MJ N-Channel Enhancement Mode Power MOSFET

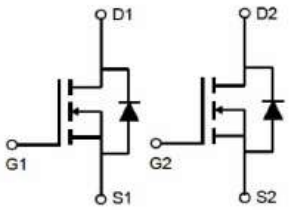
Description

The MJ40ND0812S 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.

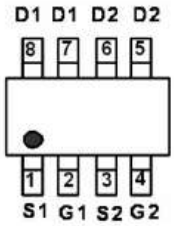
General Features

N-Channel	P-Channel
◆ V_{DS}=40V,I_D=8A	V_{DS}=40V,I_D=12A
$R_{DS(ON)}$<18mΩ @ V_{GS}=10V	$R_{DS(ON)}$<14mΩ @ V_{GS}=10V
$R_{DS(ON)}$<28mΩ @ V_{GS}=4.5V	$R_{DS(ON)}$<20mΩ @ V_{GS}=4.5V

◆ High density cell design for ultra low Rdson
◆ Fully characterized avalanche voltage and current



Schematic diagram



Marking and pin assignment

SOP-8 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MJ40ND0812S	MJ40ND0812S	SOP-8	Ø330mm	12mm	2500 units

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

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V_{DS}	40	40	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current	T_C=25°C	I_D	8	12	A
	T_C=100°C	I_D	5.7	8.5	A
Pulsed Drain Current (Note 1)		I_{DM}	32	60	A
Maximum Power Dissipation	T_C=25°C	P_D	2	2.5	W
Operating Junction and Storage Temperature Range		T_J,T_{STG}	-55 To 150	-55 To 150	℃

Thermal Characteristic

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance,Junction-to-Ambient (Note 2) (N-channel)	$R_{\theta JA}$	62.5	85	℃/W
Thermal Resistance,Junction-to-Ambient (Note 2) (P-channel)	$R_{\theta JA}$	50	75	℃/W

N1-CH Electrical Characteristics (T_A=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	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=40V,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	1.5	2.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=8A	-	15.8	18	mΩ
		V_{GS}=4.5V, I_D=4A	-	22	28	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=8A	33	-	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{lss}	V_{DS}=20V,V_{GS}=0V F=1.0MHz	-	964	-	PF
Output Capacitance	C_{oss}		-	109	-	PF
Reverse Transfer Capacitance	C_{rss}		-	96	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V, R_L=2.5Ω V_{GS}=10V,R_{GEN}=3Ω	-	5.5	-	nS
Turn-on Rise Time	t_r		-	14	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	24	-	nS
Turn-Off Fall Time	t_f		-	12	-	nS
Total Gate Charge	Q_g	V_{DS}=20V,I_D=8A V_{GS}=10V	-	22.9	-	nC
Gate-Source Charge	Q_{gs}		-	3.5	-	nC
Gate-Drain Charge	Q_{gd}		-	5.3	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=8A	-	0.8	1.2	V

Notes:

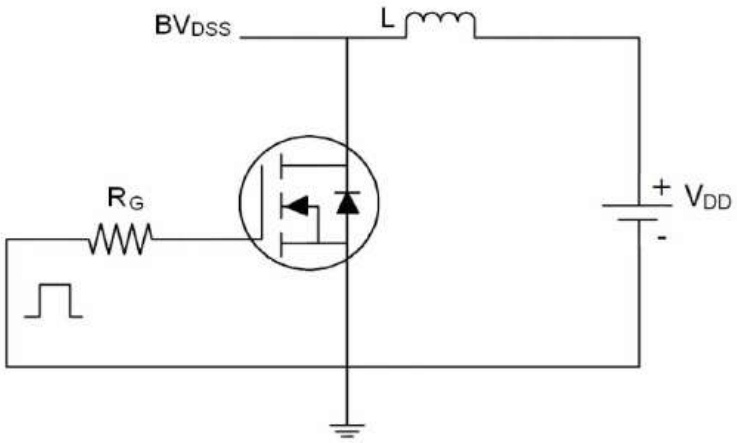
① Repetitive Rating: Pulse width limited by maximum junction temperature.

② The value of $R_{\theta JA}$ is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design.Surface Mounted on FR4 Board, t ≤ 10 sec. The current rating is based on the t ≤10s thermal resistance rating.

