

## Product Summary

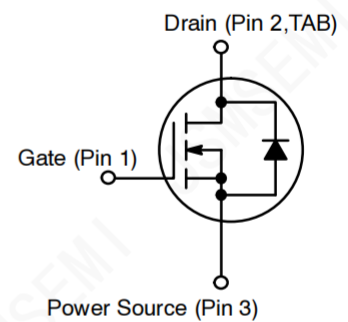
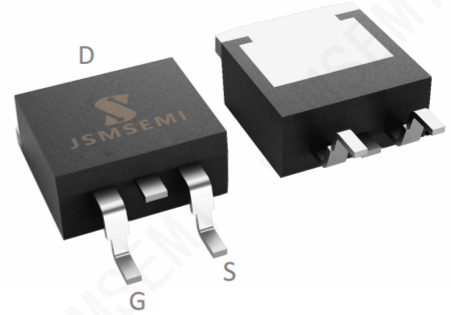
- $V_{DS}$  100V
- $I_D$  180A
- $R_{DS(ON)}$  ( at  $V_{GS}=10V$ )  $<4.5m\Omega$
- 100% EAS Tested
- 100%  $\nabla V_{DS}$  Tested

## General Description

- Trench Power MOSFET technologygate
- 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 ( $T_A=25^\circ C$ unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-source Voltage		$V_{DS}$	100	V
Gate-source Voltage		$V_{GS}$	$\pm 20$	V
Drain Current	$T_C=25^\circ C$	$I_D$	180	A
	$T_C=100^\circ C$		130	
Pulsed Drain Current <sup>A</sup>		$I_{DM}$	720	A
Avalanche energy <sup>B</sup>		EAS	980	mJ
Total Power Dissipation	$T_C=25^\circ C$	$P_D$	280	W
	$T_C=100^\circ C$		120	
Junction and Storage Temperature Range		$T_J, T_{STG}$	-55~+150	$^\circ C$

### ■ Thermal resistance

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient <sup>D</sup>	Steady-State	$R_{\theta JA}$		40	$^\circ C/W$
Thermal Resistance Junction-to-Case	Steady-State	$R_{\theta JC}$		0.45	

## Ordering Information

Order number	Package	Marking	Operation Temperature Range	MSL Grade	Ship, Quantity	Green
IRFS4010TRLPBF-JSM	TO-263	FS4010	-55 to 150 $^\circ C$	1	T&R, 800	RoHS

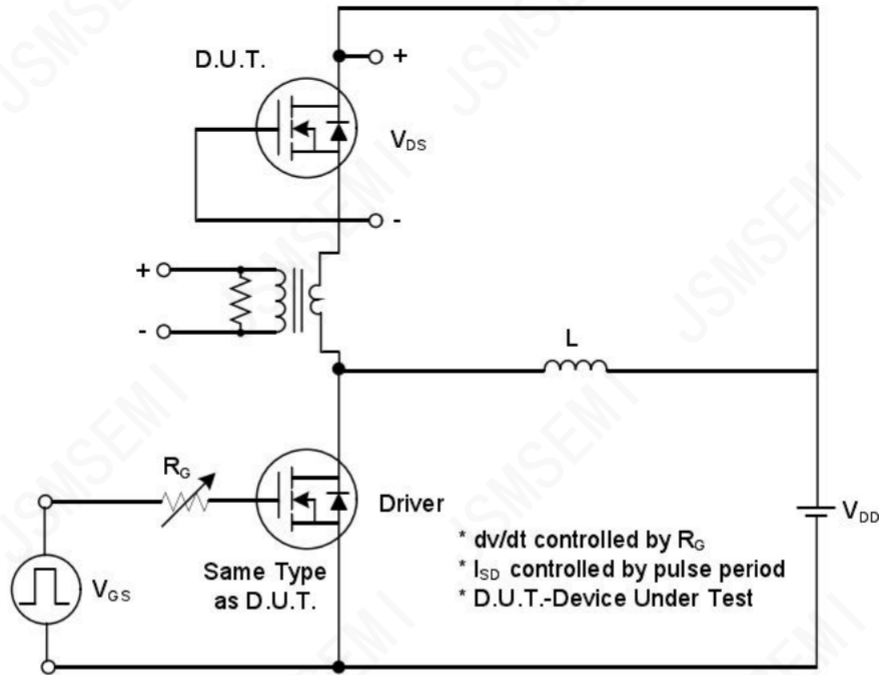
**■ Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

