

# 110V, 196A, 5.3mΩ N-channel Power SGT MOSFET

## JBL113P

### Features

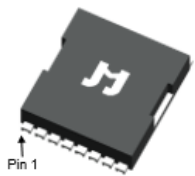
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- 100% UIS Tested
- 100%  $\Delta V_{ds}$  Tested
- Halogen-free; RoHS-compliant

### Applications

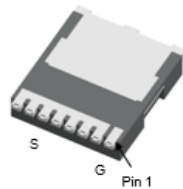
- Load Switch
- PWM Application
- Power Management

### Product Summary

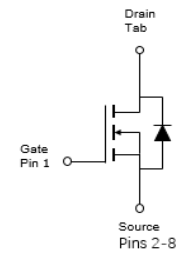
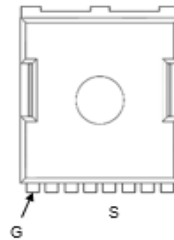
Parameters	Value	Unit
$V_{DSS}$	110	V
$V_{GS(th\_Typ)}$	2.8	V
$I_D(@V_{GS}=10V)$	196	A
$R_{DS(ON\_Typ)}(@V_{GS}=10V)$	3.3	mΩ
$R_{DS(ON\_Typ)}(@V_{GS}=6V)$	5.3	mΩ



PowerJE®10x12



Pin Assignment



Schematic Diagram

### Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JBL113P	BL113P	1	Tape&Reel	PowerJE®10x12	2000	10000

### Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-to-Source Voltage	110	V
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current	$T_C = 25^\circ\text{C}$	196
		$T_C = 100^\circ\text{C}$	124
$I_{DM}$	Pulsed Drain Current <sup>(1)</sup>	Refer to Fig.4	A
$E_{AS}$	Single Pulsed Avalanche Energy <sup>(2)</sup>	850	mJ
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	313
		$T_C = 100^\circ\text{C}$	125
$T_J, T_{STG}$	Junction & Storage Temperature Range	-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient <sup>(3)</sup>	33	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.4	



**Electrical Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$	110	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 88\text{V}$ , $V_{GS} = 0\text{V}$	-	-	1.0	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Current	$V_{DS} = 0\text{V}$ , $V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$	2.0	2.8	3.7	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance <sup>(4)</sup>	$V_{GS} = 10\text{V}$ , $I_D = 20\text{A}$	-	3.3	4.2	m $\Omega$
		$V_{GS} = 6\text{V}$ , $I_D = 20\text{A}$	-	5.3	6.9	m $\Omega$
<b>Dynamic Characteristics</b>						
$R_g$	Gate Resistance	$f = 1\text{MHz}$	-	2.1	-	$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{V}$ , $V_{DS} = 55\text{V}$ , $f = 1\text{MHz}$	4397	6156	8310	pF
$C_{oss}$	Output Capacitance		653	915	1235	pF
$C_{rss}$	Reverse Transfer Capacitance		15	21	29	pF
$Q_g$	Total Gate Charge	$V_{GS} = 0$ to $10\text{V}$ $V_{DS} = 55\text{V}$ , $I_D = 20\text{A}$	63	88	119	nC
$Q_{gs}$	Gate Source Charge		23	32	43	nC
$Q_{gd}$	Gate Drain("Miller") Charge		13	18	24	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On DelayTime	$V_{GS} = 10\text{V}$ , $V_{DD} = 55\text{V}$ $I_D = 20\text{A}$ , $R_{GEN} = 3\Omega$	-	24	-	ns
$t_r$	Turn-On Rise Time		-	25	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	49	-	ns
$t_f$	Turn-Off Fall Time		-	21	-	ns
<b>Body Diode Characteristics</b>						
$I_S$	Maximum Continuous Body Diode Forward Current		-	-	196	A
$I_{SM}$	Maximum Pulsed Body Diode Forward Current		-	-	786	A
$V_{SD}$	Body Diode Forward Voltage	$V_{GS} = 0\text{V}$ , $I_S = 20\text{A}$	-		1.2	V
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F = 20\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$	60	84	113	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge		-	248	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
  2.  $E_{AS}$  condition: Starting  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = 55\text{V}$ ,  $V_{GS} = 10\text{V}$ ,  $R_G = 25\Omega$ ,  $L = 3\text{mH}$ ,  $I_{AS} = 23.8\text{A}$ ,  $V_{DD} = 0\text{V}$  during time in avalanche.
  3.  $R_{\theta JA}$  is measured with the device mounted on a  $1\text{inch}^2$  pad of 2oz copper FR4 PCB.
  4. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 0.5\%$ .



