

# MJ N-Channel Enhancement Mode Power MOSFET

## Description

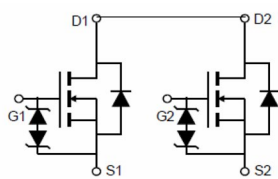
The MJ8651Q uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

## General Features

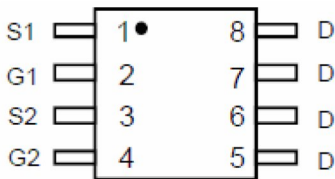
- ◆  $V_{DS}=20V, I_D=10A$   
 $R_{DS(ON)} < 11m\Omega @ V_{GS}=4.5V$   
 $R_{DS(ON)} < 11.5m\Omega @ V_{GS}=4V$   
 $R_{DS(ON)} < 12.5m\Omega @ V_{GS}=3.1V$   
 $R_{DS(ON)} < 15.5m\Omega @ V_{GS}=2.5V$
- ◆ High density cell design for ultra low  $R_{dson}$
- ◆ Fully characterized avalanche voltage and current
- ◆ 2.5V Drive
- ◆ Common-drain type

## Application

- ◆ Battery protection switch
- ◆ Mobile device battery charging and discharging



Schematic diagram



Pin Assignment



DFN 3x3 top view

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MJ8651Q	MJ8651Q	DFN 3x3	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Drain Current-Continuous	$I_D$	10	A
Pulsed Drain Current	$I_{DM}$	32	A
Maximum Power Dissipation	$P_D$	1.5	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^{\circ}\text{C}$

## Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JA}$	83	$^{\circ}\text{C/W}$
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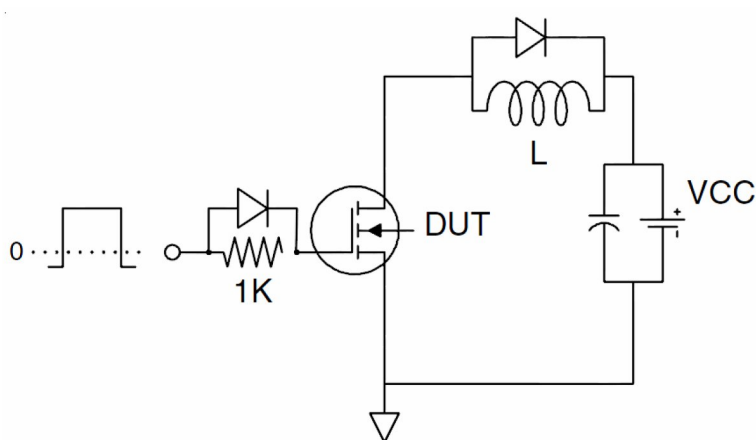
Electrical Characteristics (T<sub>A</sub> =25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	20		-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =20V,V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =±10V,V <sub>DS</sub> =0V	-	-	±10	nA
On Characteristics <sup>(Note 3)</sup>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA	0.5	0.7	1	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A	-	7.2	11	mΩ
		V <sub>GS</sub> =4V, I <sub>D</sub> =5A	-	7.4	11.5	
		V <sub>GS</sub> =3.1V, I <sub>D</sub> =5A	-	7.8	12.5	
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =2.5A	-	8.6	15.5	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =10V,I <sub>D</sub> =5A	5	-	-	S
Dynamic Characteristics <sup>(Note 4)</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =10V,V <sub>GS</sub> =0V, F=1.0MHz	-	1255	-	PF
Output Capacitance	C <sub>oss</sub>		-	220	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	168	-	PF
Switching Characteristics <sup>(Note 4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =10V,I <sub>D</sub> =5A V <sub>GS</sub> =10V,R <sub>GEN</sub> =50Ω	-	300	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	1000	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	4000	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	2500	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =10V,I <sub>D</sub> =10A, V <sub>GS</sub> =10V	-	29	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	5.2	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	6.3	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V,I <sub>S</sub> =10A	-	0.85	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		-	-	10	A

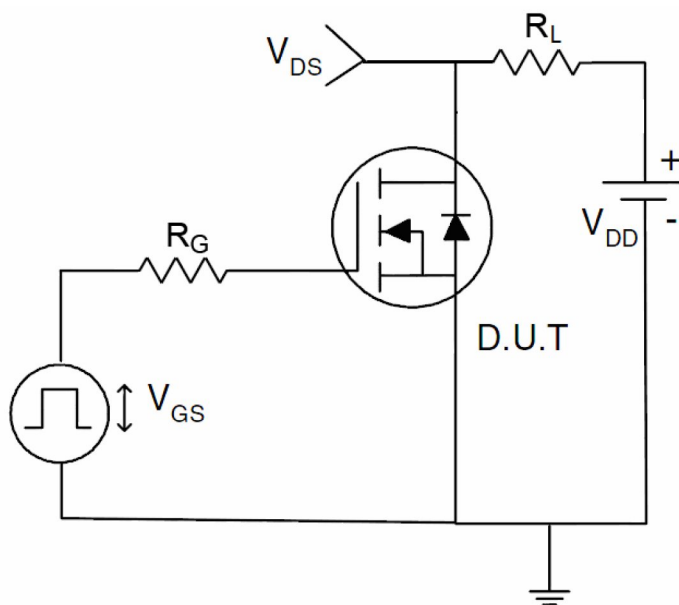
Notes:

- ① Repetitive Rating: Pulse width limited by maximum junction temperature.
- ② Surface Mounted on FR4 Board, t ≤ 10 sec.
- ③ Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
- ④ Guaranteed by design, not subject to production

## Test circuit

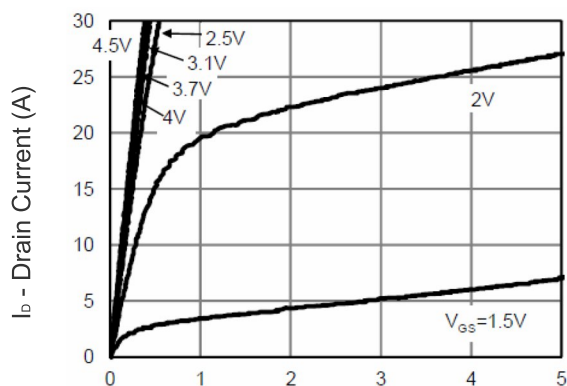


Gate charge test Circuit



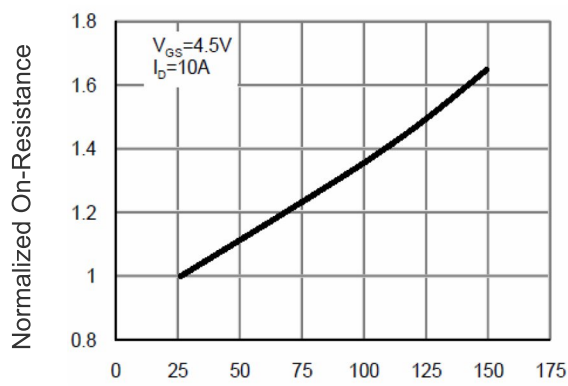
Switch Time Test Circuit

# Typical Electrical and Thermal Characteristics (Curves)



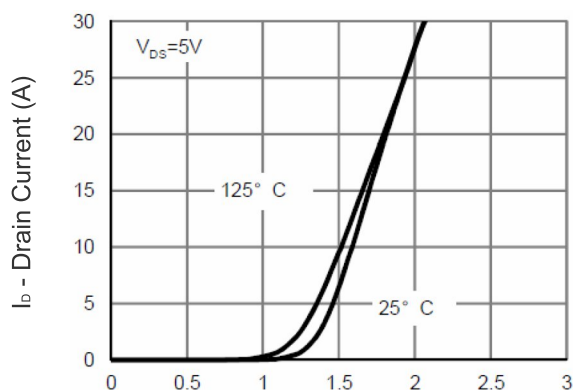
Vds Drain-Source Voltage (V)

Figure 1 Output Characteristics



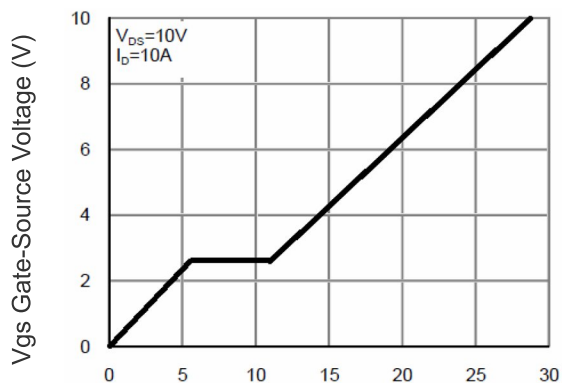
Tj -Junction Temperature(°C)

Figure 4 Rdson-Junction Temperature



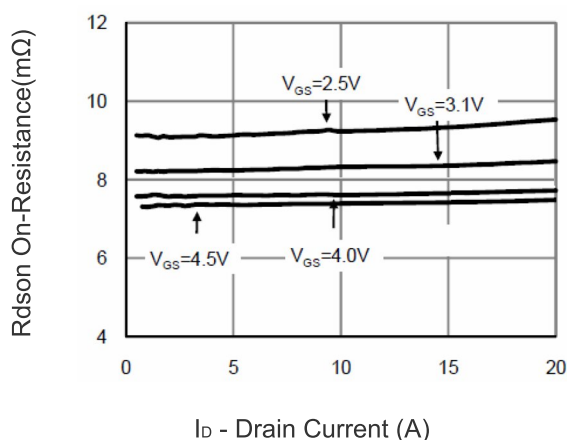
Vgs Gate-Source Voltage (V)