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	-	3.5	4.5	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>		-	-	180	A
<b>Dynamic Parameters</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =0V, f=1MHz	-	7315	-	pF
Output Capacitance	C <sub>oss</sub>		-	2656	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	59	-	
<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	-	110	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	24	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	35	-	
Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> =20A, di/dt=100A/μs	-	209	-	nC
Reverse Recovery Time	t <sub>rr</sub>		-	90	-	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	-	25	-	ns
Turn-on Rise Time	t <sub>r</sub>		-	45	-	
Turn-off Delay Time	t <sub>D(off)</sub>		-	88	-	
Turn-off fall Time	t <sub>f</sub>		-	53	-	

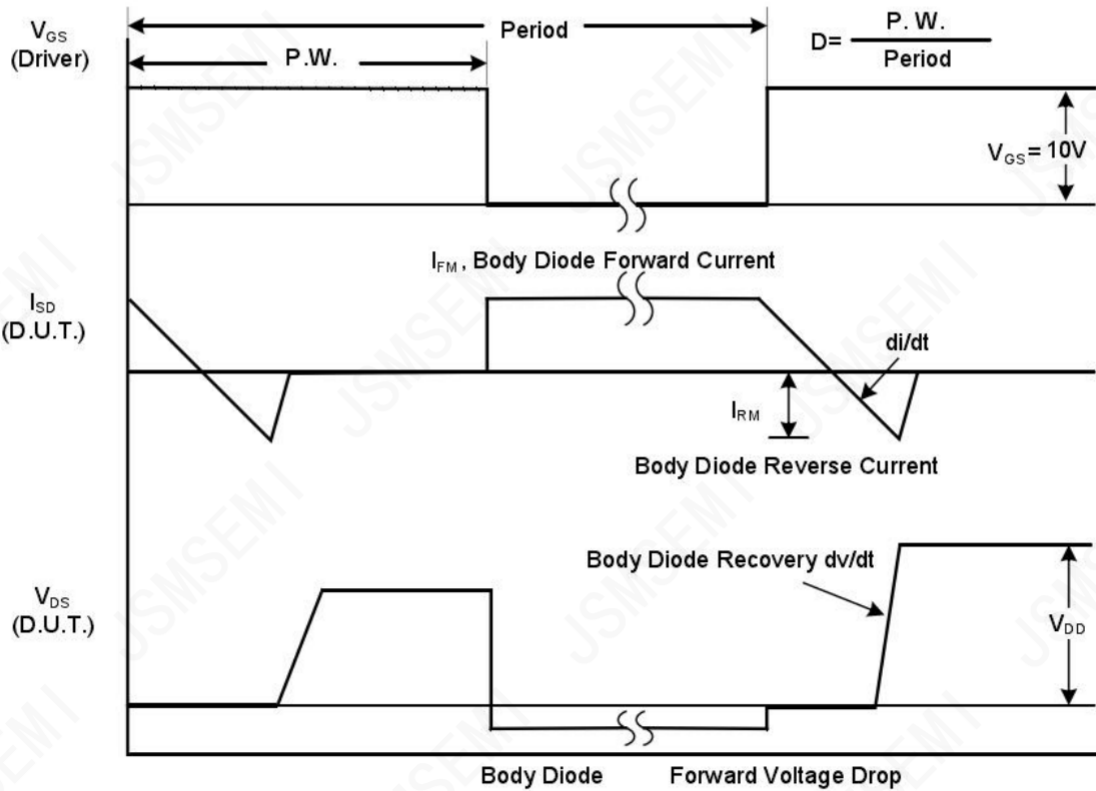
A. Repetitive rating; pulse width limited by max. junction temperature.

