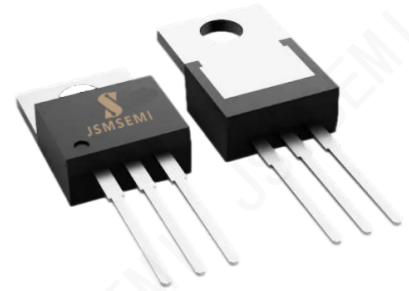


## Product Summary

- $V_{DS}$  100V
- $I_D$  45A
- $R_{DS(ON)}$ ( at  $V_{GS}=10V$ ) < 36m $\Omega$
- 100% EAS Tested
- 100%  $\nabla V_{DS}$  Tested

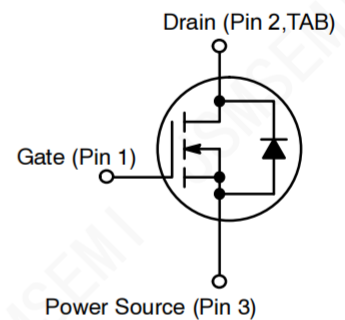


## General Description

- Trench Power MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low  $R_{DS(ON)}$
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free

## Applications

- Power switching application
- Uninterruptible power supply
- DC-DC convertor
- Motor drivers



### ■ Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-source Voltage		$V_{DS}$	100	V
Gate-source Voltage		$V_{GS}$	$\pm 20$	V
Drain Current	$T_C=25^\circ\text{C}$	$I_D$	45	A
	$T_C=100^\circ\text{C}$		30	
Pulsed Drain Current <sup>A</sup>		$I_{DM}$	180	A
Avalanche energy <sup>B</sup>		EAS	58	mJ
Total Power Dissipation <sup>C</sup>	$T_A=25^\circ\text{C}$	$P_D$	48	W
	$T_C=100^\circ\text{C}$		24	
Junction and Storage Temperature Range		$T_J, T_{STG}$	-55~+175	$^\circ\text{C}$

### ■ Thermal resistance

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient <sup>D</sup>	Steady-State	$R_{\theta JA}$	40	46	$^\circ\text{C/W}$
	Thermal Resistance Junction-to-Case	$R_{\theta JC}$	2.7	3.1	

## Ordering Information

Ordernumber	Package	Marking	Operation Temperature Range	MSL Grade	Ship, Quantity	Green
IRF1310NPBF-JSM	TO-220-3	F1310N	-55 to 175 $^\circ\text{C}$	1	TUBE,1000	Rohs

**■ Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>Static Parameter</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> =250μA	100	-	-	V
		V <sub>GS</sub> = 0V, I <sub>D</sub> =1mA	100	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =100V, V <sub>GS</sub> =0V	-	-	1	μA
		V <sub>DS</sub> =100V, V <sub>GS</sub> =0V, T <sub>J</sub> =150°C	-	-	100	
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> =0V	-	-	±100	nA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	3.0	4.0	V
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> =20A	-	25	36	mΩ
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =50A, V <sub>GS</sub> =0V	-	-	1.2	V
Gate resistance	R <sub>G</sub>	f=1MHz	-	1.7	-	Ω
Maximum Body-Diode Continuous Current	I <sub>S</sub>		-	-	45	A
<b>Dynamic Parameters</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =0V, f=1MHz	-	1015	-	pF
Output Capacitance	C <sub>oss</sub>		-	356	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	19	-	
<b>Switching Parameters</b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =50V, I <sub>D</sub> =20A	-	18	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	3.9	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	4.4	-	
Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> =1A, di/dt=100A/us	-	29	-	nC
Reverse Recovery Time	t <sub>rr</sub>		-	33	-	ns
Turn-on Delay Time	t <sub>D(on)</sub>	V <sub>GS</sub> =10V, V <sub>DD</sub> =50V, I <sub>D</sub> =20A R <sub>GEN</sub> =3Ω	-	7.2	-	ns
Turn-on Rise Time	t <sub>r</sub>		-	18	-	
Turn-off Delay Time	t <sub>D(off)</sub>		-	19	-	
Turn-off fall Time	t <sub>f</sub>		-	5.3	-	