## Typical Performance Characteristics

Figure 1: Power De-rating



Figure 2: Current De-rating

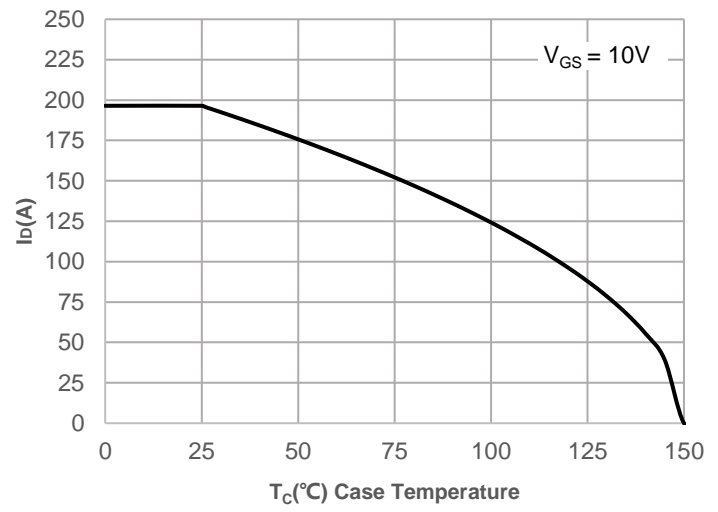


Figure 3: Normalized Maximum Transient Thermal Impedance

