

40V, 381A, 0.9mΩ N-channel Power SGT MOSFET
JMSH0401PTSQ
Features

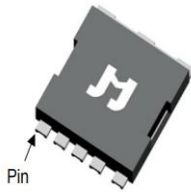
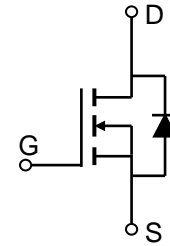
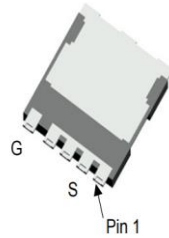
- Ultra-low ON-resistance, R_{DS(ON)}
- Low Gate Charge
- 100% UIS Tested
- 100% ΔV_{ds} Tested
- Halogen-free; RoHS-compliant
- AEC-Q101 Qualified

Applications

- Load Switch
- PWM Application
- General Automotive Application

Product Summary

Parameters	Value	Unit
V _{DSS}	40	V
V _{GS(th)_Typ}	2.6	V
I _D (@V _{GS} =10V)	381	A
R _{DS(ON)_Typ} (@V _{GS} =10V)	0.9	mΩ


PowerJE®7x8

Schematic Diagram
Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMSH0401PTSQ-13	SH0401PQ	1	Tape&Reel	PowerJE®7x8	2000	10000

Absolute Maximum Ratings (@ T_C = 25°C unless otherwise specified)

Symbol	Parameter	Value	Unit
V _{DS}	Drain-to-Source Voltage	40	V
V _{GS}	Gate-to-Source Voltage	±20	V
I _D	Continuous Drain Current	T _C = 25°C	381
		T _C = 100°C	269
I _{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4	A
E _{AS}	Single Pulsed Avalanche Energy ⁽²⁾	662	mJ
P _D	Power Dissipation	T _C = 25°C	300
		T _C = 100°C	150
T _J , T _{STG}	Junction & Storage Temperature Range	-55 to 175	°C

Thermal Characteristics

Symbol	Parameter	Max	Unit
R _{θJA}	Thermal Resistance, Junction to Ambient ⁽³⁾	40	°C/W
R _{θJC}	Thermal Resistance, Junction to Case	0.5	

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 32\text{V}, V_{GS} = 0\text{V}$	-	-	1.0	μA
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	-	-	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.8	2.6	3.3	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance ⁽⁴⁾	$V_{GS} = 10\text{V}, I_D = 20\text{A}$	-	0.9	1.1	m Ω
Dynamic Characteristics						
R_g	Gate Resistance	$f = 1\text{MHz}$	-	1.1	-	Ω
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 20\text{V},$ $f = 1\text{MHz}$	4067	5693	7686	pF
C_{oss}	Output Capacitance		2623	3673	4958	pF
C_{rss}	Reverse Transfer Capacitance		215	301	407	pF
Q_g	Total Gate Charge	$V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 20\text{V}, I_D = 20\text{A}$	65	90	122	nC
Q_{gs}	Gate Source Charge		18	25	34	nC
Q_{gd}	Gate Drain("Miller") Charge		19	26	36	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On DelayTime	$V_{GS} = 10\text{V}, V_{DD} = 20\text{V}$ $I_D = 20\text{A}, R_{GEN} = 2.7\Omega$	-	21	-	ns
t_r	Turn-On Rise Time		-	32	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	45	-	ns
t_f	Turn-Off Fall Time		-	22	-	ns
Body Diode Characteristics						
I_S	Maximum Continuous Body Diode Forward Current		-	-	381	A
I_{SM}	Maximum Pulsed Body Diode Forward Current		-	-	1524	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	$I_F = 20\text{A}, di/dt = 100\text{A}/\mu\text{s}$	50	70	95	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	113	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 20\text{V}$, $V_G = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 3\text{mH}$, $I_{AS} = 21\text{A}$, $V_{DD} = 0\text{V}$ during time in avalanche.
 3. $R_{\theta JA}$ is measured with the device mounted on a 1inch^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