A. Repetitive rating; pulse width limited by max. junction temperature.

B. T<sub>J</sub>=25°C, V<sub>G</sub>=10V, R<sub>G</sub>=25Ω, L=0.5 mH

C. P<sub>d</sub> is based on max. junction temperature, using junction-case and junction-ambient thermal resistance.

■ Typical Electrical and Thermal Characteristics Diagrams

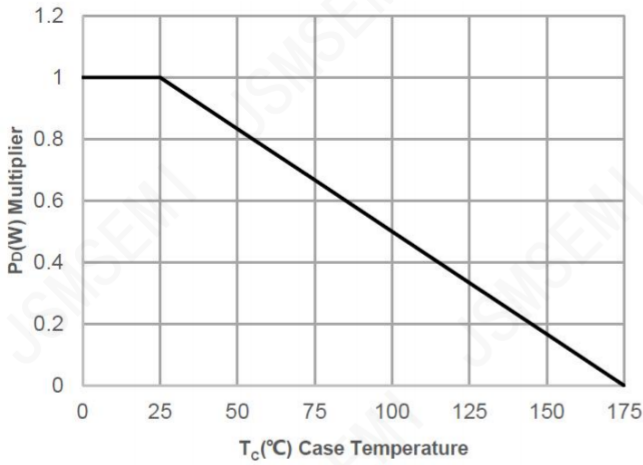


Figure.1 Power De-rating

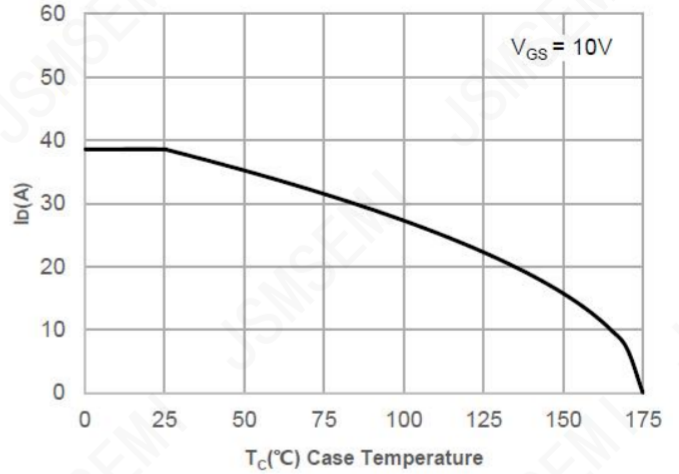


Figure.2 Current De-rating

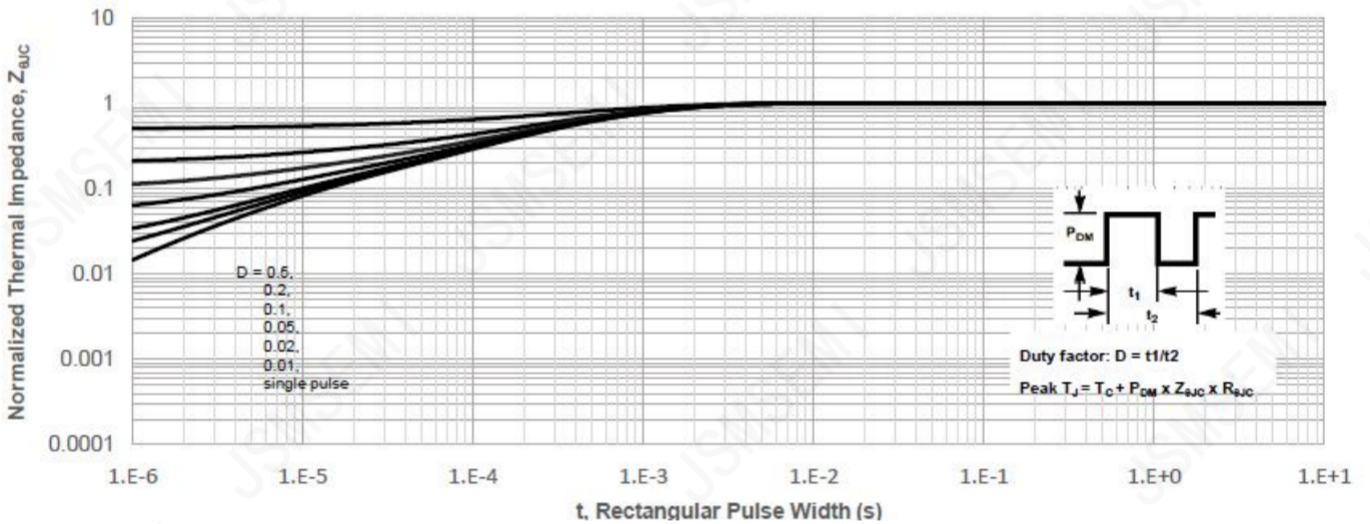


Figure.3 Normalized Maximum Transient Thermal Impedance

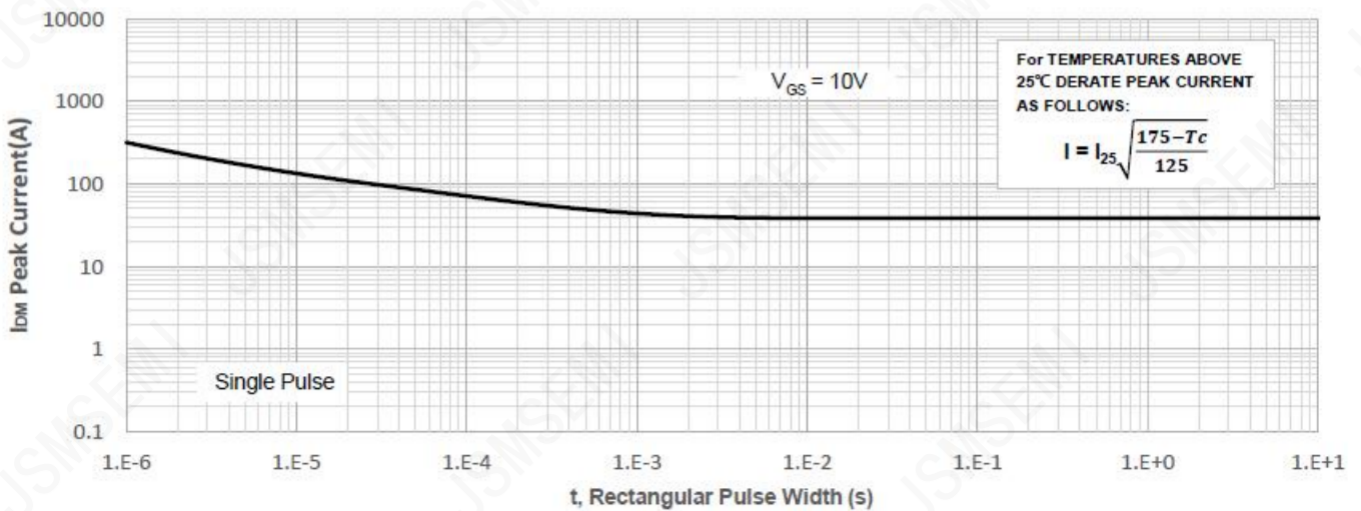


Figure.4 Peak Current Capacity

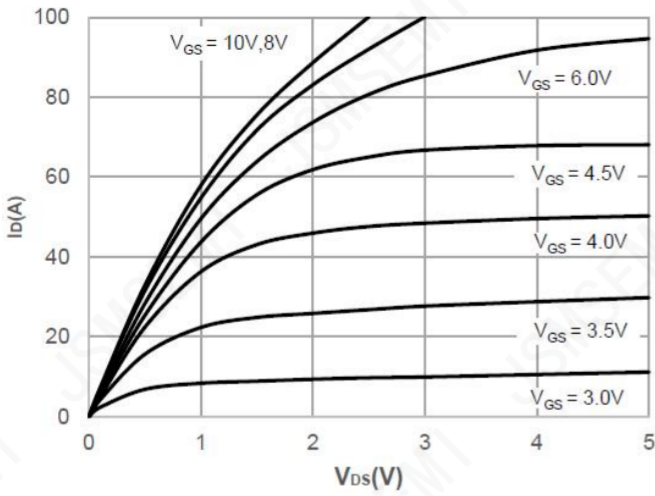