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

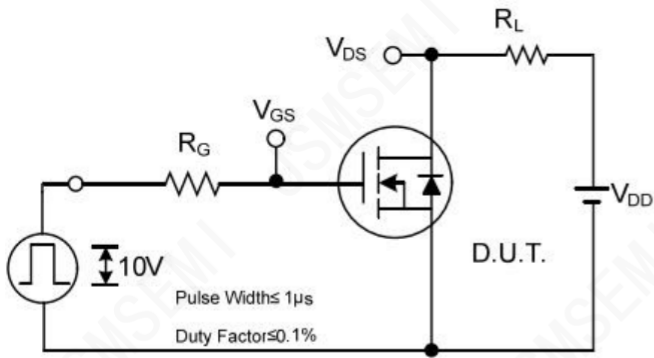
■ RATING AND CHARACTERISTIC CURVES



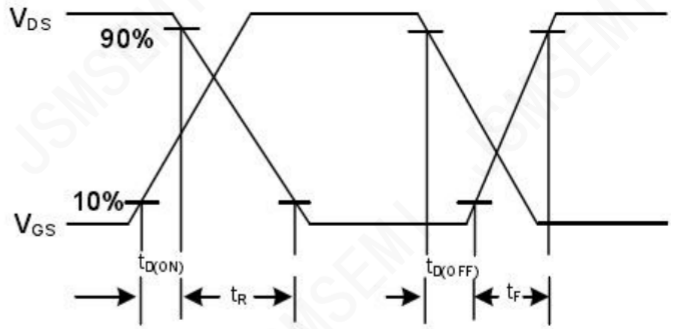
Peak Diode Recovery  $dv/dt$  Test Circuit



