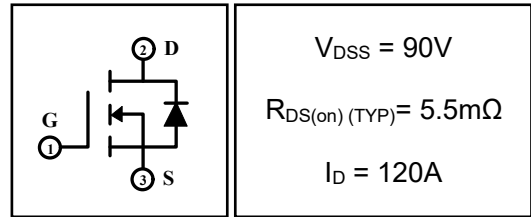


## 120A 90V N-channel Enhancement Mode Power MOSFET

### 1 Description

These N-channel enhancement mode power mosfets used advanced splite gate technology design, provided excellent Rdson and low gate charge. Which accords with the RoHS standard.



### 2 Features

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

### 3 Applications

- Motor control and drive
- Battery management
- Power tool control
- UPS(uninterruptible power supplies) power supply



### 4 Electrical Characteristics

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

Parameter	Symbol	Rating				Units
		DH90N 055R	DHI90 N55R	DHE90 N055R	DHF90 N055R	
Drain-to-Source Voltage	$V_{DSS}$	90				V
Gate-to-Source Voltage	$V_{GSS}$	$\pm 20$				V
Continuous Drain Current	$I_D$	$T_C=25^\circ C$				A
		$T_C=100^\circ C$				A
Pulsed Drain Current <sup>(1)</sup>	$I_{DM}$	480				A
Single Pulse Avalanche Energy <sup>(4)</sup>	$E_{AS}$	110				mJ
Maximum Power Dissipation	$P_{tot}$	$T_a=25^\circ C$				W
		$T_c=25^\circ C$				W
Isolation Voltage	$V_{ISO}$	/			2500	V
Junction Temperature Range	$T_j$	-55~150				°C
Storage Temperature Range	$T_{stg}$	-55~150				°C
High Temperature(tin solder)	$T_L$	300				°C

#### 4.2 Thermal Characteristics

Parameter	Symbol	Rating				Unit
		DH90N 055R	DHI90 N55R	DHE90 N055R	DHF90 N055R	
Thermal Resistance, Junction to Case-sink	$R_{thJC}$	0.76	0.76	0.76	1.67	°C/W
Thermal Resistance, Junction to Ambient	$R_{thJA}$	62.5	62.5	62.5	62.5	°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-to-Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	90	98	---	V	
Drain-to-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =90V, V <sub>GS</sub> =0V, T <sub>C</sub> =25°C	---	---	1	μA	
		V <sub>DS</sub> =72V, V <sub>GS</sub> =0V, T <sub>C</sub> =125°C	---	---	100	μA	
Gate-to-Source 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-to-Source on-state Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =50A	TO-220	---	5.5	6.5	mΩ
			TO--220F	---	5.5	6.5	
			TO-262	---	5.5	6.5	
			TO-263	---	5.3	6.3	
Forward Transfer Conductance	g <sub>fs</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =40A	---	70	---	S	
<b>Dynamic Characteristics</b>							
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =42.5V, f=1.0MHz	---	2860	---	pF	
Output Capacitance	C <sub>oss</sub>		---	790	---		
Reverse Transfer Capacitance	C <sub>rss</sub>		---	19	---		
Gate Resitance	R <sub>G</sub>	V <sub>DD</sub> =0V, V <sub>GS</sub> =0V, F=1MHz	---	3.3	---	Ω	
<b>Switching Characteristics</b>							
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =42.5V, I <sub>D</sub> =10A, V <sub>GS</sub> =10V, R <sub>g</sub> =3.5Ω	---	16	---	nS	
Turn-on Rise Time	t <sub>r</sub>		---	31	---		
Turn-off Delay Time	t <sub>d(off)</sub>		---	36	---		
Turn-off Fall Time	t <sub>f</sub>		---	19	---		
Total Gate Charge	Q <sub>g</sub>	I <sub>D</sub> =50A, V <sub>DS</sub> =42.5V, V <sub>GS</sub> =10V	---	47	---	nC	
Gate-to-Source Charge	Q <sub>gs</sub>		---	13	---		
Gate-to-Drain("Miller") Charge	Q <sub>gd</sub>		---	11	---		
<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> =50A	---	0.9	1.4	V	
Diode Forward Current	I <sub>S</sub>		---	---	120	A	
Reverse Recovery Time <sup>(3)</sup>	t <sub>rr</sub>	T <sub>J</sub> =25°C, I <sub>F</sub> =30A, dI <sub>F</sub> /dt=100A/μS, V <sub>GS</sub> =0V	---	56	---	nS	
Reverse Recovery Charge <sup>(3)</sup>	Q <sub>rr</sub>		---	54	---	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: Guaranteed by design, not subject to production.
- 5: L=0.5mH, I<sub>D</sub>=21A, V<sub>DD</sub>=50V, V<sub>GATE</sub>=80V, Start T<sub>J</sub>=25°C.