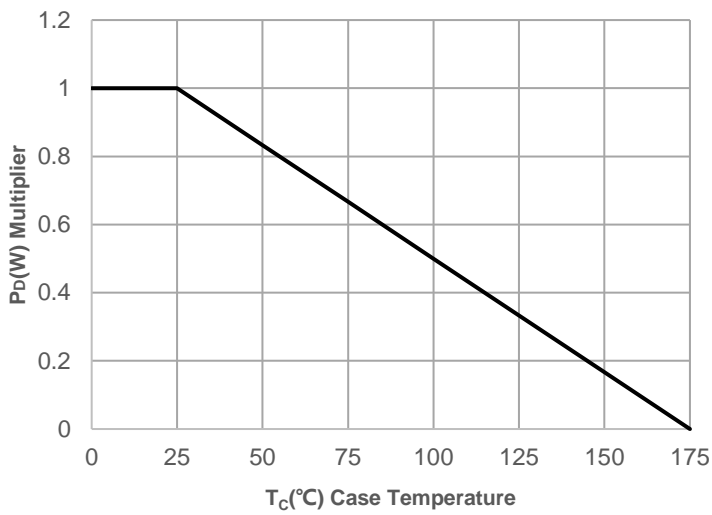


Figure 2: Current De-rating

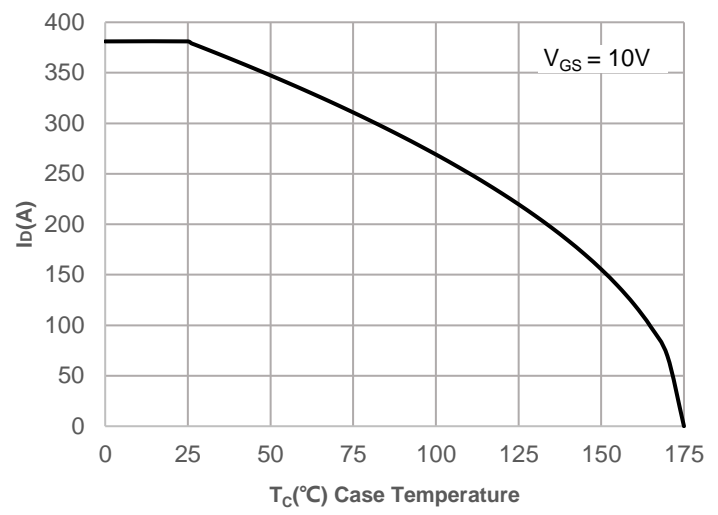