Figure.5 Output Characteristics

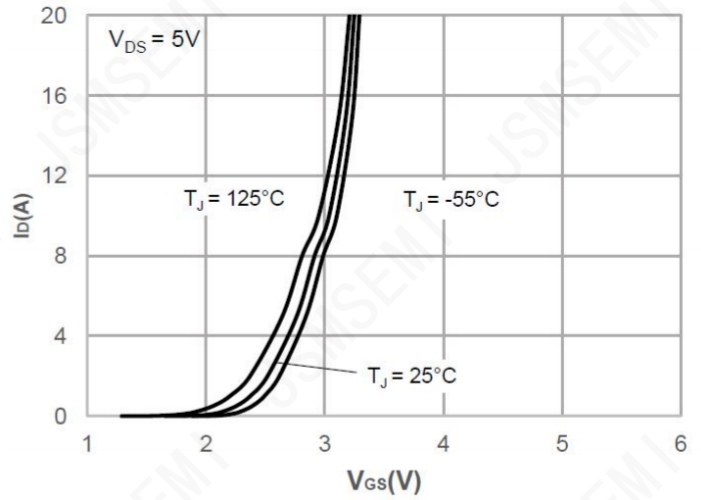


Figure.6 Typical Transfer Characteristics

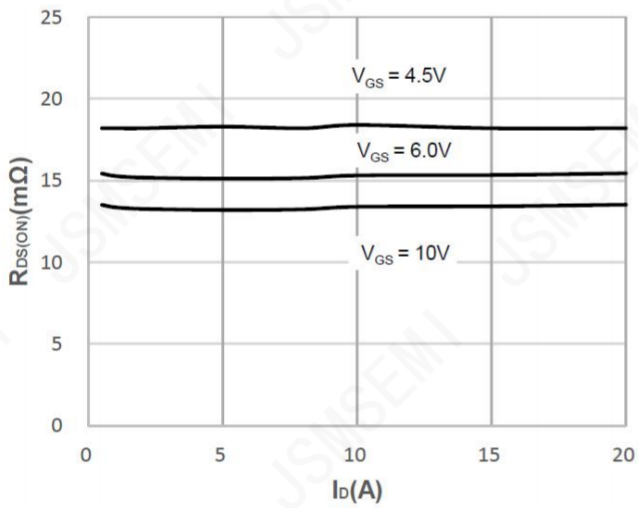


Figure.7 On-resistance vs. Drain Current

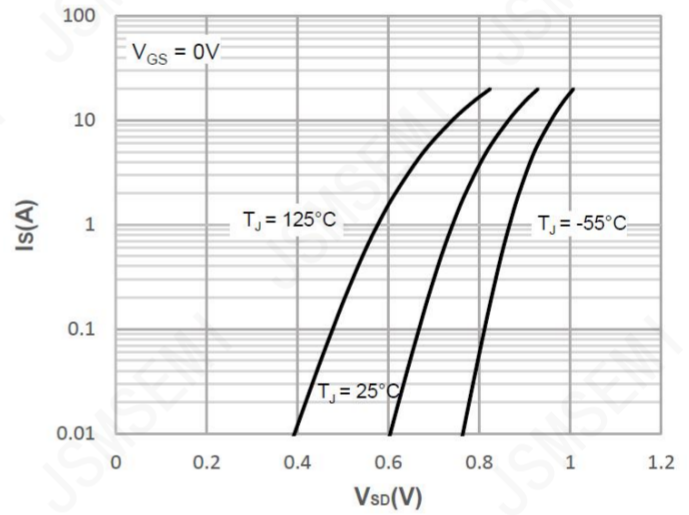


Figure.8 Body Diode Characteristics

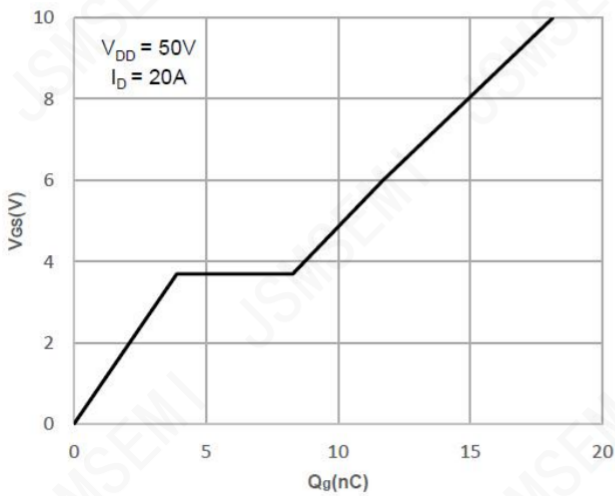