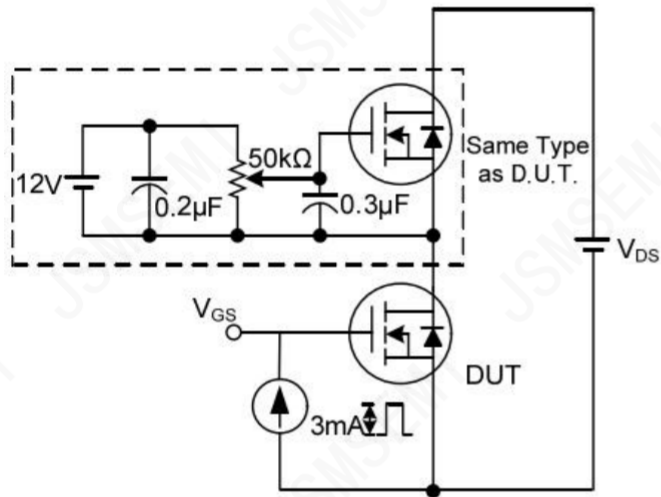
Peak Diode Recovery  $dv/dt$  Waveforms



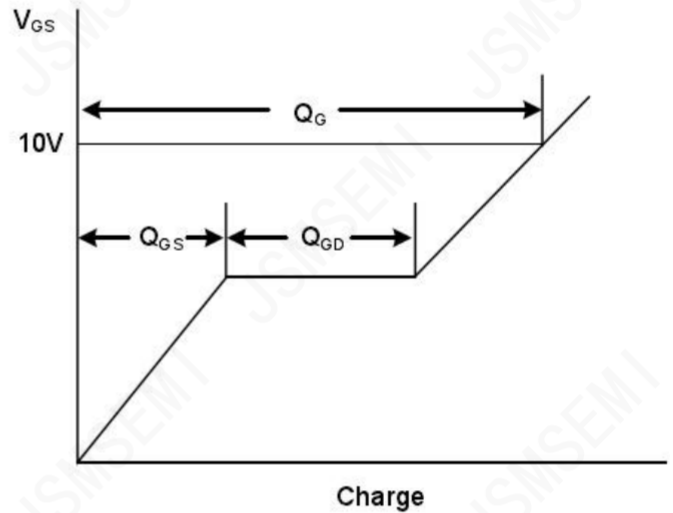
Switching Test Circuit



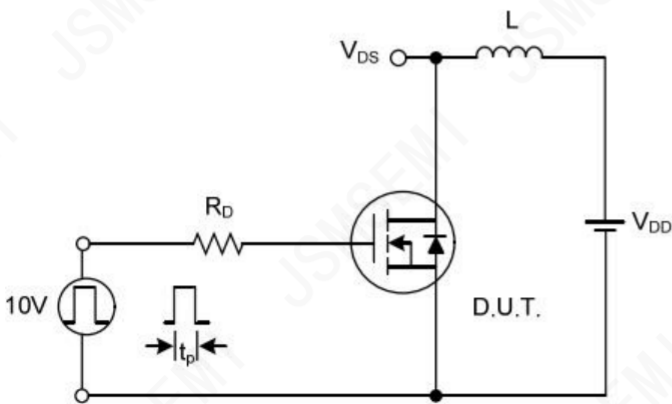
Switching Waveforms



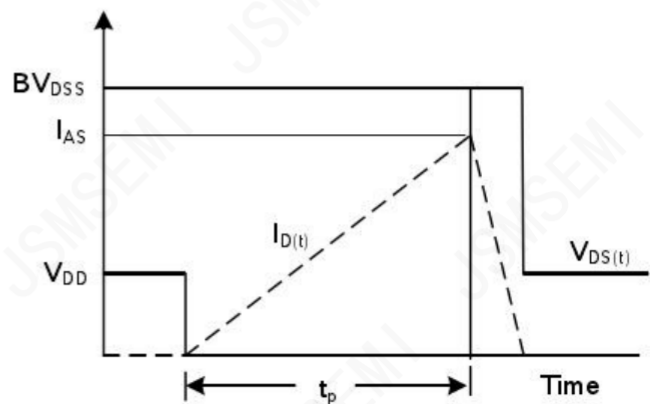
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