Figure 3: Normalized Maximum Transient Thermal Impedance

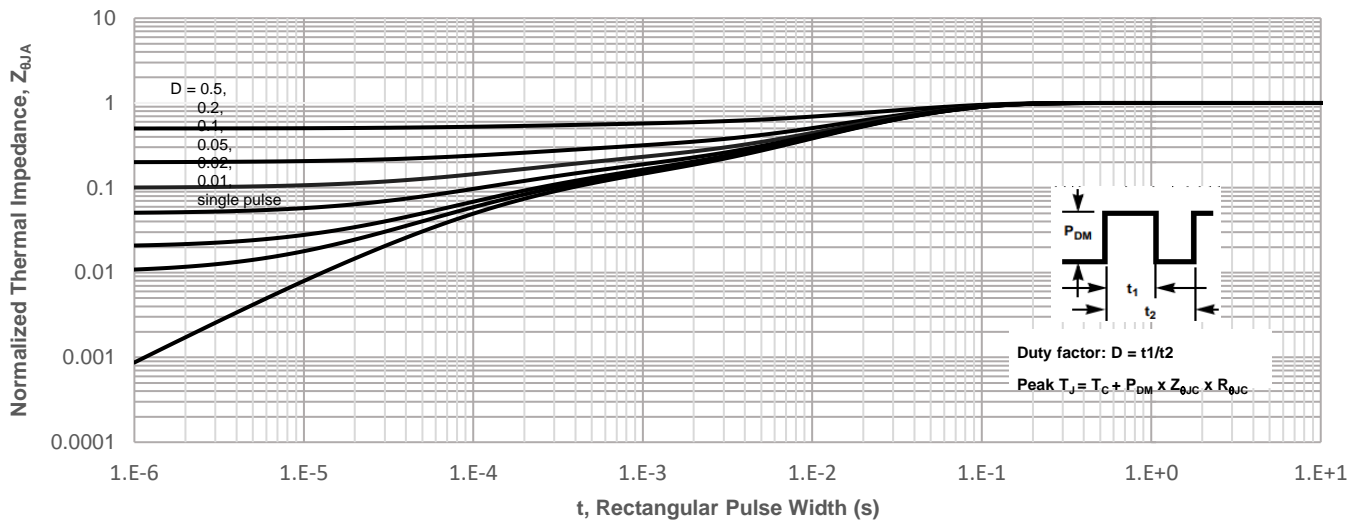
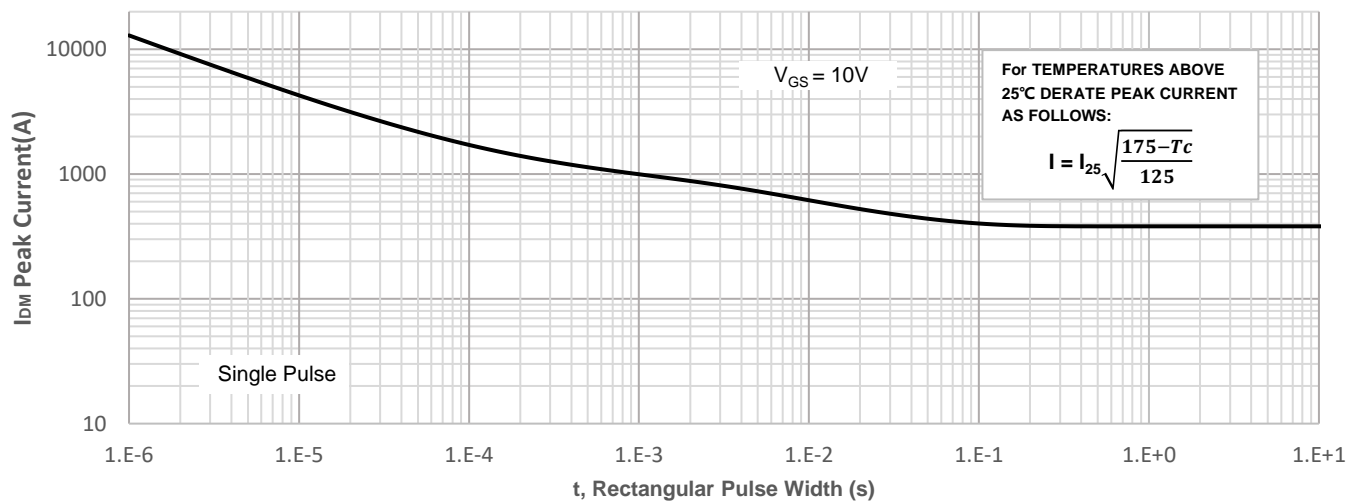