## 5 Typical characteristics diagrams

Fig 1: Output Characteristics

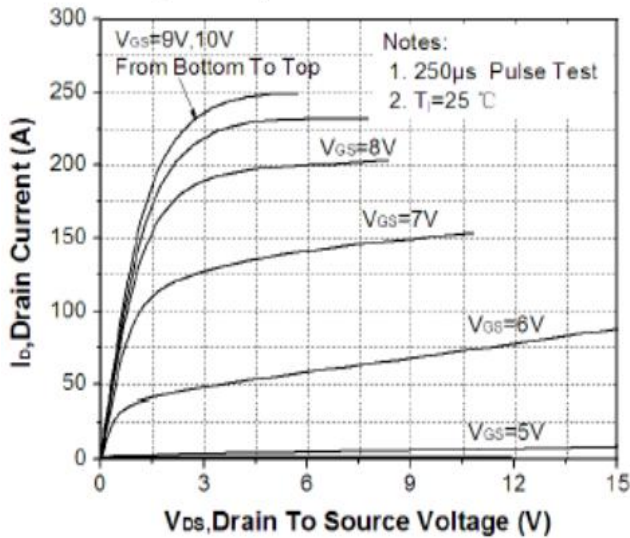


Fig 2: Transfer Characteristics

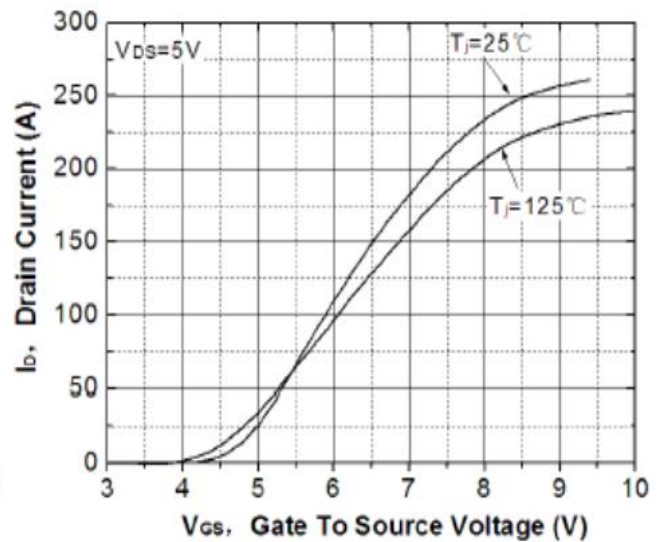


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

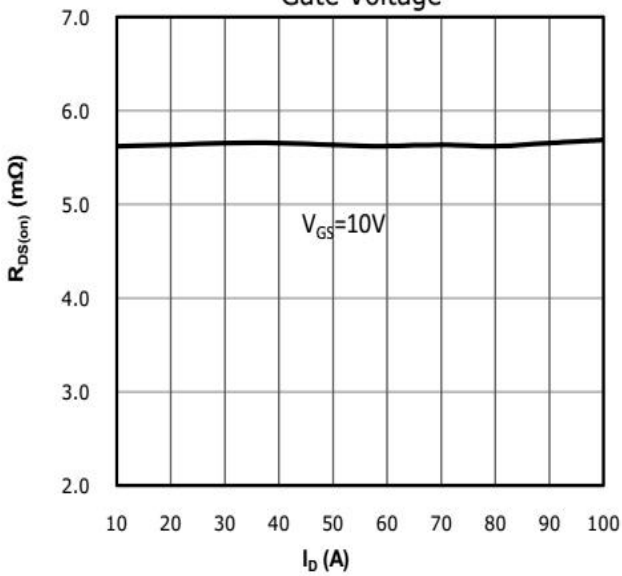
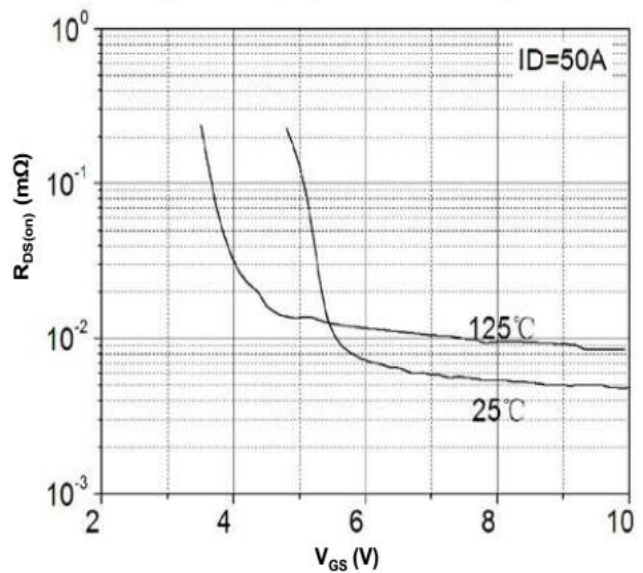