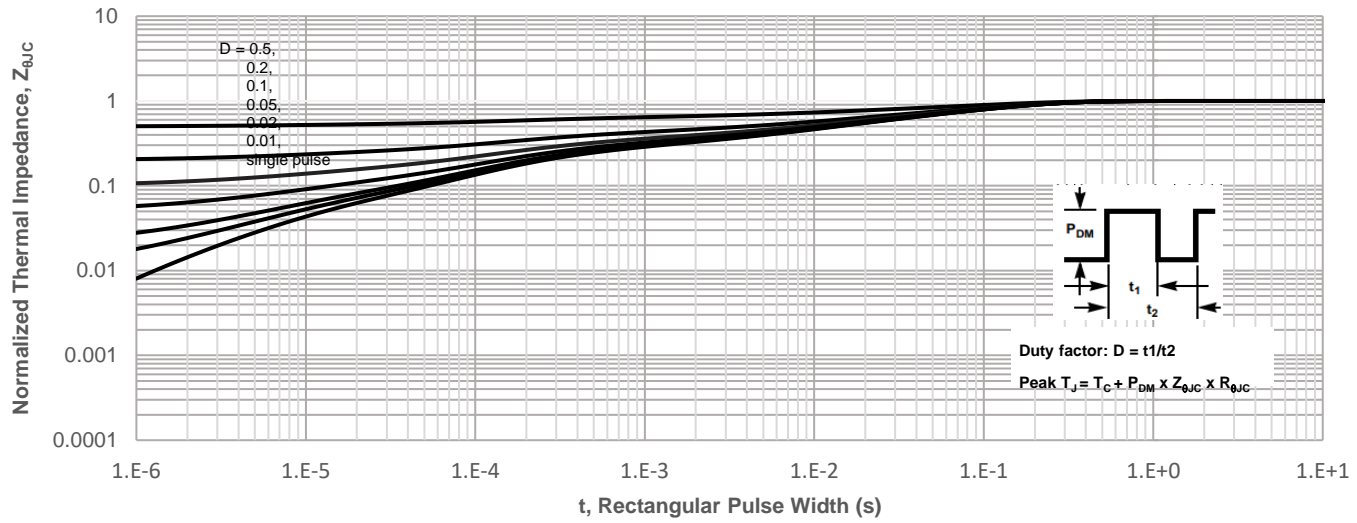
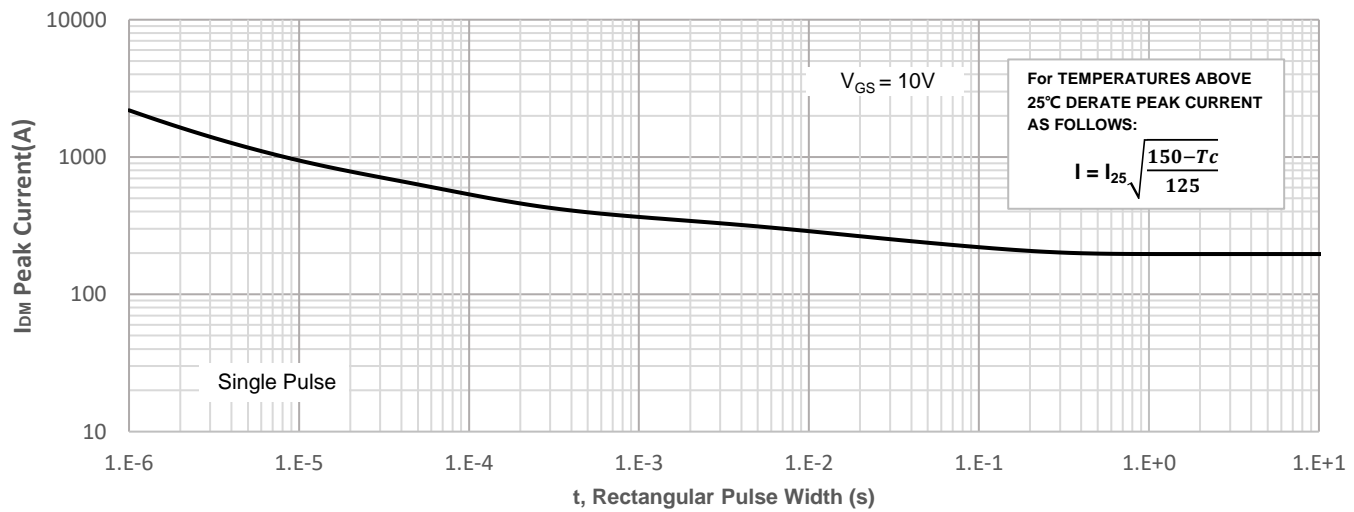
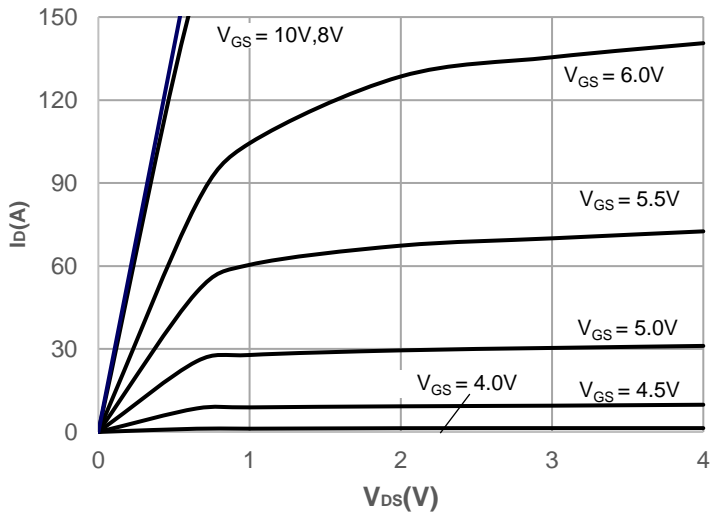
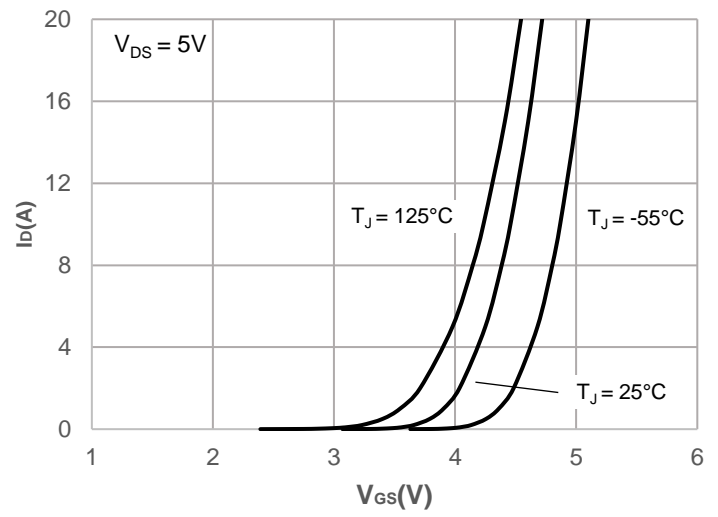