Figure 4: Peak Current Capacity



Typical Performance Characteristics

Figure 5: Output Characteristics

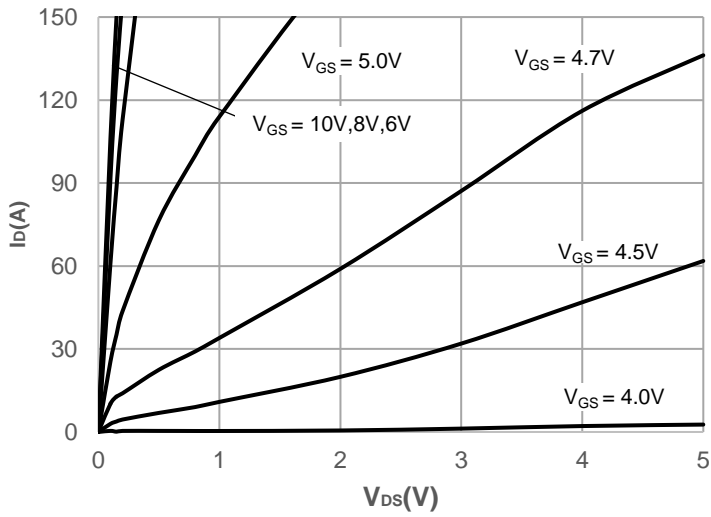


Figure 6: Typical Transfer Characteristics

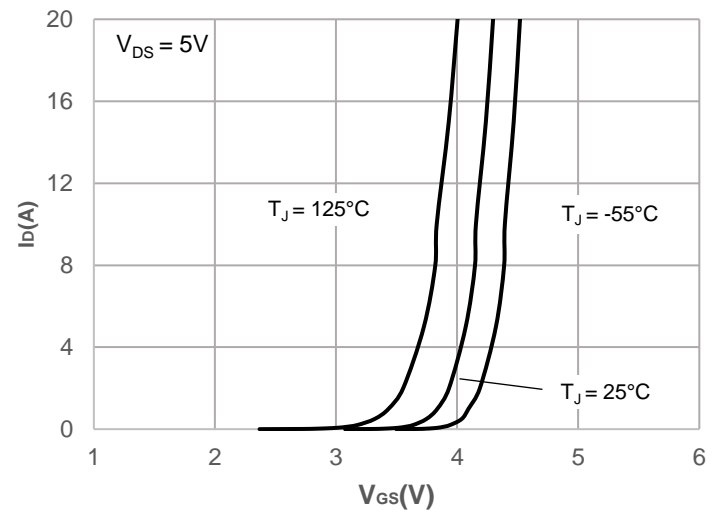


Figure 7: On-resistance vs. Drain Current

