MJ N-Channel Enhancement Mode Power MOSFET

Description

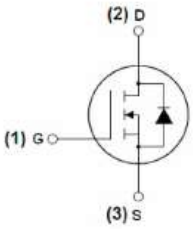
The MJ4558K uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

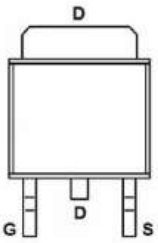
- V_{DS} =45V,I_D =58A
  $R_{DS(ON)}$ <12mΩ @ V_{GS}=10V
  $R_{DS(ON)}$ <18mΩ @ V_{GS}=4.5V
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Application

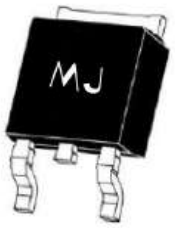
- Load switching
- Hard switched and high frequency circuits
- Uninterruptible power supply



Schematic diagram



Marking and pin assignment



TO-252-2L top view

100% UIS TESTED! 100% ΔVds TESTED!

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MJ4558K	MJ4558K	TO-252-2L	-	-	-

Absolute Maximum Ratings (T_C =25 ℃unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	45	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	58	A
Drain Current-Continuous(T_C =100℃)	$I_{D(100℃)}$	41	A
Pulsed Drain Current	I_{DM}	200	A
Maximum Power Dissipation	P_D	65	W
Derating factor		0.43	W/℃
Single pulse avalanche energy (Note 5)	E_{AS}	240	mJ
Operating Junction and Storage Temperature Range	T_J ,T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case (Note 2)	$R_{\theta JC}$	2.3	℃/W

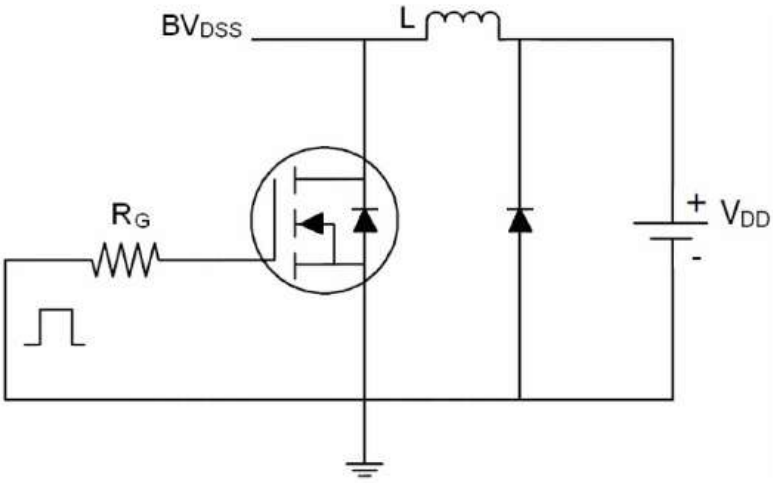
Electrical Characteristics (T_C =25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	45	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=45V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{DS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS} ,I_D=250μA	1.2	1.9	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A	-	8.0	10	mΩ
		V_{GS}=4.5V, I_D=15A	-	11.6	18	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=20A	20	-	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{lss}	V_{DS}=20V,V_{GS}=0V F=1.0MHz	-	1800	-	PF
Output Capacitance	C_{oss}		-	182	-	PF
Reverse Transfer Capacitance	C_{rss}		-	138	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V, R_L=1Ω V_{GS}=10V,R_G=3Ω	-	6.4	-	nS
Turn-on Rise Time	t_r		-	17.2	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	29.6	-	nS
Turn-Off Fall Time	t_f		-	16.8	-	nS
Total Gate Charge	Q_g	V_{DS}=20V,I_D=20A V_{GS}=10V	-	36.8	-	nC
Gate-Source Charge	Q_{gs}		-	4.8	-	nC
Gate-Drain Charge	Q_{gd}		-	11.2	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=10A	-	-	1.2	V
Diode Forward Current (Note 2)	I_S		-	-	58	A
Reverse Recovery Time	t_{rr}	T_J=25°C, I_F=20A di/dt=100A/μs (Note 3)	-	29	-	nS
Reverse Recovery Charge	Q_{rr}		-	26	-	nC