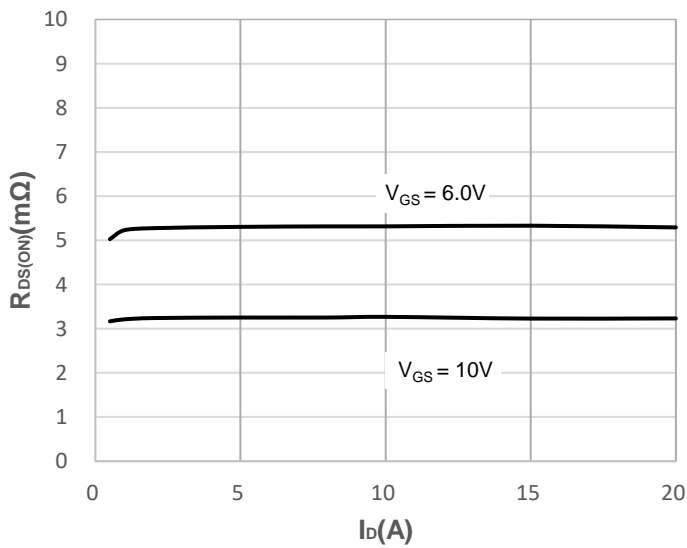
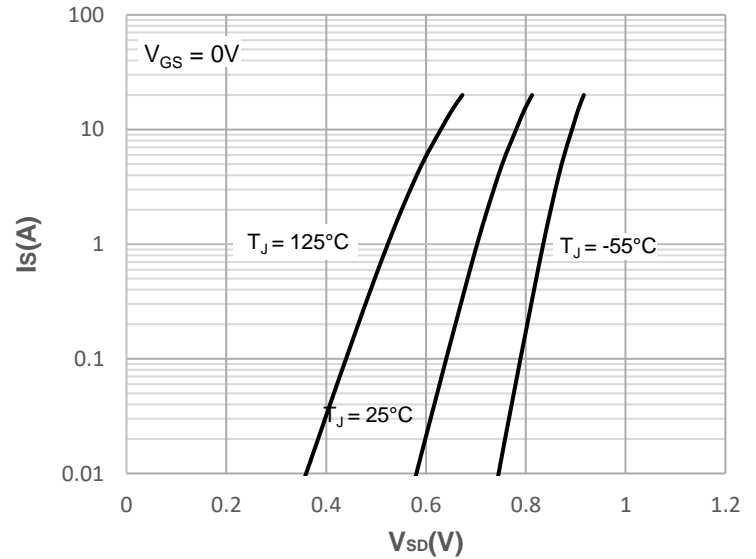
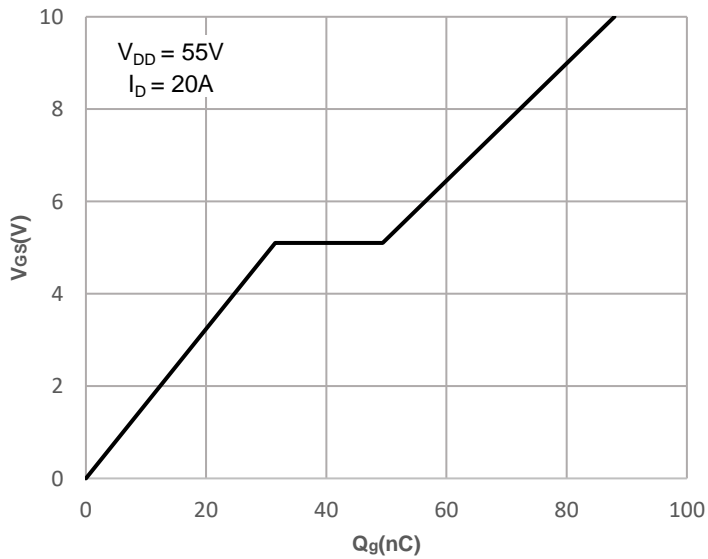
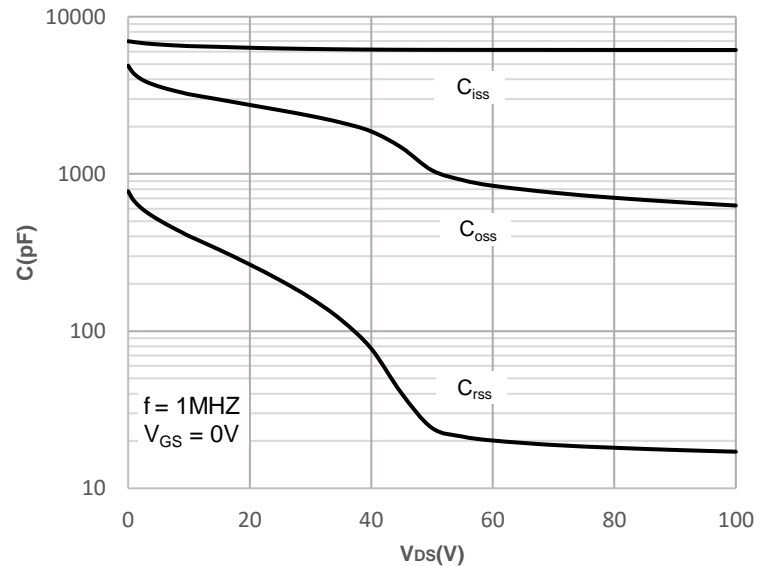