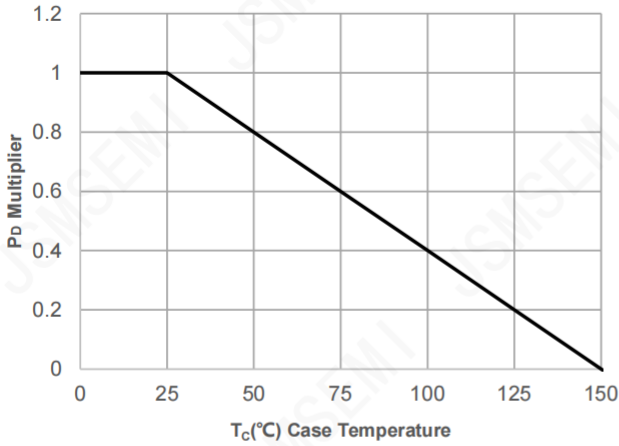
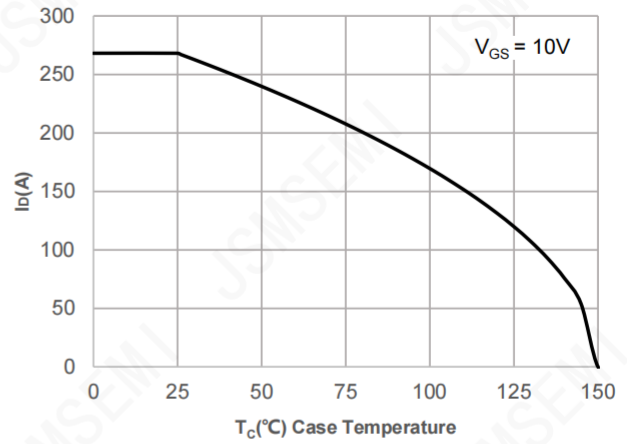
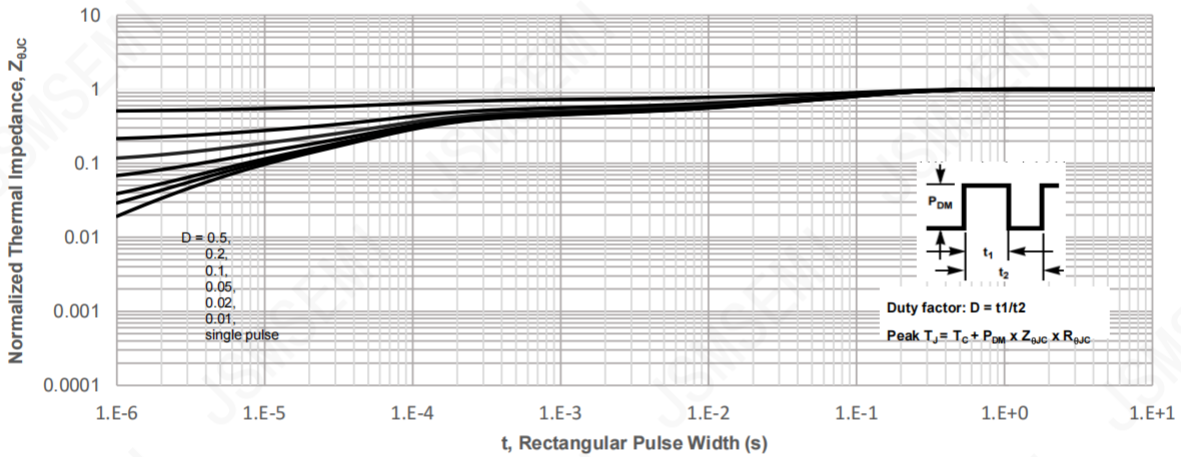
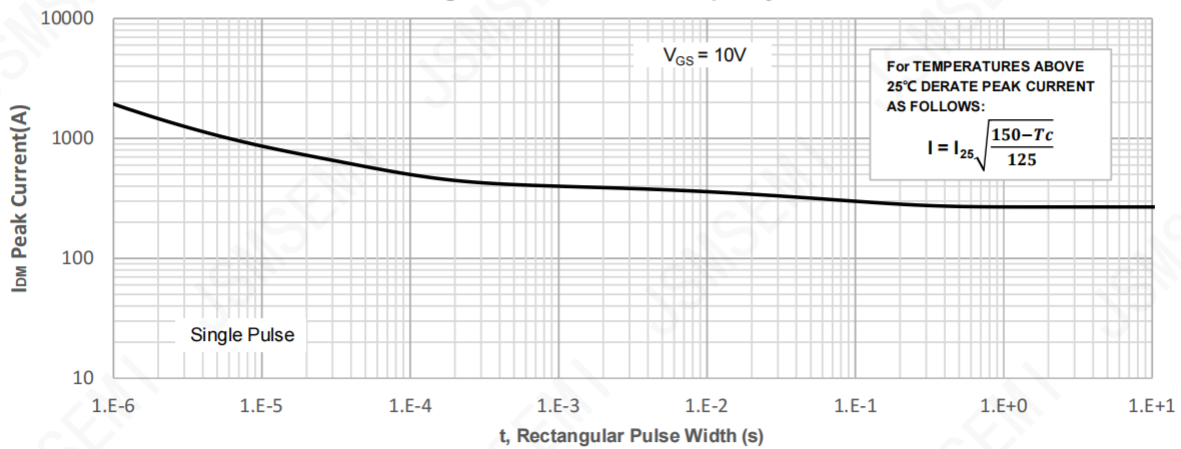
**Typical Electrical and Thermal Characteristics Diagrams**
**Figure 1: Power De-rating**