Figure.9 Gate Charge Characteristics

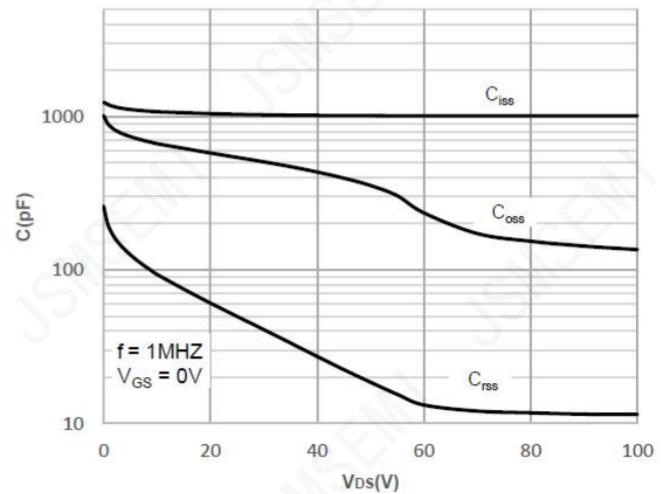


Figure.10 Capacitance Characteristics

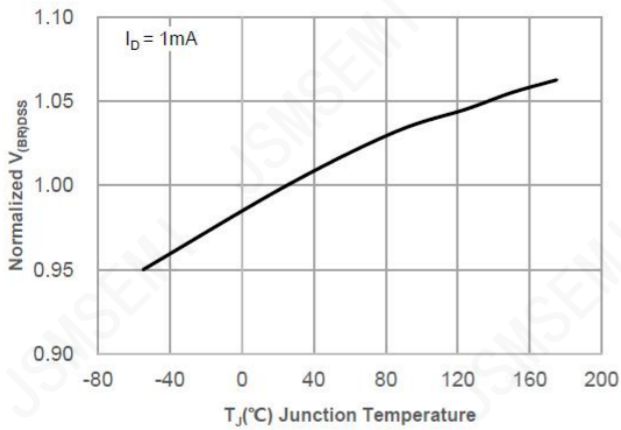


Figure.11 Normalized Breakdown voltage vs. Junction Temperature

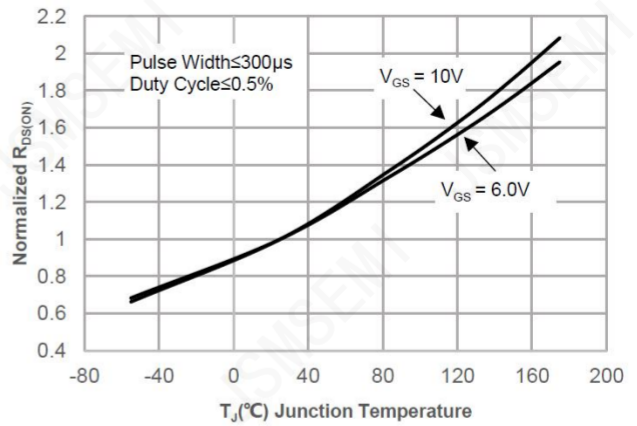


Figure.12 Normalized on Resistance vs. Junction Temperature