Figure 4: Peak Current Capacity



## Typical Performance Characteristics

**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**


## Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

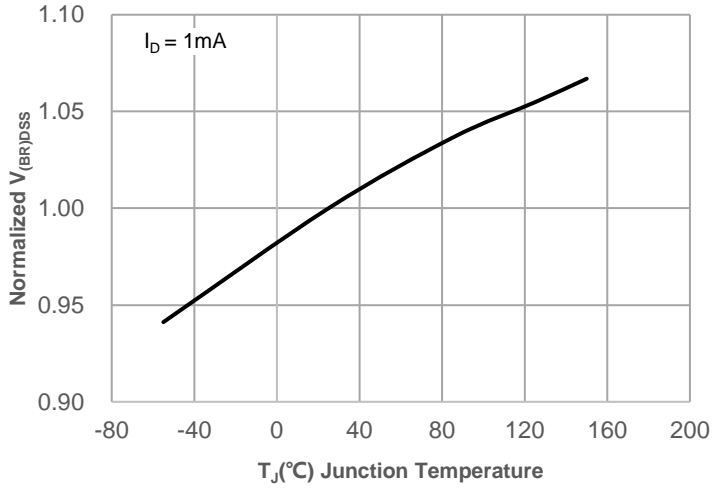


Figure 12: Normalized on Resistance vs. Junction Temperature