Figure 2 Transfer Characteristics



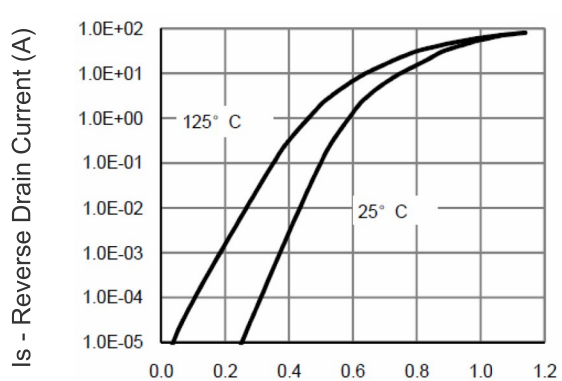
Qg Gate Charge (nC)

Figure 5 Gate Charge



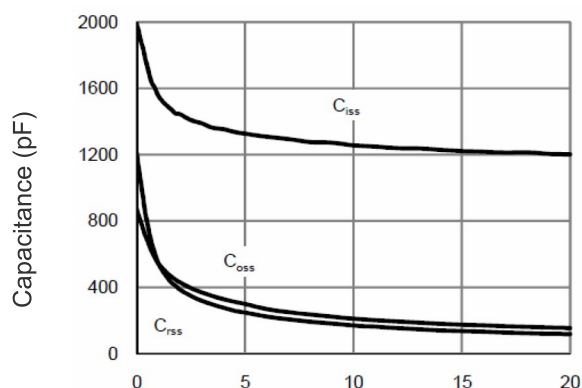
Id - Drain Current (A)

Figure 3 Rdson- Drain Current



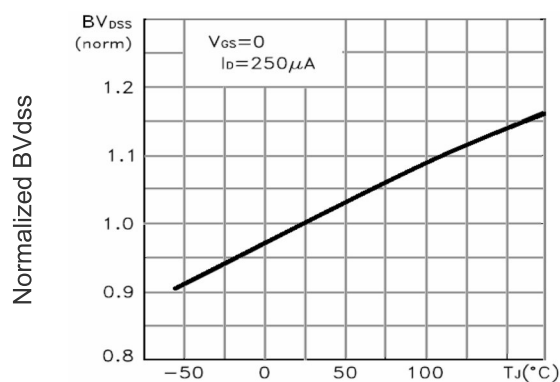
Vsd Source-Drain Voltage (V)

Figure 6 Source- Drain Diode Forward



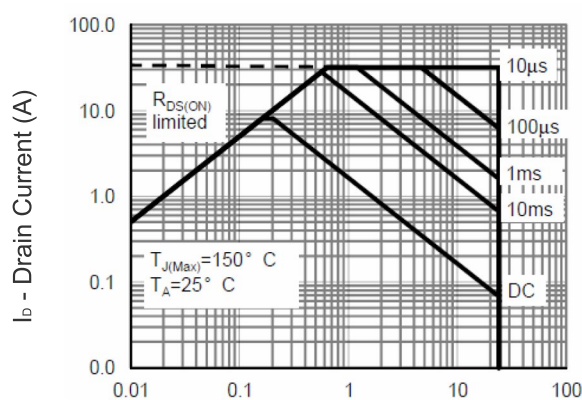
Vds Drain-Source Voltage (V)

Figure 7 Capacitance vs Vds



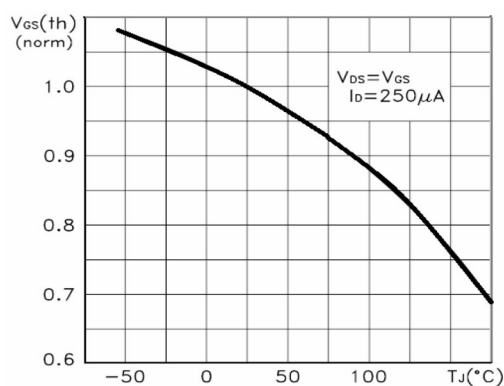
Junction Temperature(°C)

Figure 9 BV<sub>DSS</sub> vs Junction Temperature



Vds Drain-Source Voltage (V)

Figure 8 Safe Operation Area



T<sub>J</sub> -Junction Temperature(°C)