Fig 4:  $R_{DS(on)}$  vs Gate Voltage



5 Typical characteristics diagrams(continues)

Fig 5: Rds(on) vs. Temperature

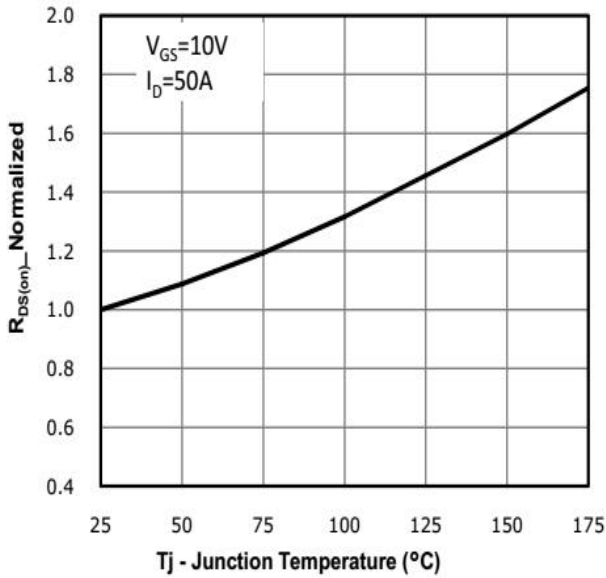


Fig 6: Capacitance Characteristics

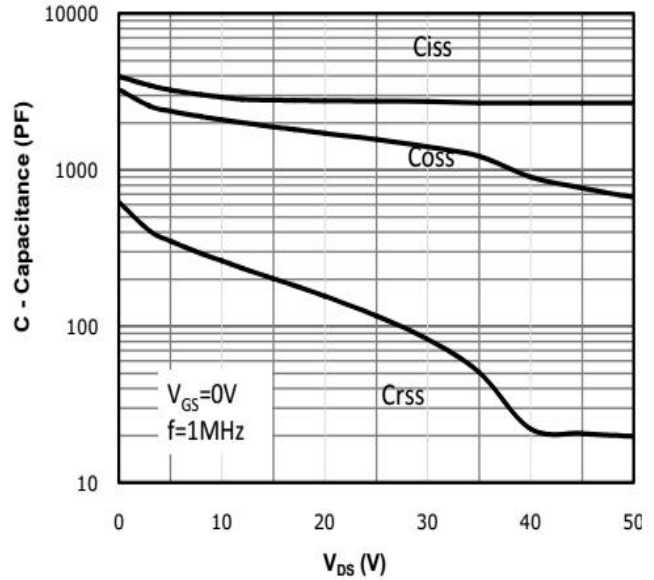


Fig 7: Gate Charge Characteristics

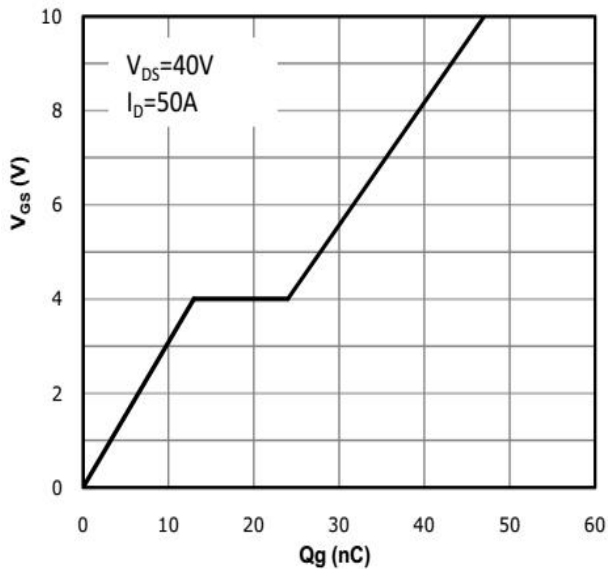
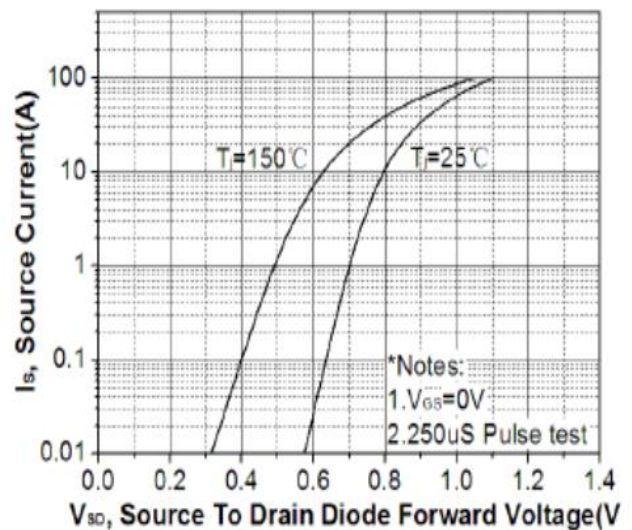