**Figure 2: Current De-rating**

**Figure 3: Normalized Maximum Transient Thermal Impedance**

**Figure 4: Peak Current Capacity**


Figure 5: Output Characteristics

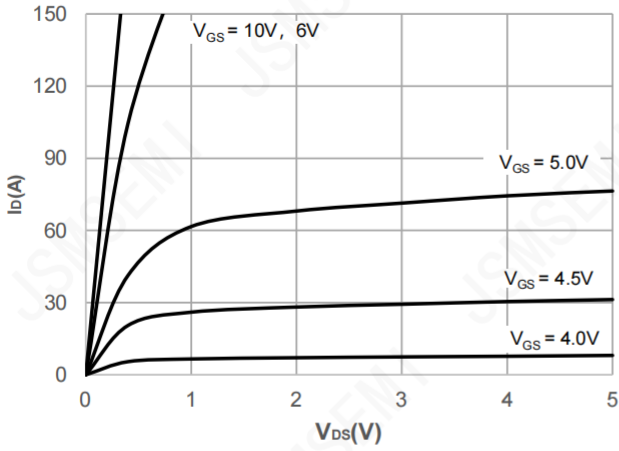


Figure 6: Typical Transfer Characteristics

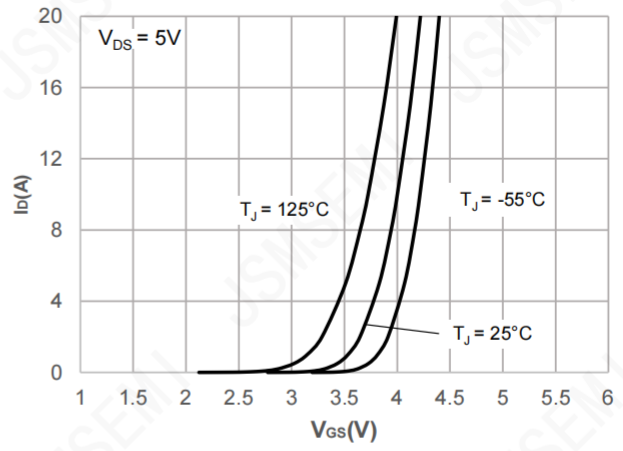


Figure 7: On-resistance vs. Drain Current

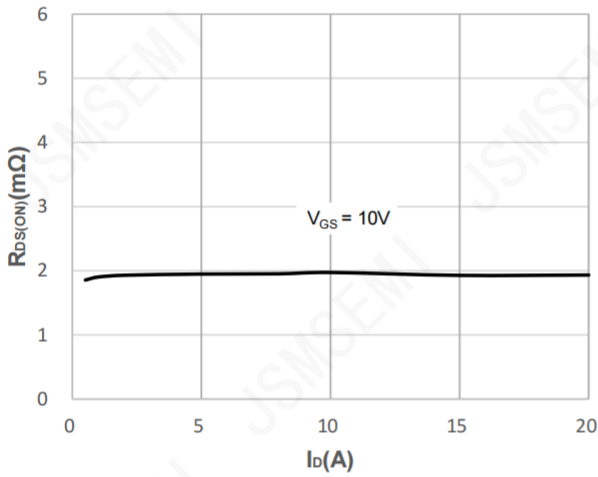


Figure 8: Body Diode Characteristics

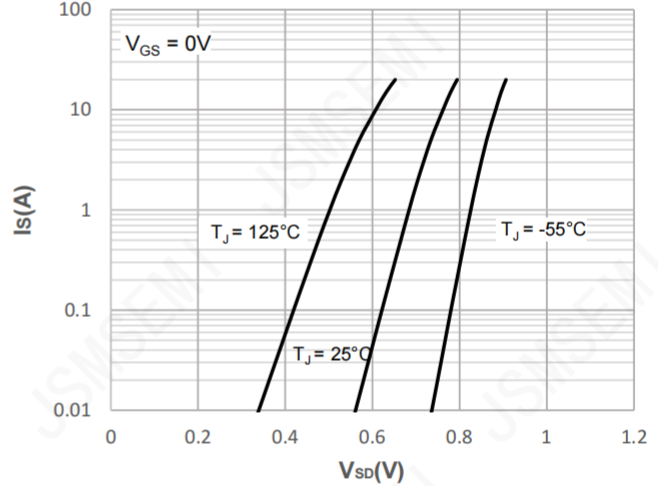


Figure 9: Gate Charge Characteristics