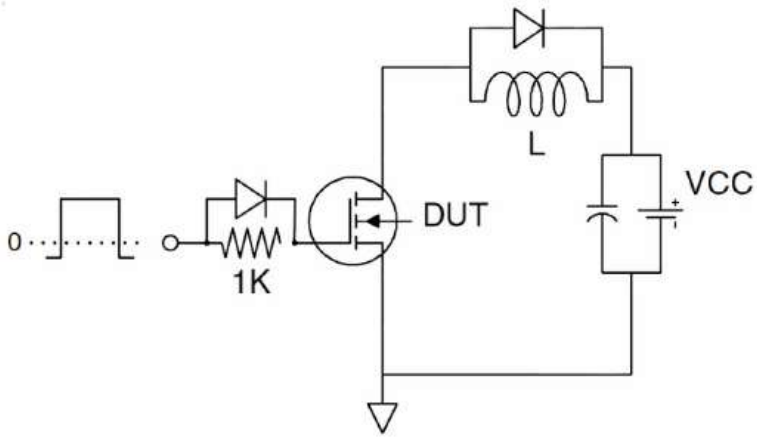
Notes:

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
⑤ EAS condition: Tj=25℃,V_{DD}=20V,V_G=10V,L=0.5mH,Rg=25Ω

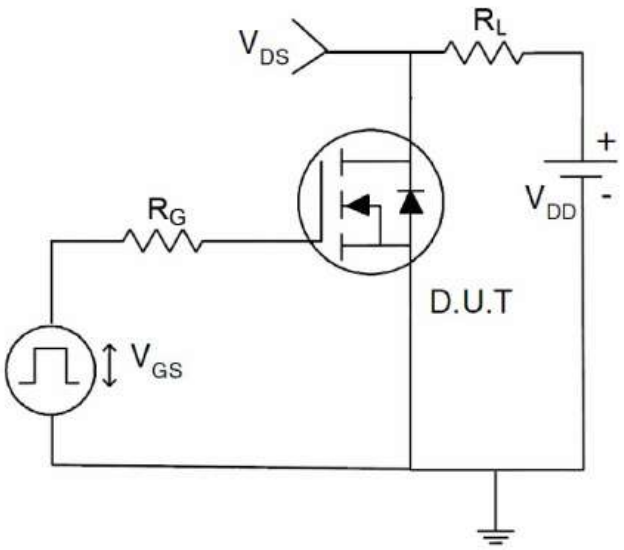
Test circuit



EAS test Circuit



Gate charge test Circuit



Switch Time Test Circuit

Typical Electrical and Thermal Characteristics (Curves)

