	1.20	1.30	0.047	0.051
H	2.54 TYP		0.200 TYP	
b	5.50	6.50	0.216	0.256
E1	2.4	2.6	0.0946	0.1024
L2	5.20	5.80	0.205	0.228
L3	2.20	3.20	0.087	0.126
F	0.03	0.23	0.0012	0.0091

## 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
2022.07.19	1.0	Original	