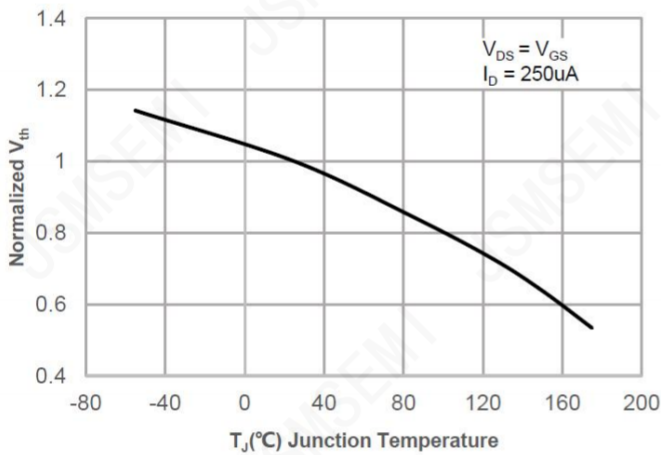


Figure.13 Normalized Threshold Voltage vs. Junction Temperature

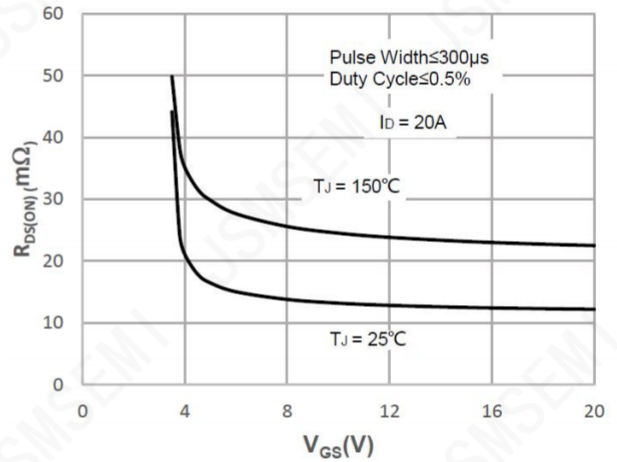


Figure.14  $R_{DS(ON)}$  vs.  $V_{GS}$

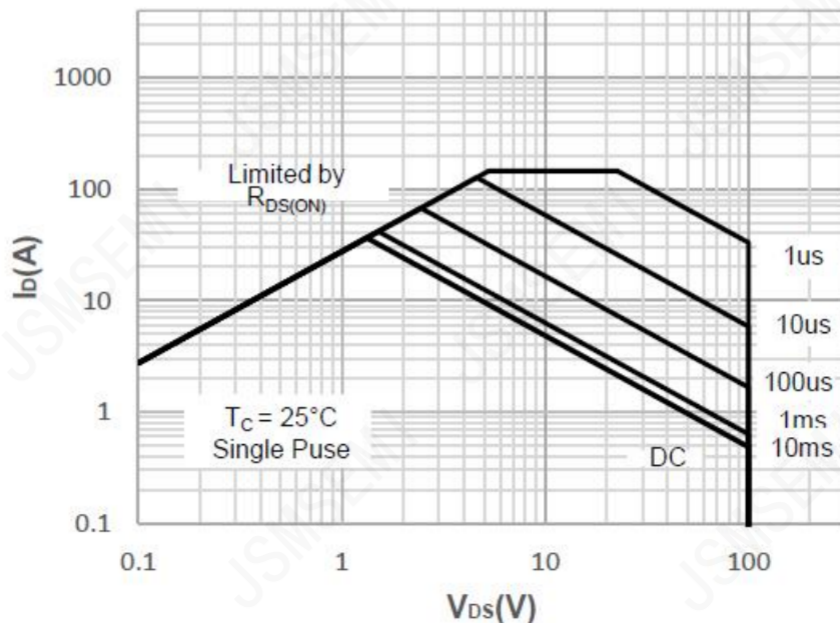
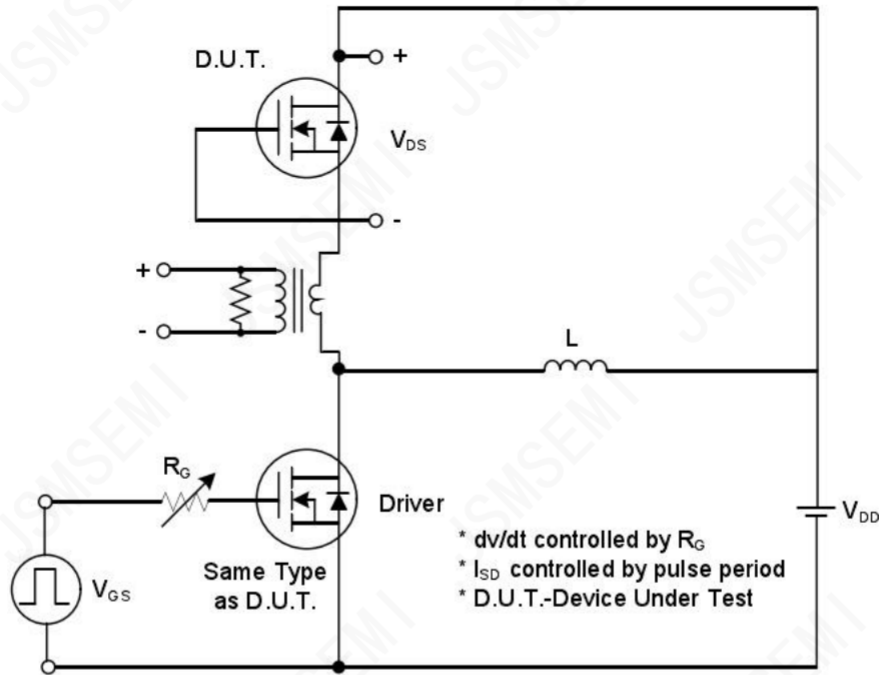
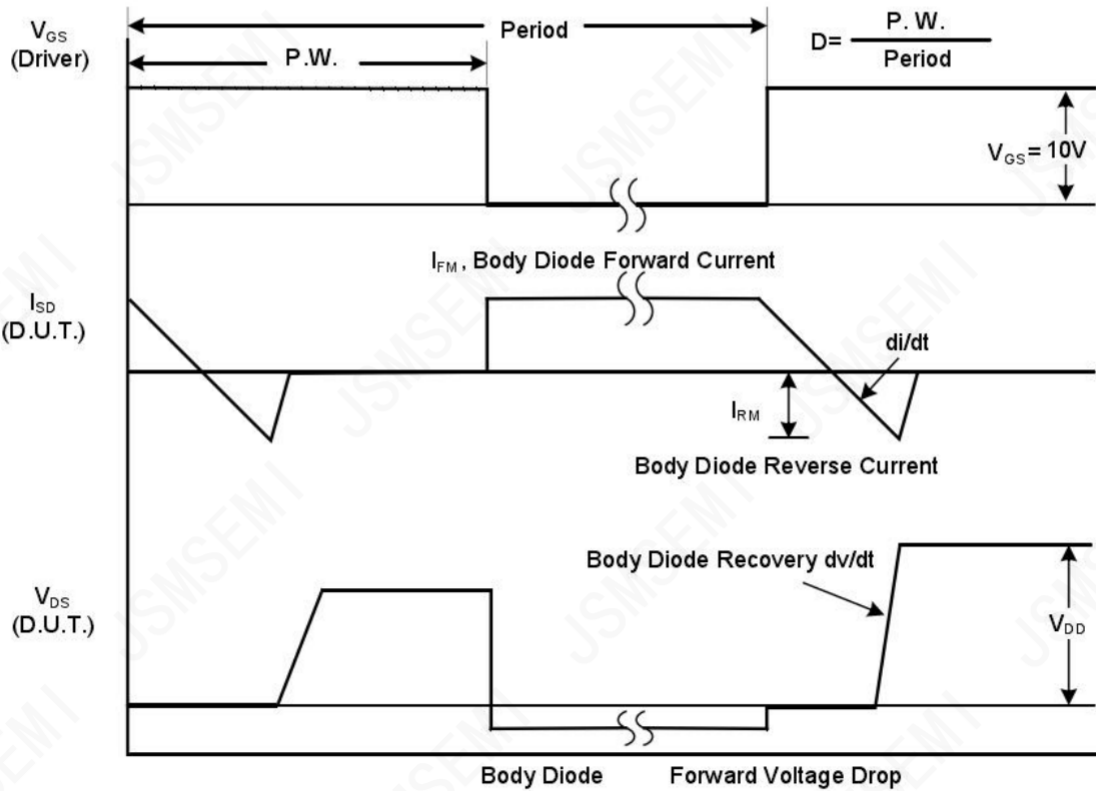