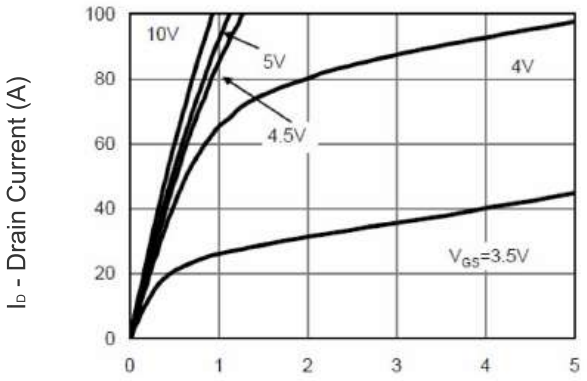


Figure 1 Output Characteristics

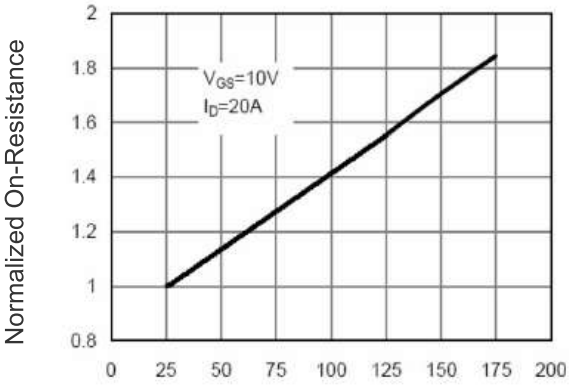


Figure 4 Rdson-Junction Temperature

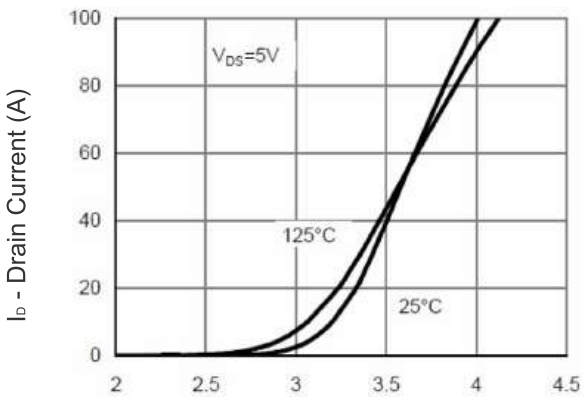


Figure 2 Transfer Characteristics

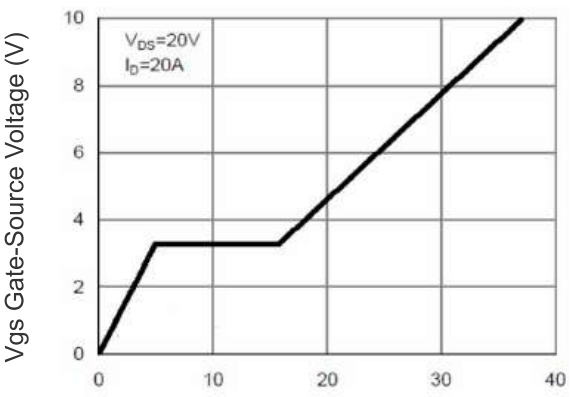


Figure 5 Gate Charge

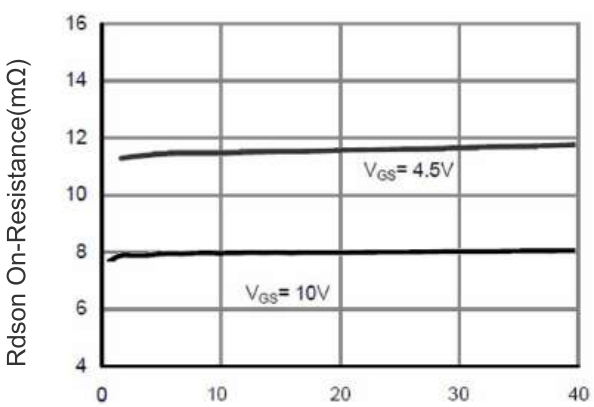


Figure 3 Rdson- Drain Current

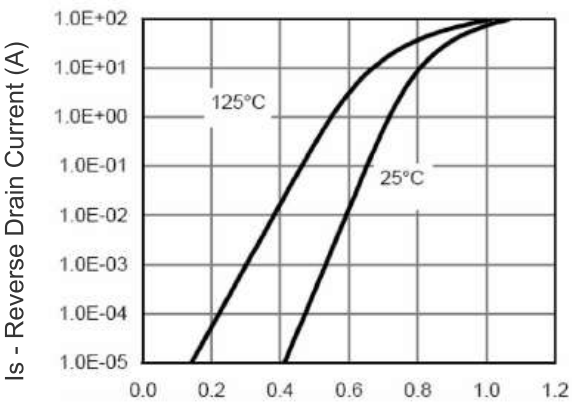
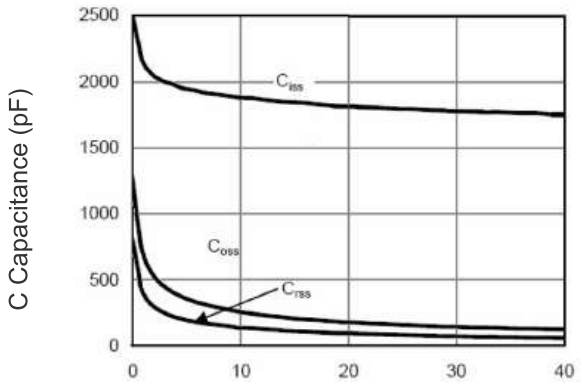


Figure 6 Source- Drain Diode Forward

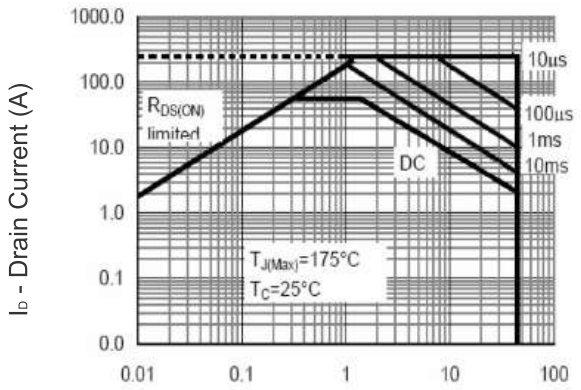


Vds Drain-Source Voltage (V)