Figure 10 V<sub>GS(th)</sub> vs Junction Temperature

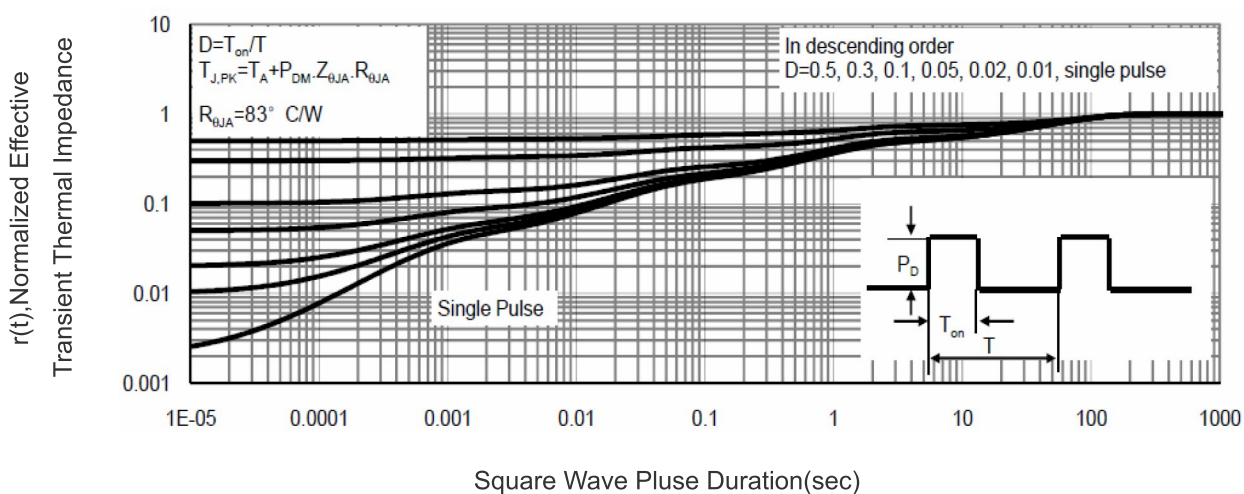
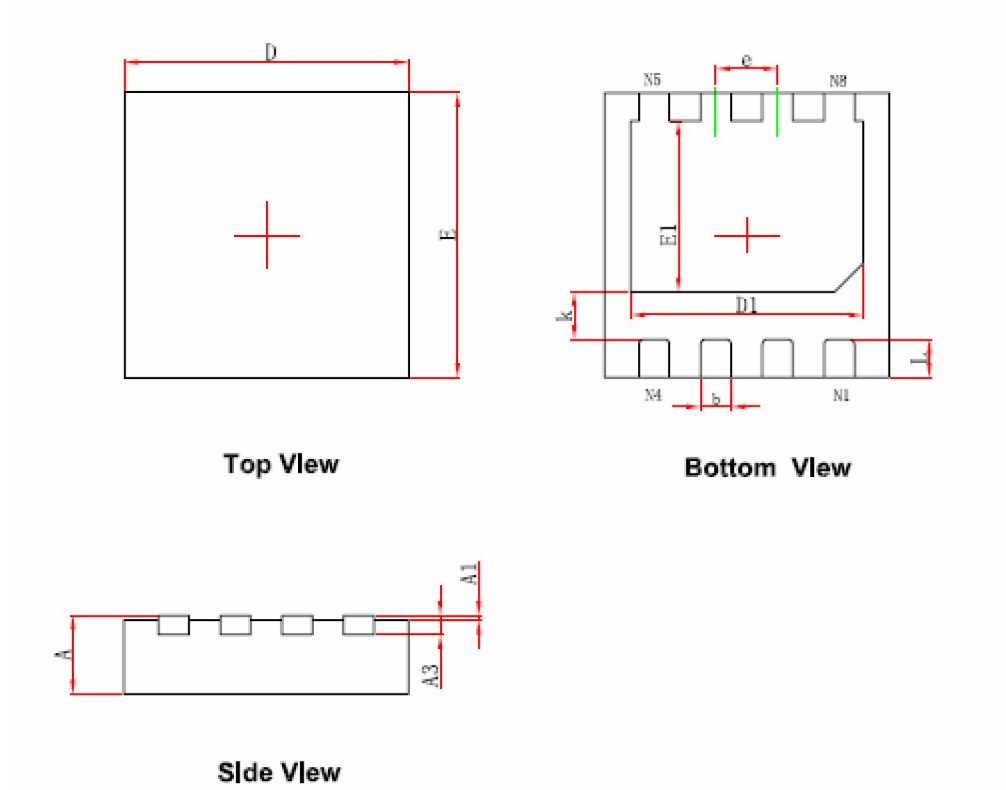


Figure 11 Normalized Maximum Transient Thermal Impedance

# DFN3X3 EP Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.924	3.076	0.115	0.121
E	2.924	3.076	0.115	0.121
D1	2.350	2.550	0.093	0.100
E1	1.700	1.900	0.067	0.075
k	0.450	0.550	0.018	0.022
b	0.270	0.370	0.011	0.015
e	0.650TYP.		0.026TYP.	
L	0.324	0.476	0.013	0.019

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