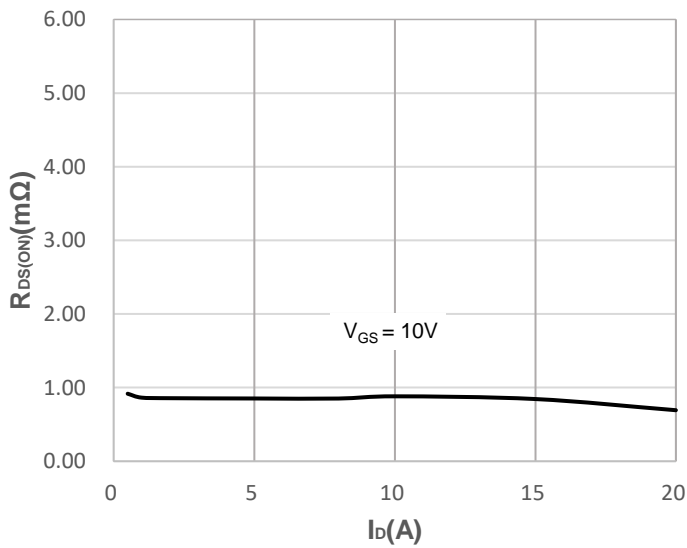


Figure 8: Body Diode Characteristics

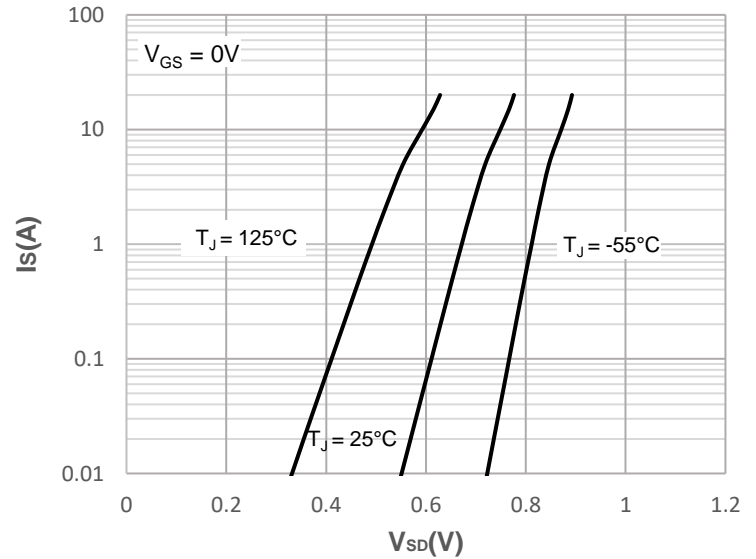


Figure 9: Gate Charge Characteristics

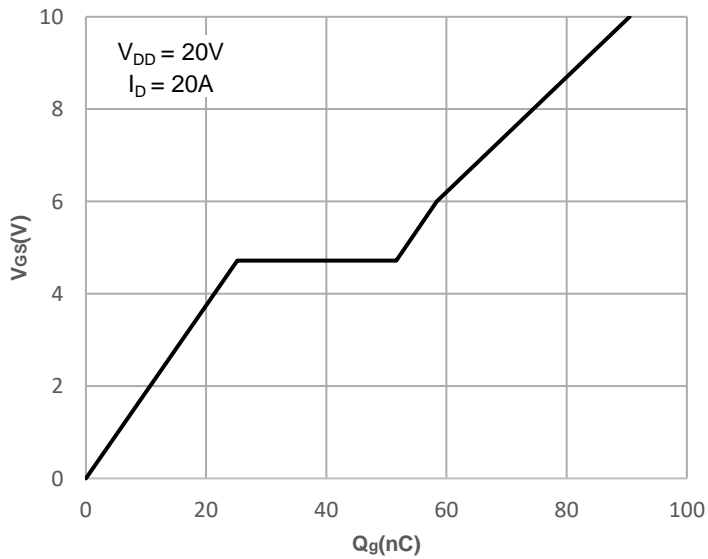
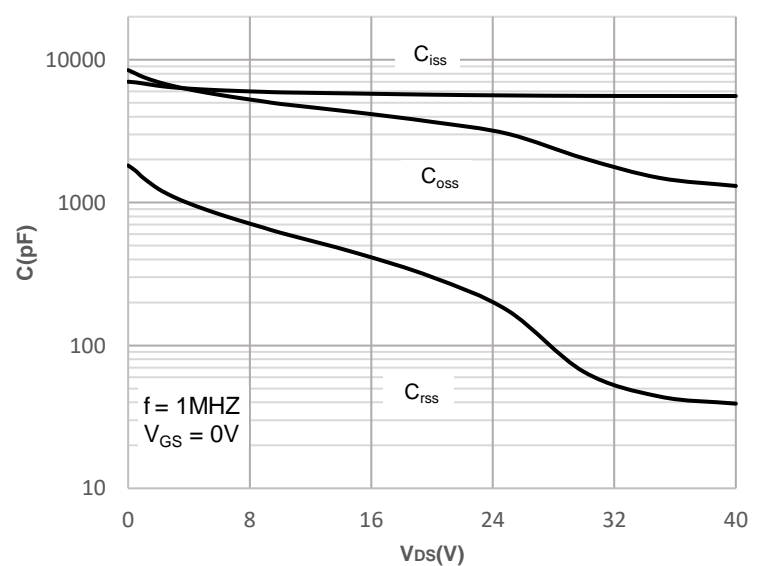