Fig 8: Body-diode Forward Characteristics



5 Typical characteristics diagrams(continues)

Fig 9: Power Dissipation

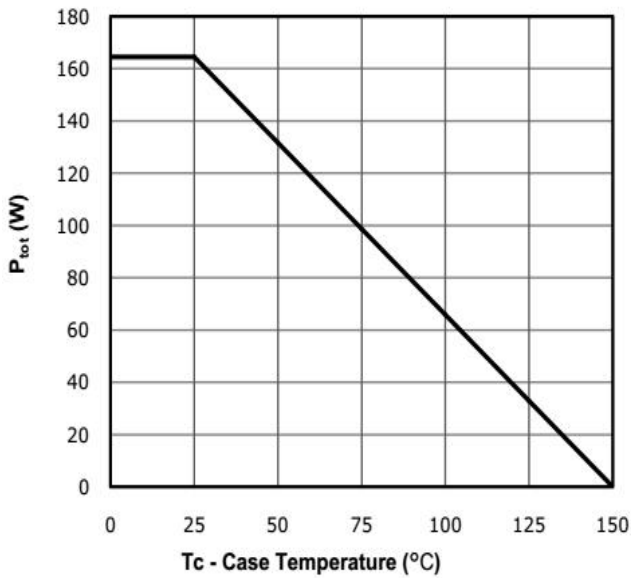


Fig 10: Drain Current Derating

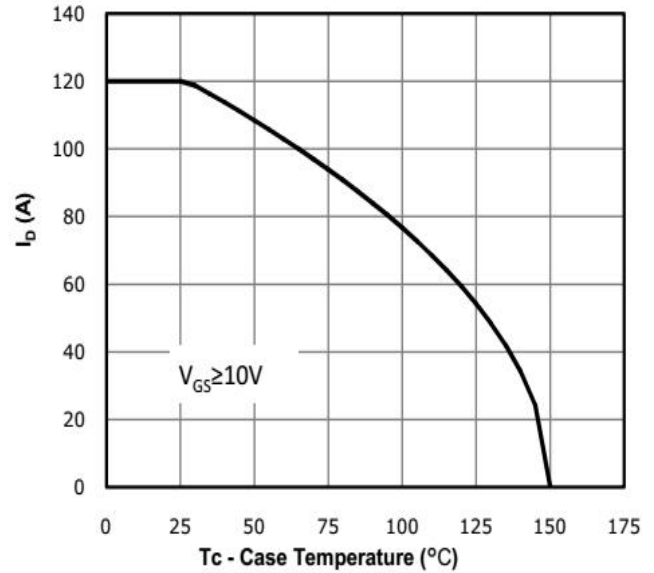
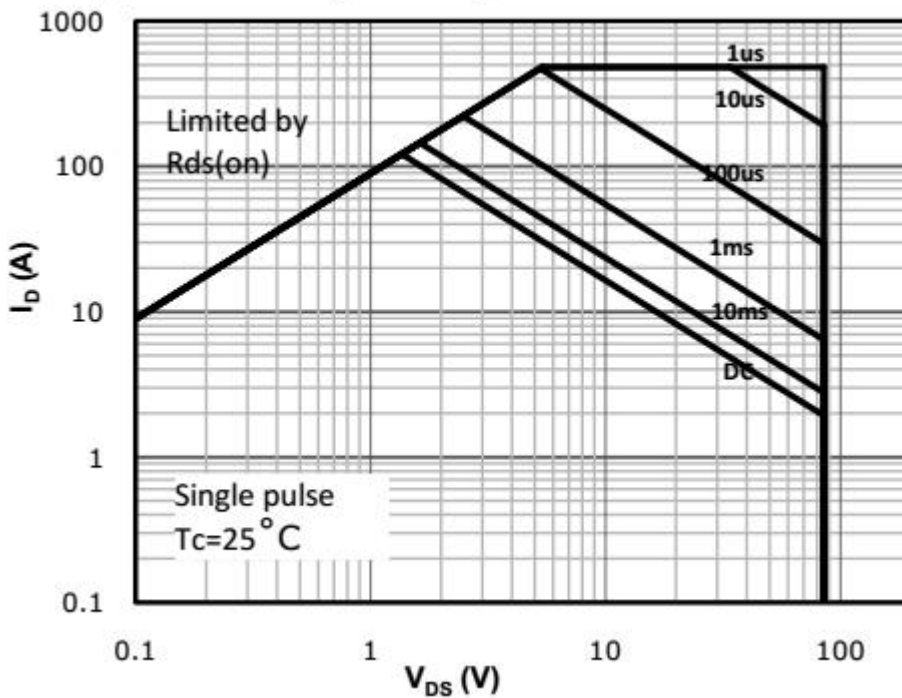
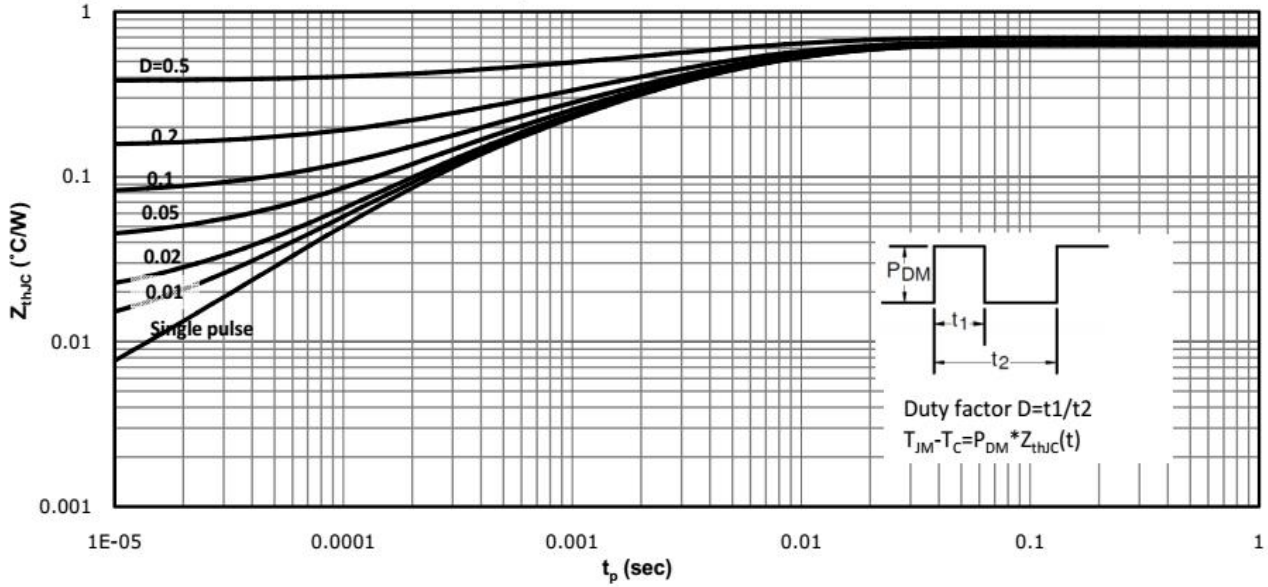