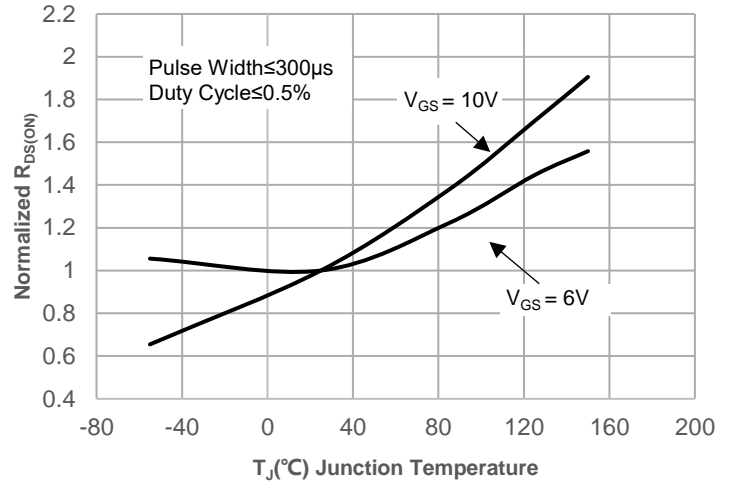


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

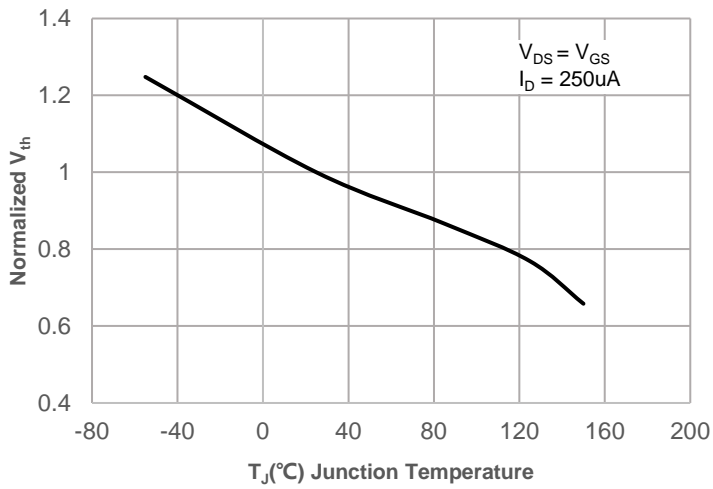


Figure 14:  $R_{DS(ON)}$  vs.  $V_{GS}$

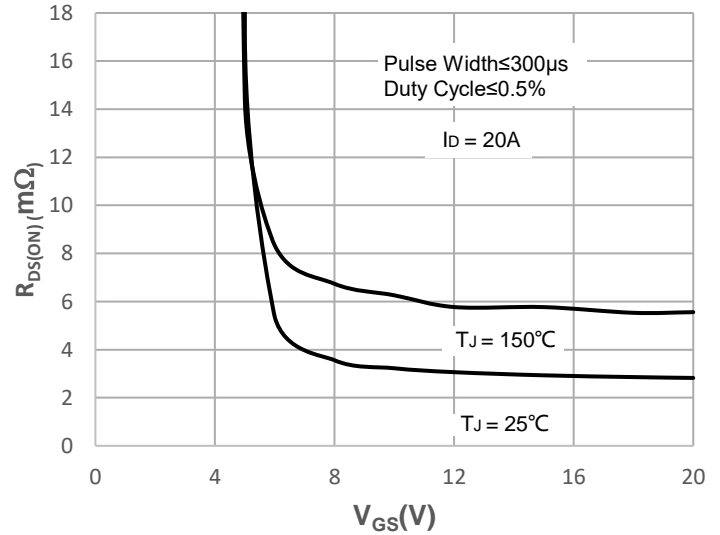
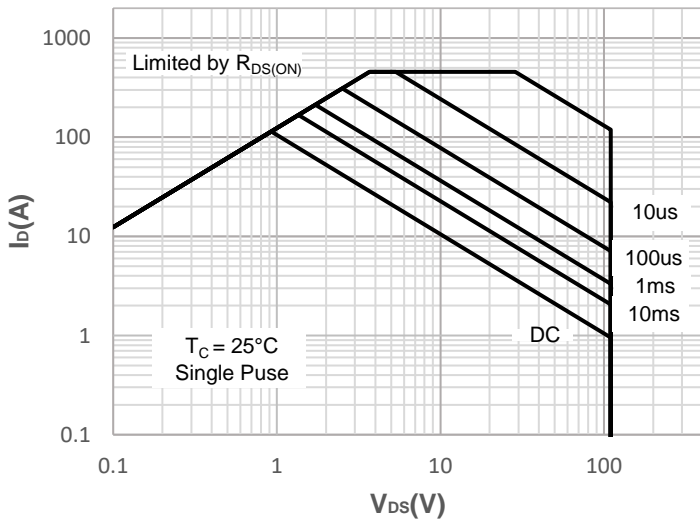