Figure.15 Maximum Safe Operating Area

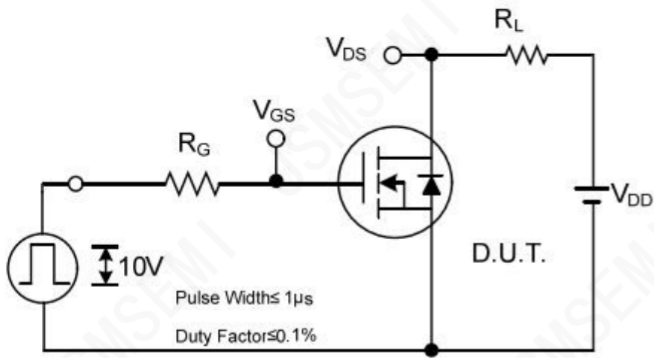
■ RATING AND CHARACTERISTIC CURVES



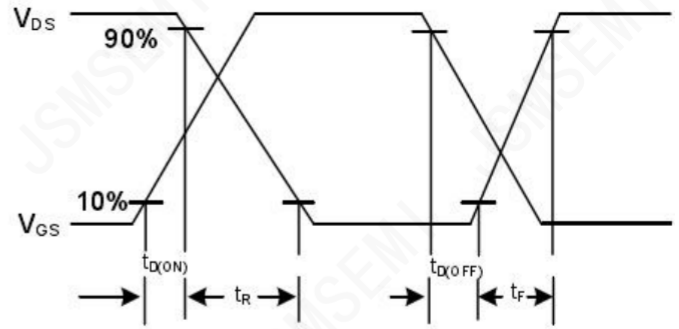
Peak Diode Recovery  $dv/dt$  Test Circuit