Fig 11: Safe Operating Area

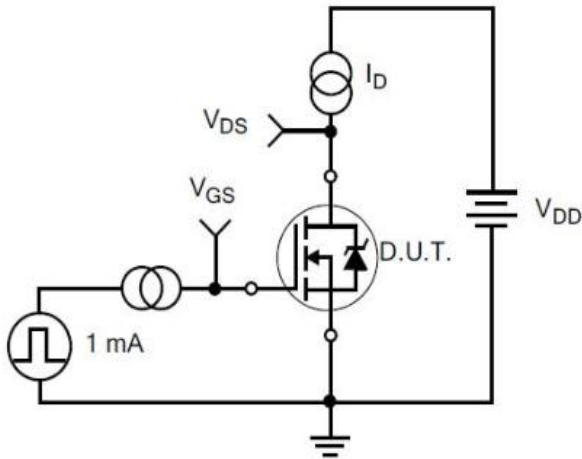


5 Typical characteristics diagrams(continues)

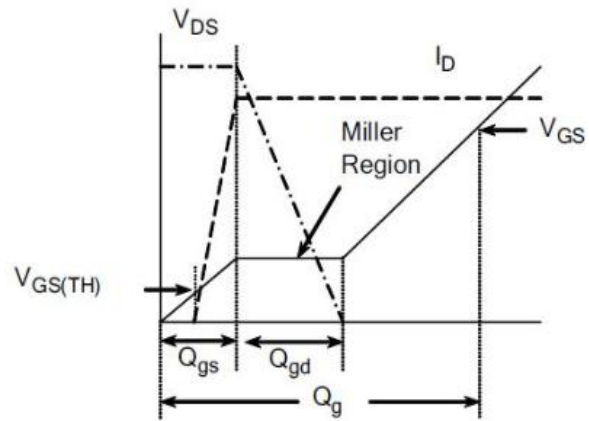
Fig 12: Max. Transient Thermal Impedance