Figure 15: Maximum Safe Operating Area



### Test Circuit



Figure 1: Gate Charge Test Circuit & Waveform

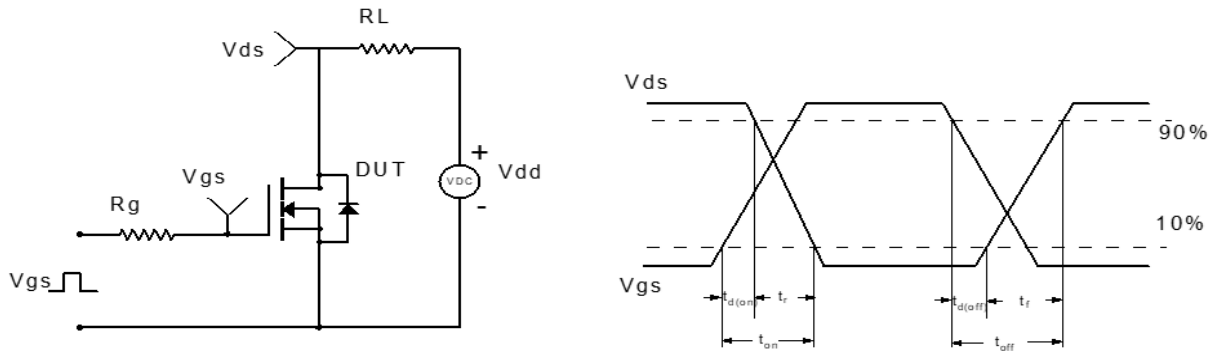


Figure 2: Resistive Switching Test Circuit & Waveform

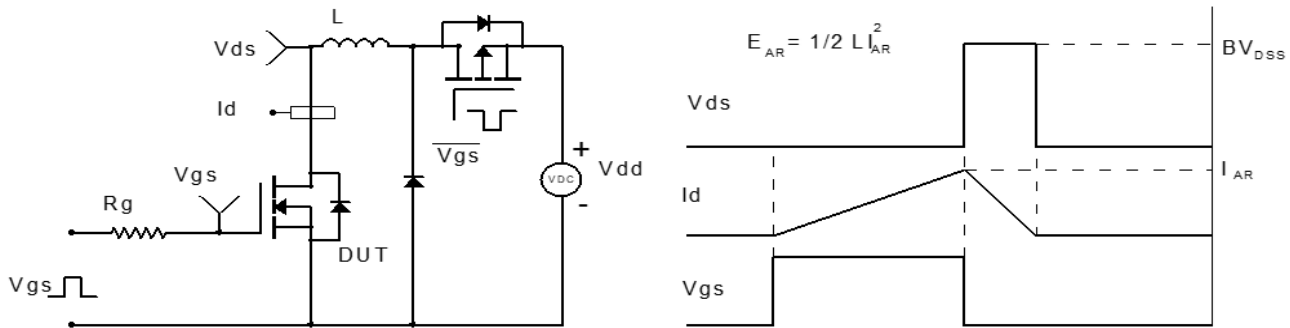


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

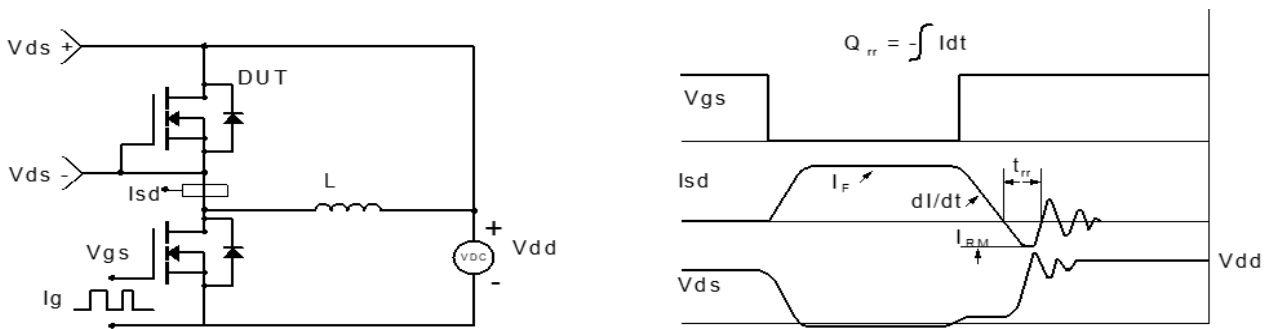
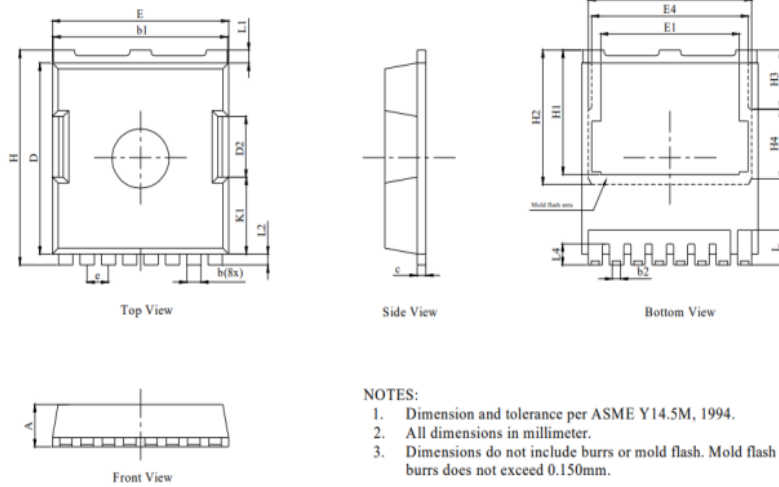
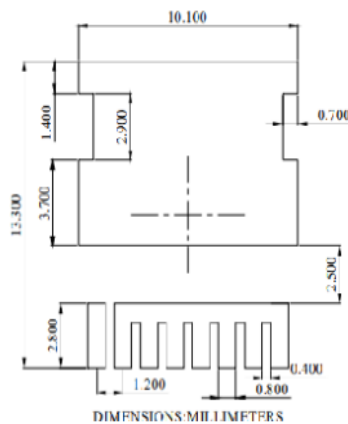


Figure 4: Diode Recovery Test Circuit & Waveform



## Package Mechanical Data(PowerJE®10x12)

**Package Outlines**

**Recommended Soldering Footprint**


DIM.	MILLIMETER		
	MIN	NOM	MAX
A	2.20	2.30	2.50
b	0.70	0.80	0.90
b1	9.70	9.80	9.90
b2	0.42	0.46	0.50
C	0.40	0.50	0.65
D	10.28	10.38	10.58
D2	3.30		
E	9.70	9.90	10.10
E1	7.80		
E4	8.80		
E5	9.20		
e	1.20(BSC)		
H	11.48	11.68	11.88
H1	6.55	6.75	6.85
H2	7.30		
H3	3.20		
H4	3.80		
K1	4.18		
L	1.70	1.90	2.10
L1	0.70		
L2	0.60		
L4	1.00	1.15	1.30

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