Figure 7 Capacitance vs Vds

TJ-Junction Temperature (℃)

Figure 9 Power De-rating

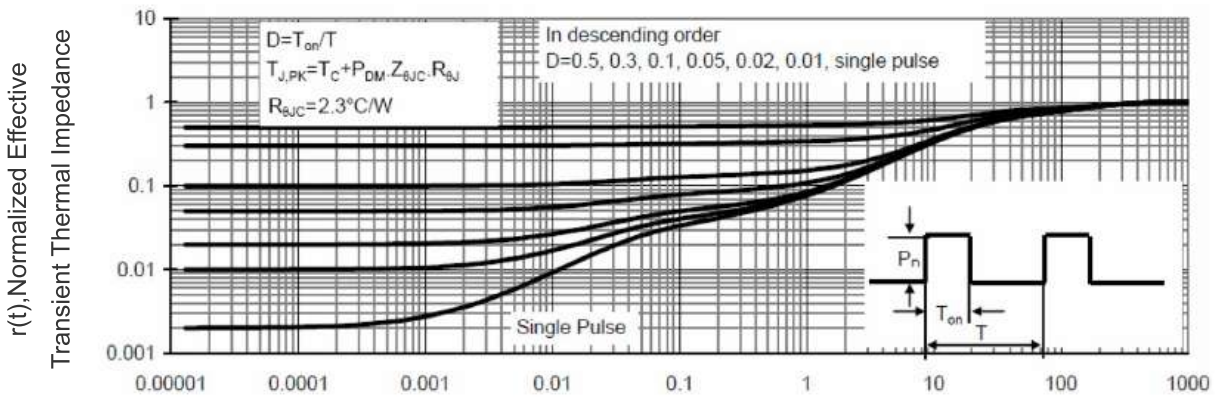


Vds Drain-Source Voltage (V)

Figure 8 Safe Operation Area

TJ-Junction Temperature (℃)

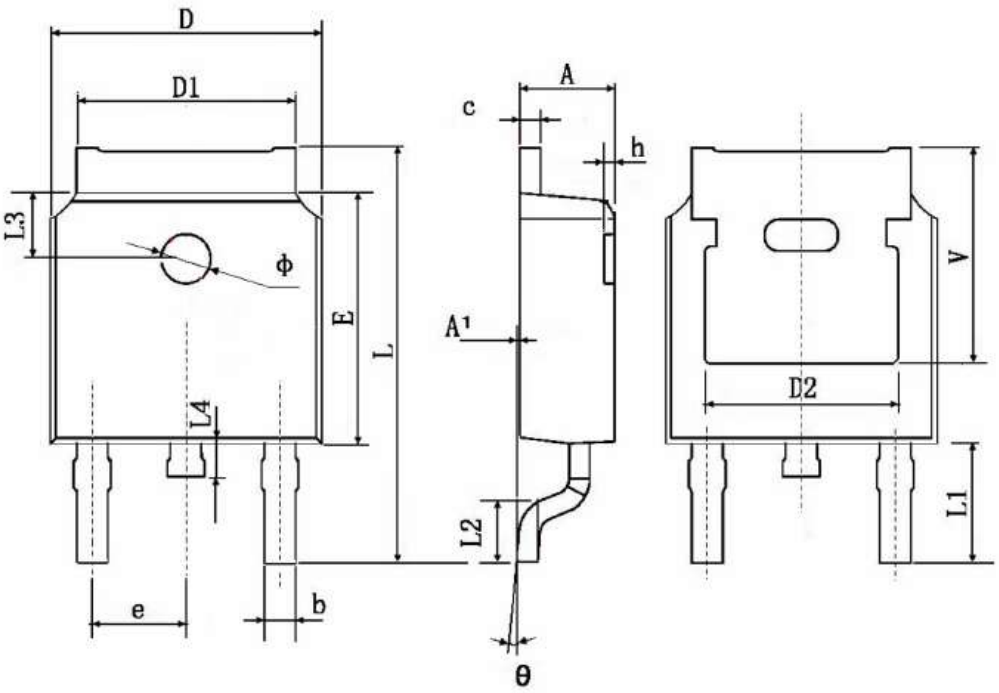
Figure 10 Current De-rating



Square Wave Pluse Duration(sec)

Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	

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