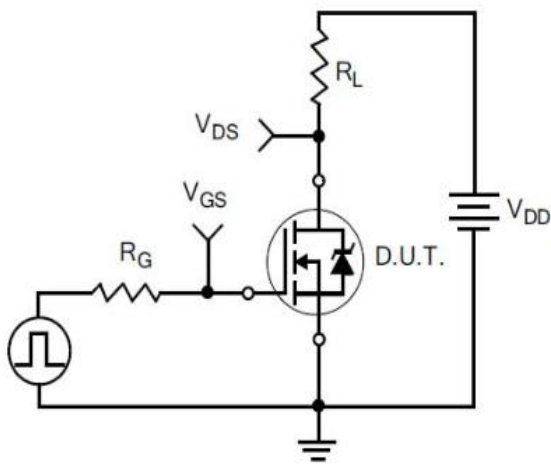
**6 Typical Test Circuit and Waveform**



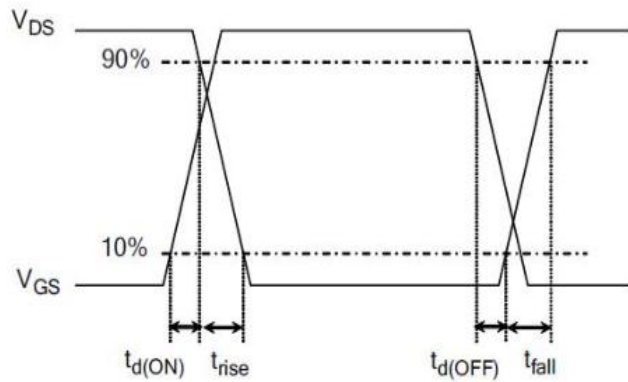
1) Gate Charge Test Circuit



2) . Gate Charge Waveform

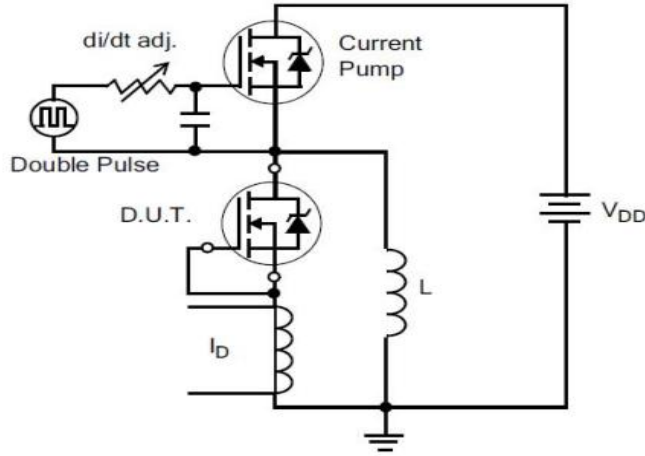


3) Resistive Switching Test Circuit

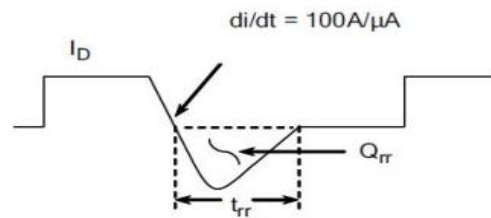


4) Resistive Switching Waveforms

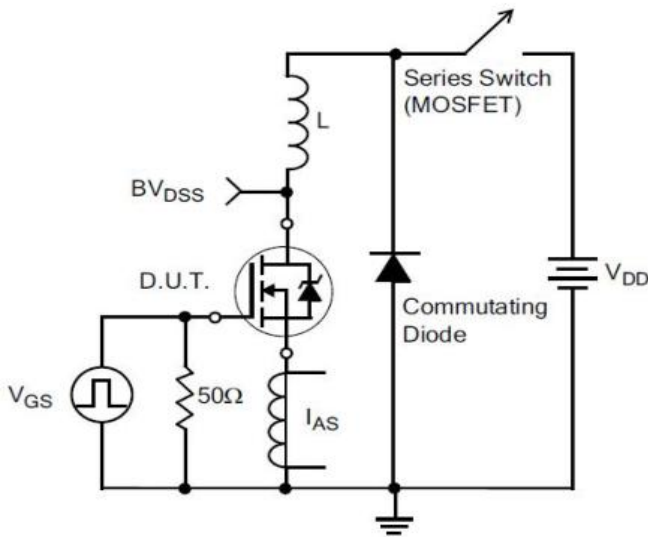
**6 Typical Test Circuit and Waveform(continues)**