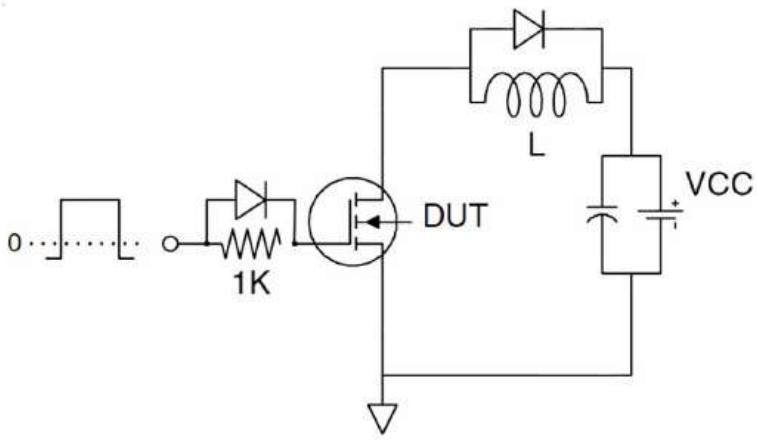
③ Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

④ Guaranteed by design, not subject to production

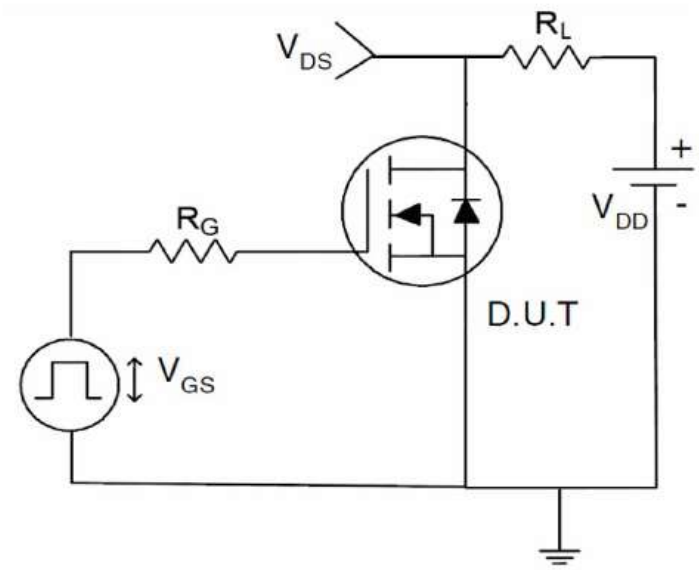
Test circuit



EAS test Circuit



Gate charge test Circuit



Switch Time Test Circuit

N-channelTypical Electrical and Thermal Characteristics (Curves)