Figure 10: Capacitance Characteristics



Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

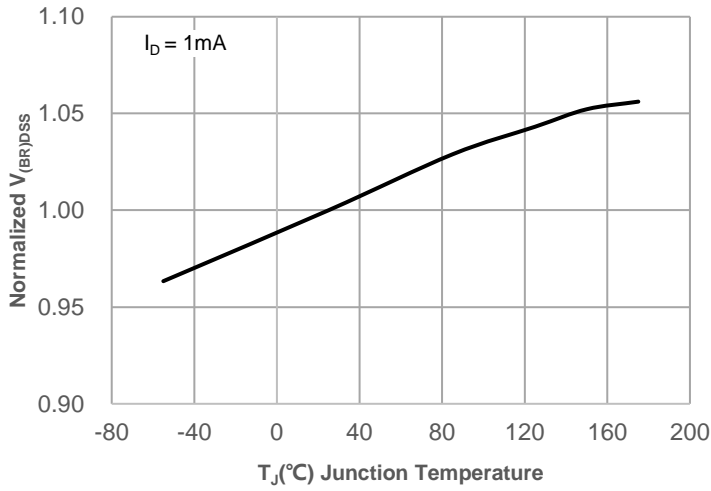


Figure 12: Normalized on Resistance vs. Junction Temperature

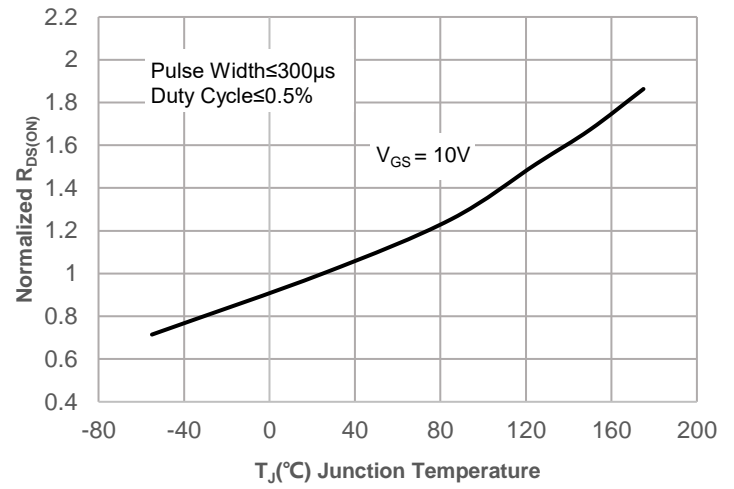


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

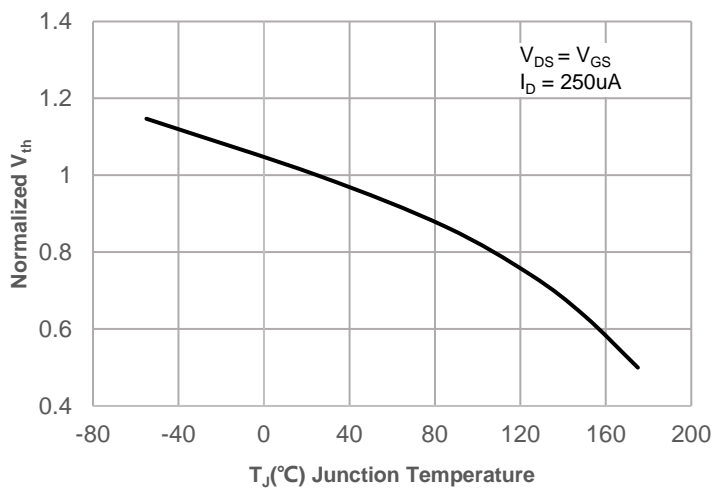


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

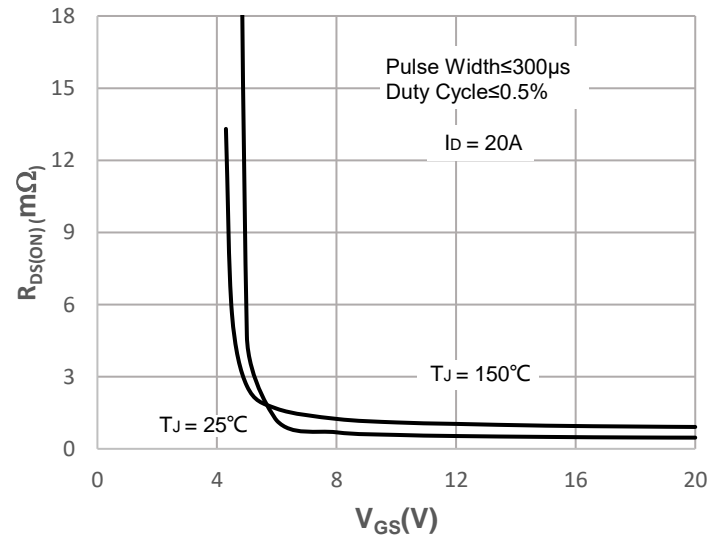
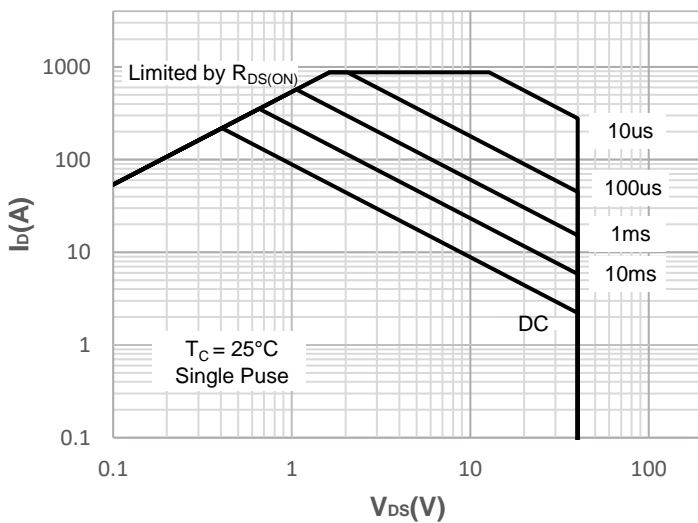