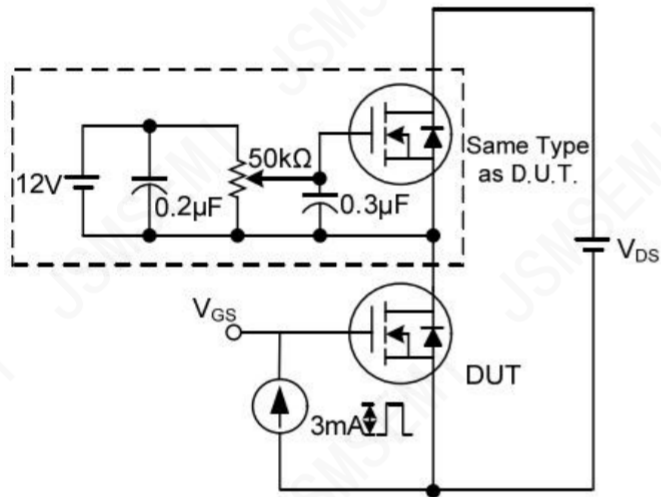
Peak Diode Recovery  $dv/dt$  Waveforms



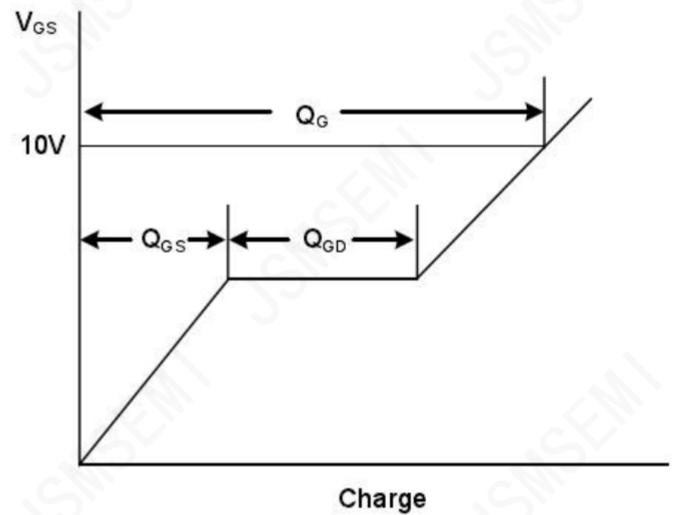
**Switching Test Circuit**



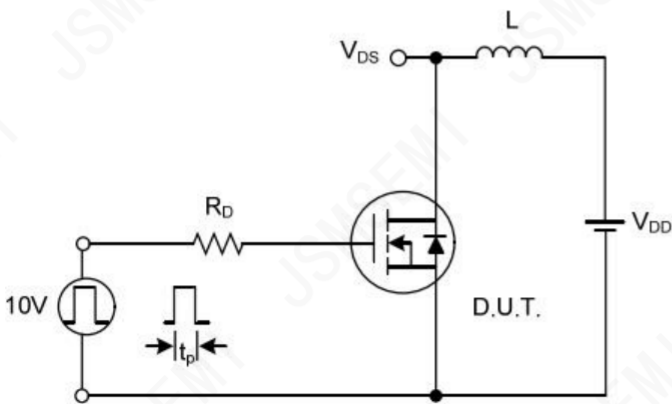
**Switching Waveforms**



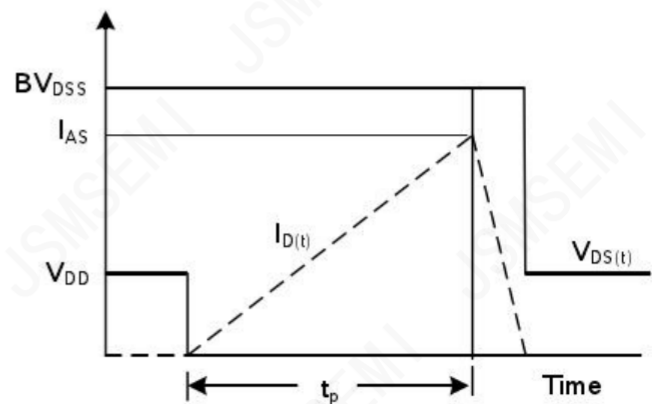
**Gate Charge Test Circuit**



**Gate Charge Waveform**



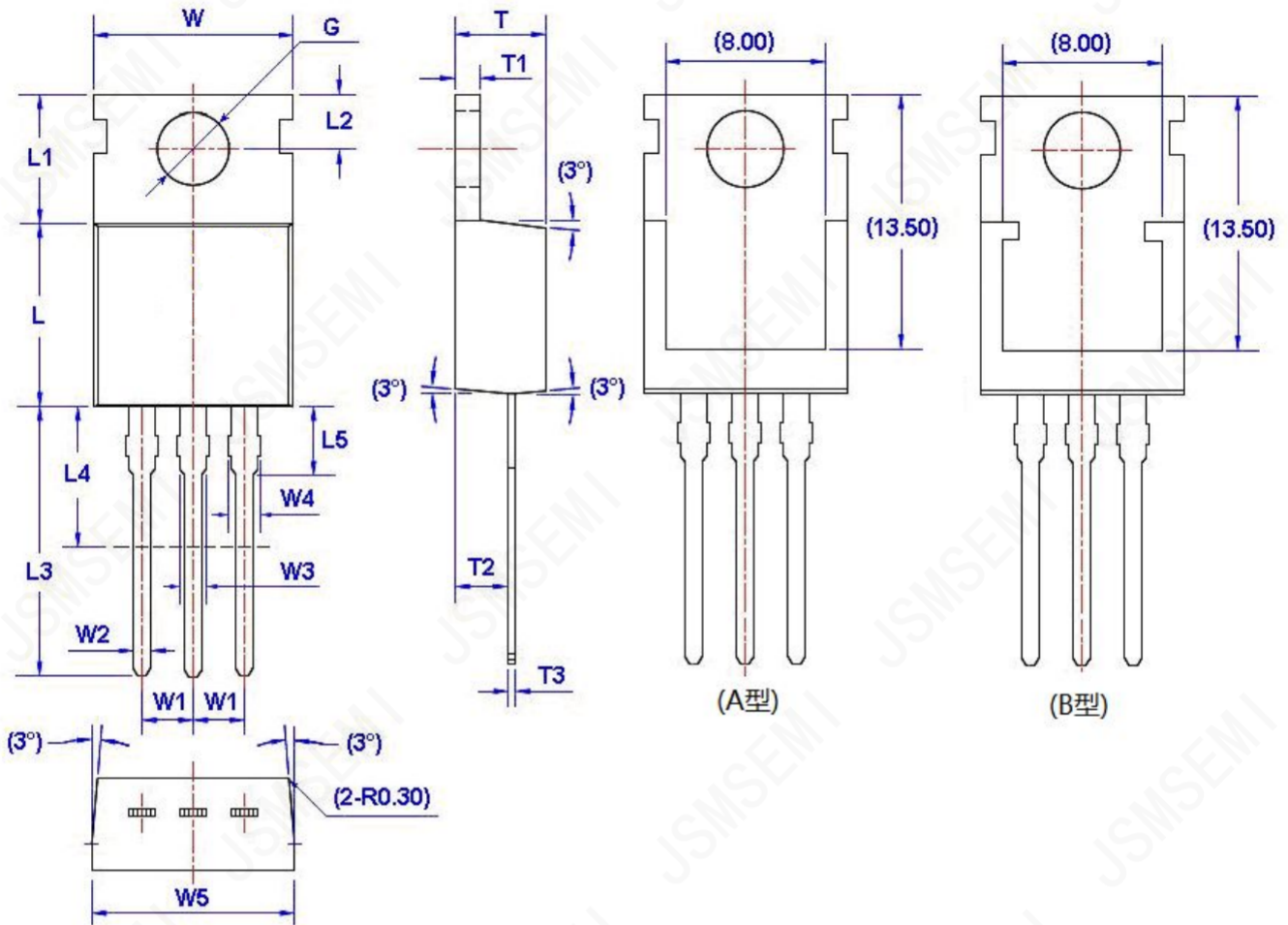
**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

**Package Information**

TO-220-3



Unit: mm

Symbol	Size		Symbol	Size		Symbol	Size		Symbol	Size	
	Min	Max		Min	Max		Min	Max		Min	Max
W	9.66	10.28	W5	9.80	10.20	L4**	6.20	6.60	T3	0.45	0.60
W1	2.54 (TYP)		L	9.00	9.40	L5	2.79	3.30	G(Φ)	3.50	3.70
W2	0.70	0.95	L1	6.40	6.80	T	4.30	4.70			
W3	1.17	1.37	L2	2.70	2.90	T1	1.15	1.40			
W4*	1.32	1.72	L3	12.70	14.27	T2	2.20	2.60			

## Revision History

Rev.	Change	Date
V1.0	Initial version	6/27/2021

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