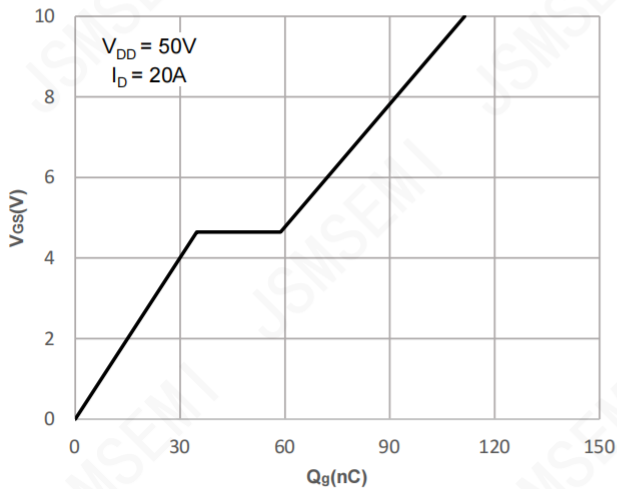


Figure 10: Capacitance Characteristics

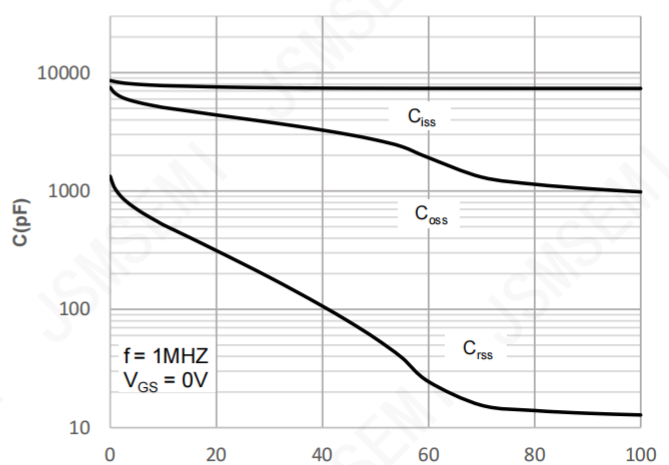


Figure 11: Normalized Breakdown voltage vs. Junction Temperature

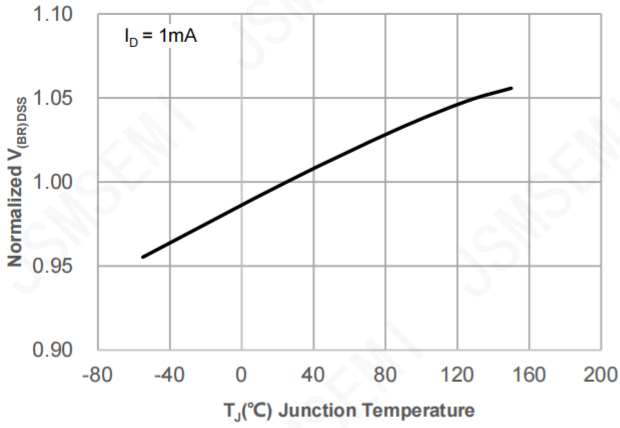


Figure 12: Normalized on Resistance vs. Junction Temperature

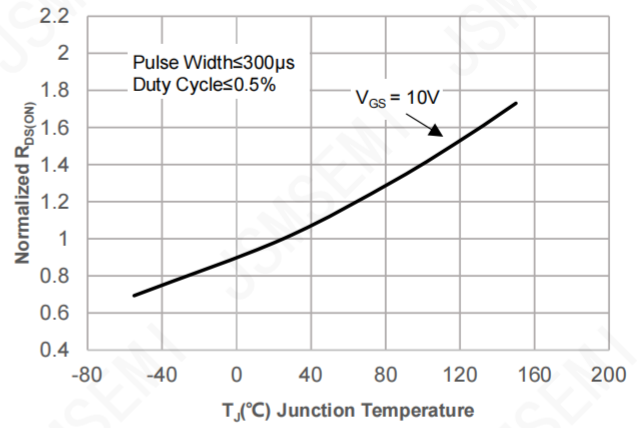


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

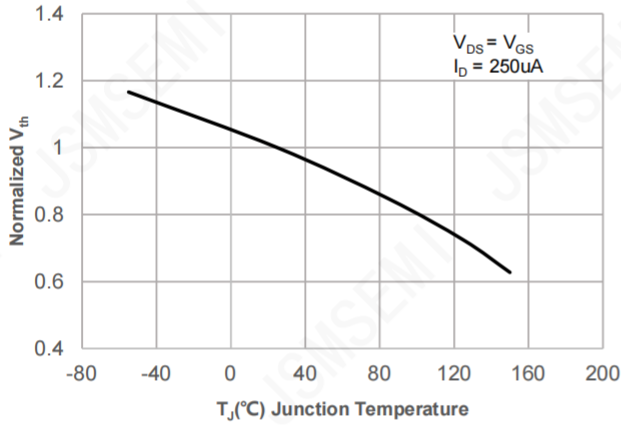


Figure 14:  $R_{DS(ON)}$  vs.  $V_{GS}$

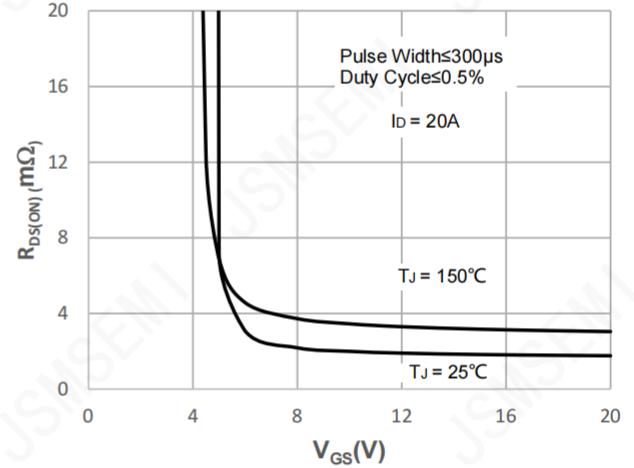