Figure 15: Maximum Safe Operating Area



Test Circuit

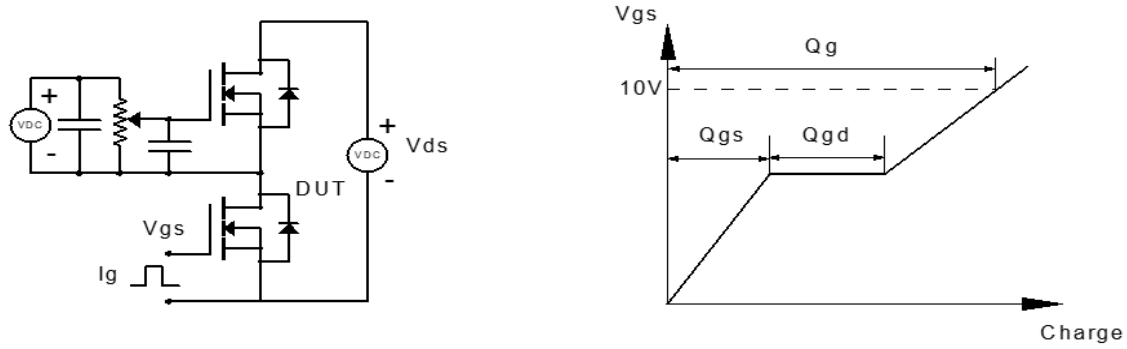


Figure 1: Gate Charge Test Circuit & Waveform

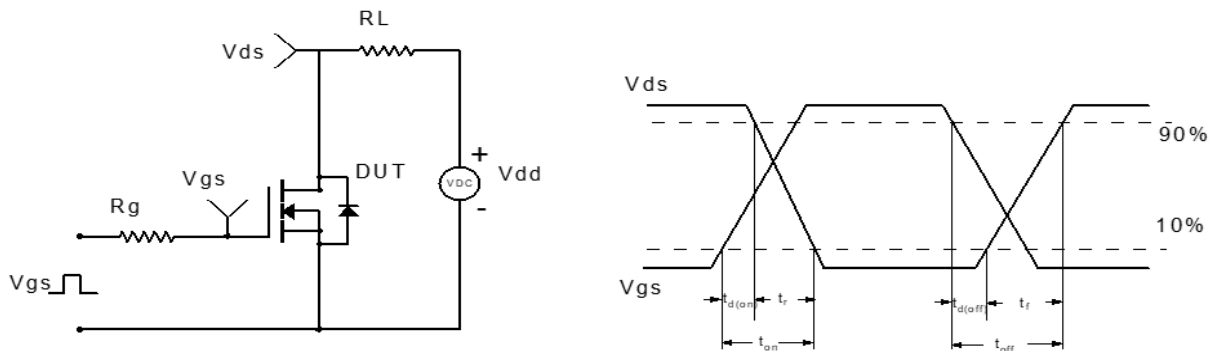


Figure 2: Resistive Switching Test Circuit & Waveform

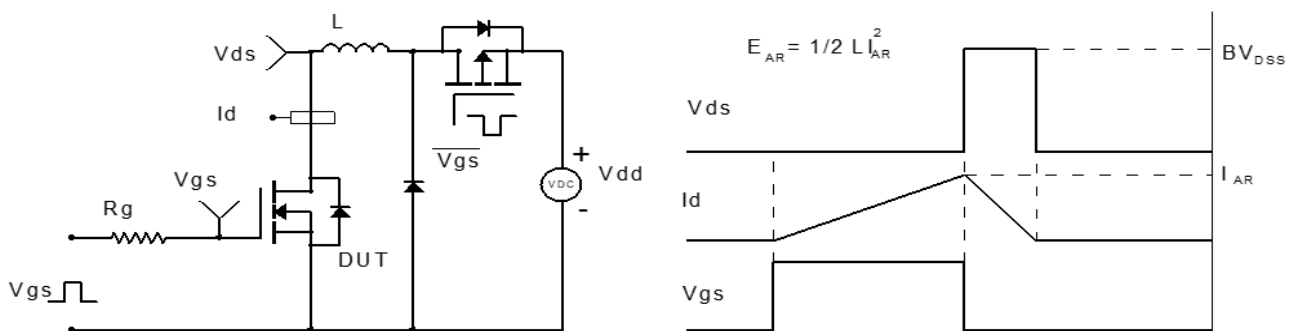


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

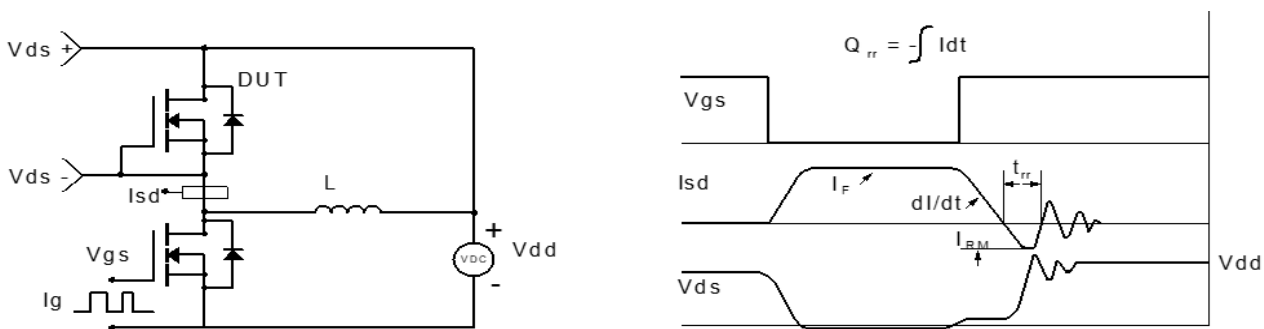
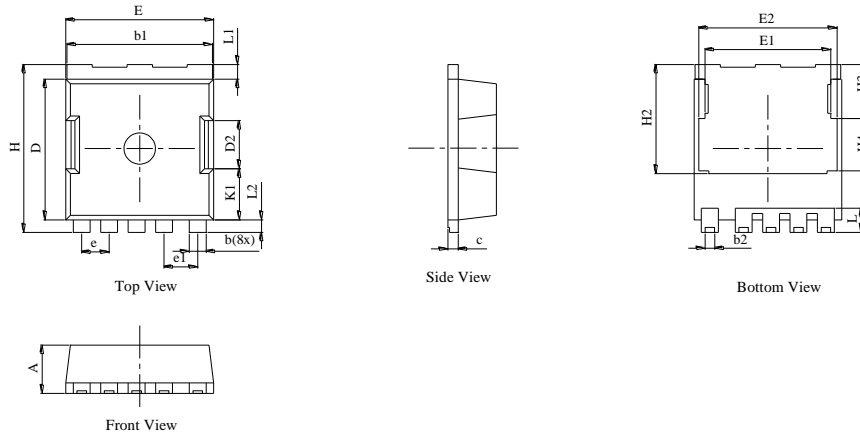


Figure 4: Diode Recovery Test Circuit & Waveform

Package Mechanical Data(PowerJE®7x8)

Package Outlines

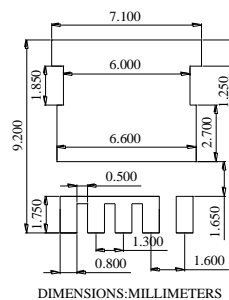


NOTES:

1. Dimension and tolerance per ASME Y14.5M, 1994.
2. All dimensions in millimeter.
3. Dimensions do not include burrs or mold flash.

DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	2.20	2.30	2.40
b	0.70	0.80	0.90
b1	6.80	6.90	7.00
b2	0.40	0.45	0.50
c	0.40	0.50	0.60
D	6.50	6.70	6.90
D2	2.30 (REF)		
E	6.80	7.00	7.20
E1	5.96 (REF)		
E2	6.56 (REF)		
e	1.30 (BSC)		
e1	1.60 (BSC)		
H	7.80	8.00	8.20
H2	5.20 (REF)		
H3	2.57 (REF)		
H4	2.50 (REF)		
K1	2.43 (REF)		
L	1.05	1.15	1.25
L1	0.70		
L2	0.60		

Recommended Soldering Footprint



DIMENSIONS: MILLIMETERS

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