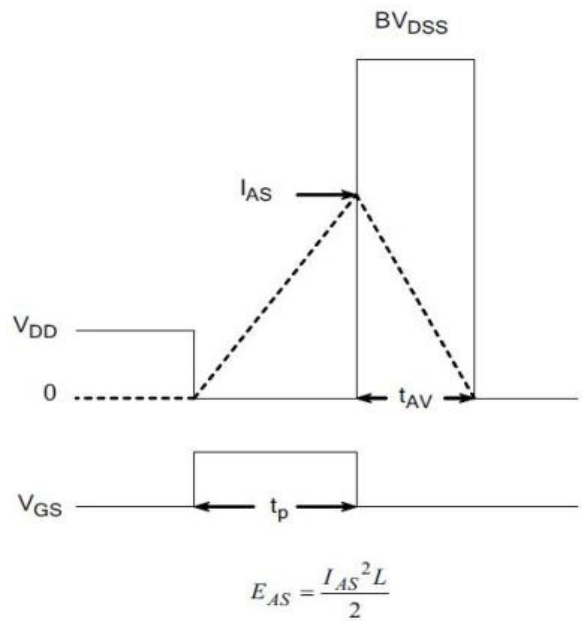
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



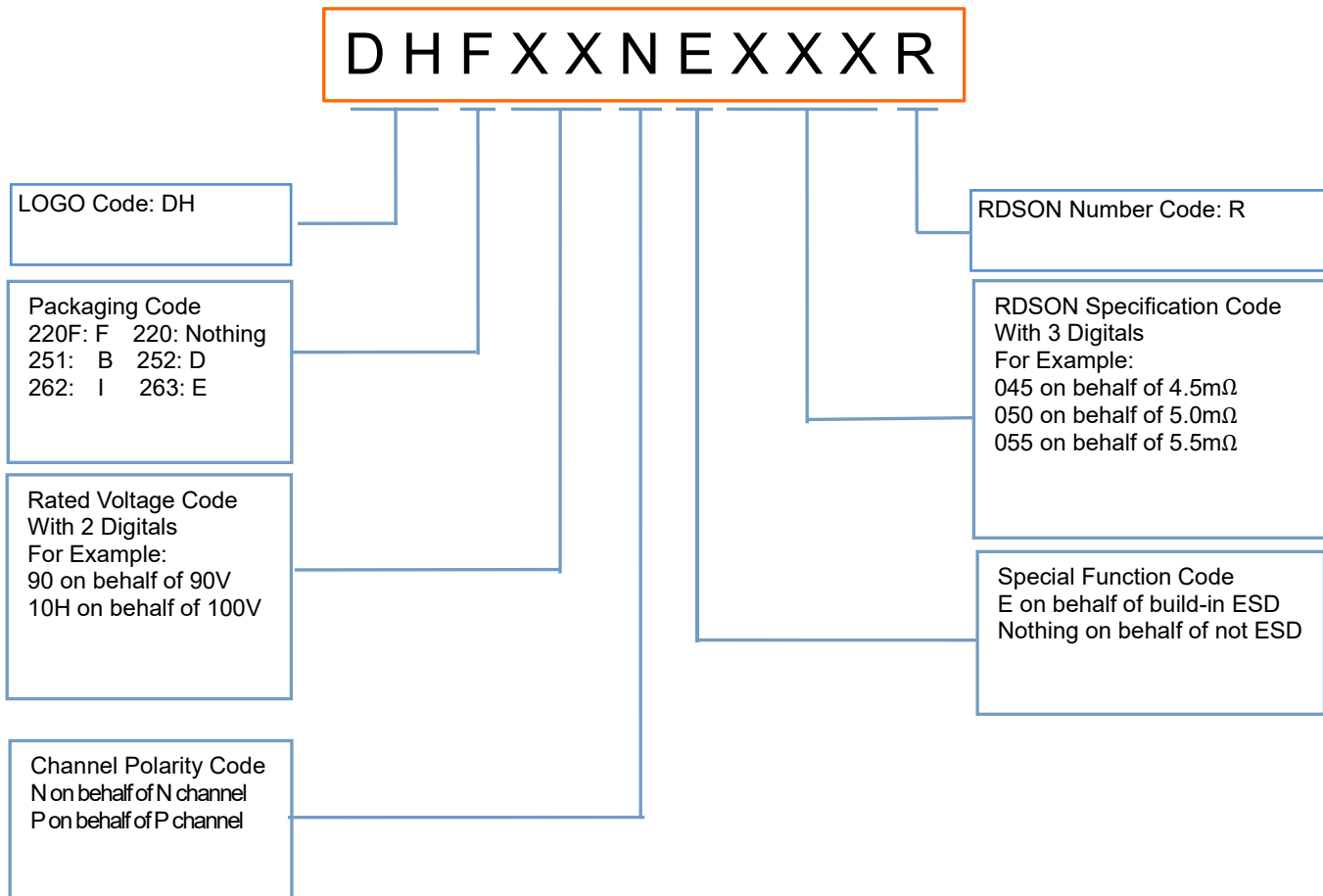
7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms



## 7 Product Names Rules

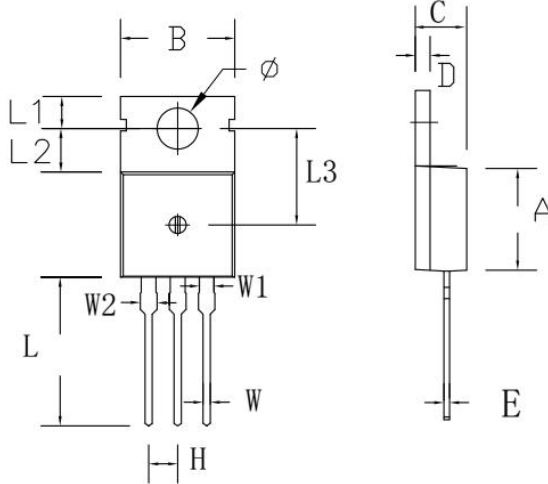


## 8 Product Specifications and Packaging Models

Product Model	Package Type	Mark Name	RoHS	Package	Quantity
DH90N055R	TO-220C	DH90N055R	Pb-free	Tube	1000/box
DHF90N055R	TO-220F	DHF90N055R	Pb-free	Tube	1000/box
DHI90N055R	TO-262	DHI90N055R	Pb-free	Tube	1000/box
DHE90N055R	TO-263	DHE90N055R	Pb-free	Tape & Reel	800/box

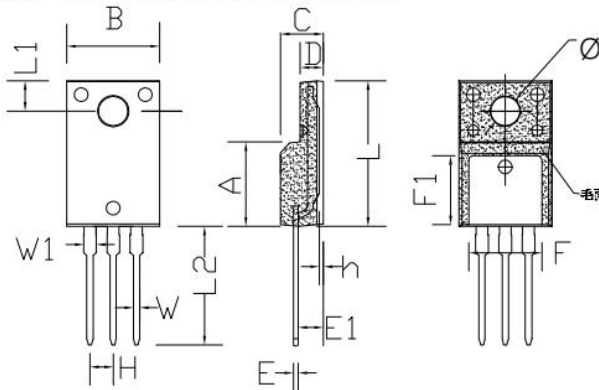
**9 Dimensions**

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

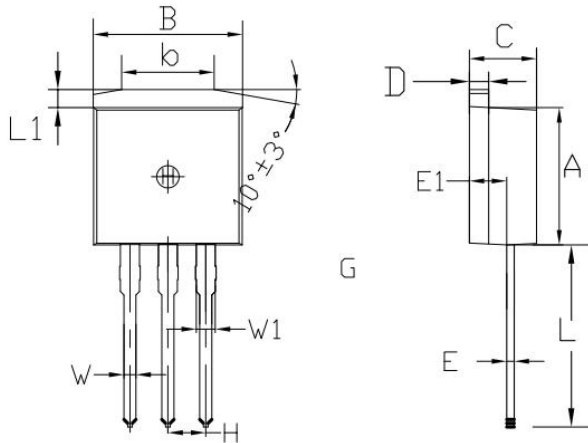
TO-220F PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	8.80	9.30	0.346	0.366
B	10.00	10.50	0.394	0.413
C	4.30	4.90	0.169	0.193
D	2.30	2.70	0.091	0.106
L	15.55	16.15	0.612	0.636
h	0.40	0.60	0.016	0.024
L1	3.15	3.55	0.124	0.140
L2	12.65	13.35	0.498	0.526
W	0.70	0.90	0.028	0.035
W1	1.15	1.55	0.045	0.061
H	2.54 TYP		0.100 TYP	
E	0.48	0.53	0.019	0.021
Φ	2.90	3.40	0.114	0.134
E1	2.40	2.90	0.094	0.114
F	7.75	8.25	0.305	0.325
F1	7.35	7.85	0.289	0.309

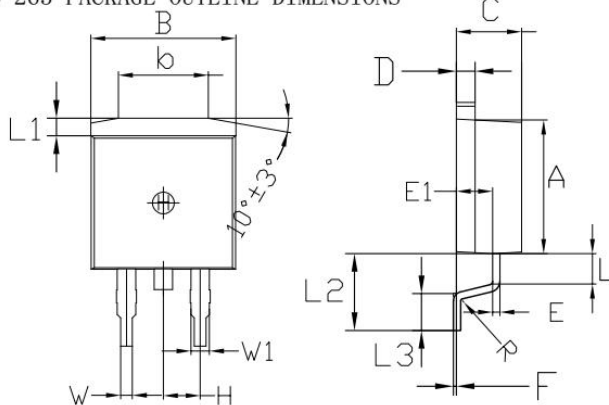
**9 Dimensions(continues)**

TO-262 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	12.25	13.75	0.482	0.541
L1	1.15	1.45	0.045	0.057
E1	2.4	2.6	0.0945	0.1024
W	0.80	0.82	0.0315	0.034
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

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
2017.08.09	1.0	Original	