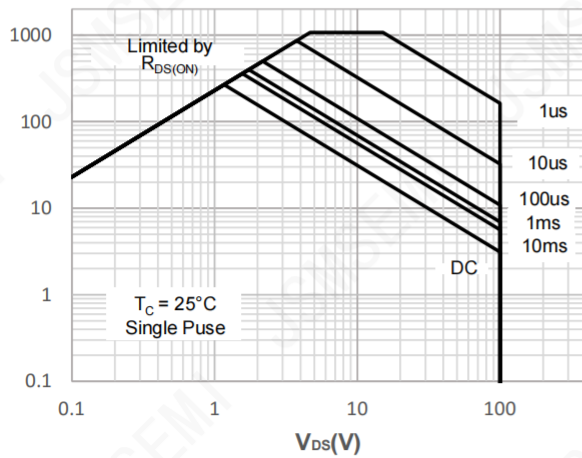
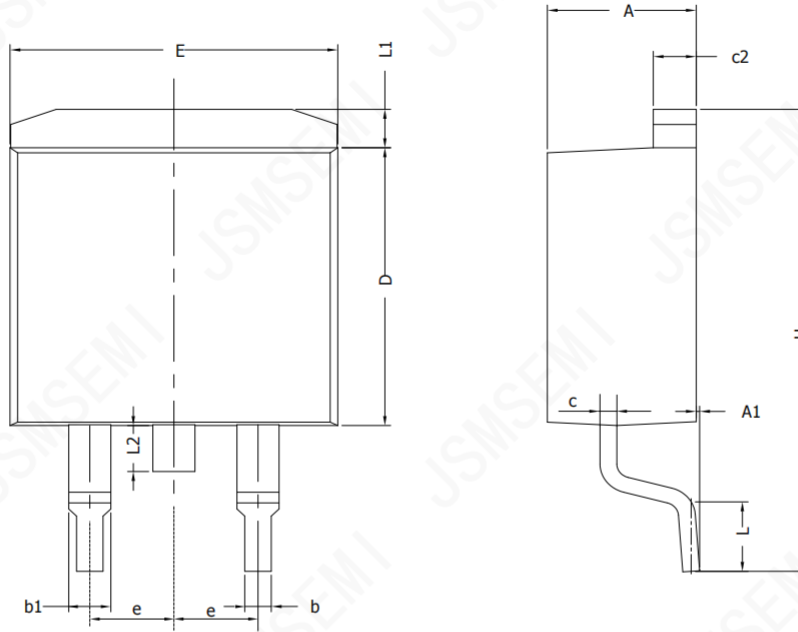


Figure 15: Maximum Safe Operating Area



**Package Information**

TO-263



SYMBOL	MIN	NOM	MAX
A	4.30	4.57	4.72
A1	0	0.10	0.25
b	0.71	0.81	0.91
c	0.30	---	0.60
c2	1.17	1.27	1.37
D	8.50	---	9.35
E	9.80	---	10.45
e	2.54BSC		
H	14.70	---	15.75
L	2.00	2.30	2.74
L1	1.12	1.27	1.42
L2	---	---	1.75

## Revision History

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

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