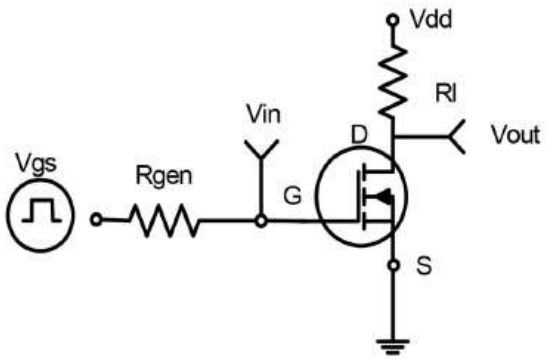


Figure 1 Switching Test Circuit

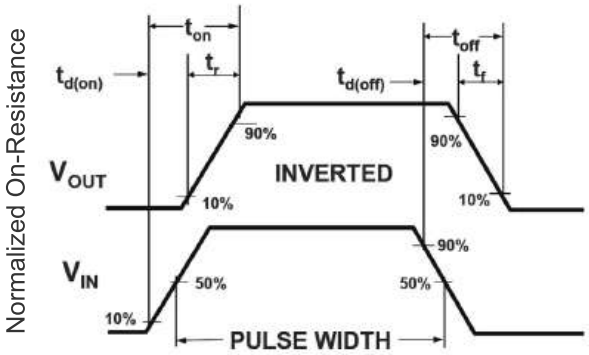


Figure 2 Switching Waveforms

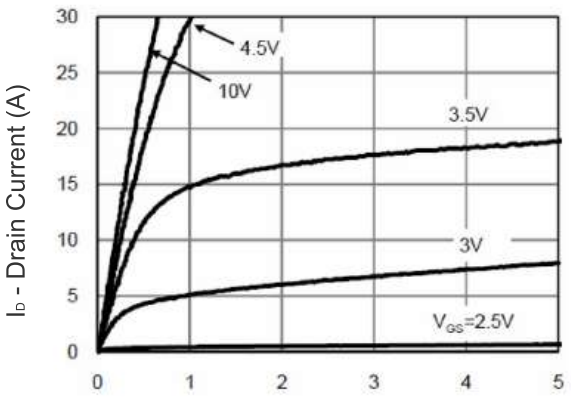


Figure 3 Output Characteristics

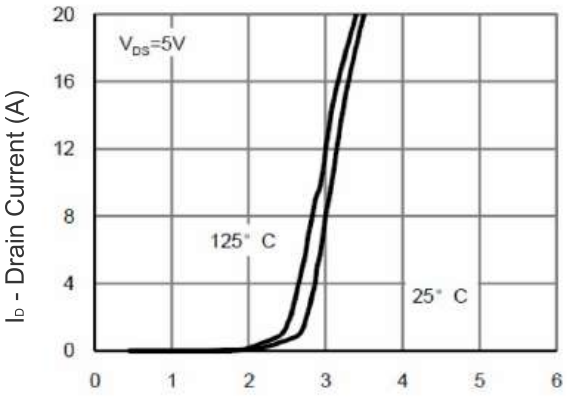


Figure 4 Transfer Characteristics

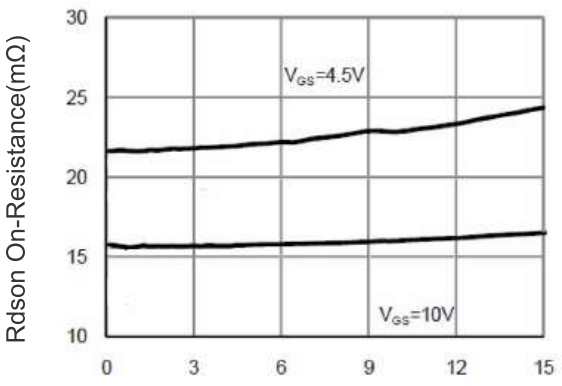


Figure 5 Drain-Source On-Resistance

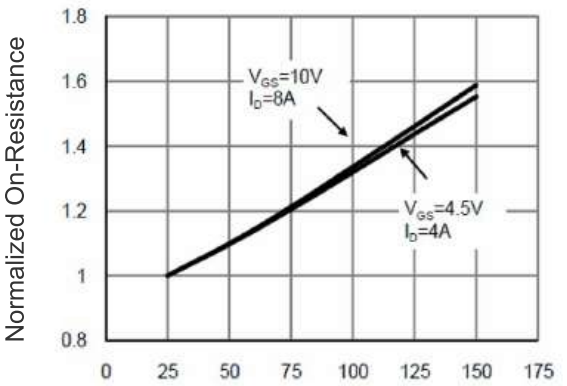


Figure 6 Drain-Source On-Resistance

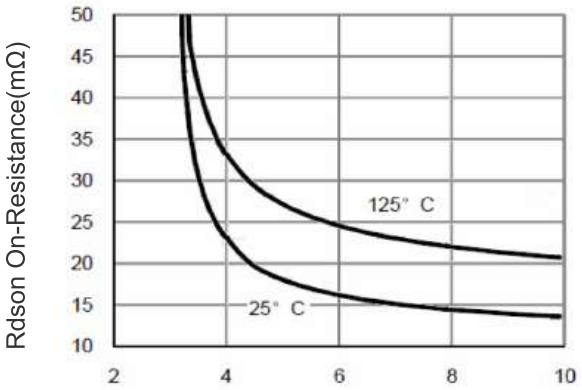


Figure7 Rdson vs Vgs

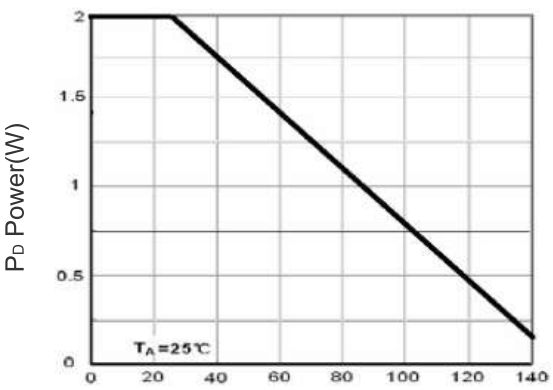


Figure 8 Power Dissipation

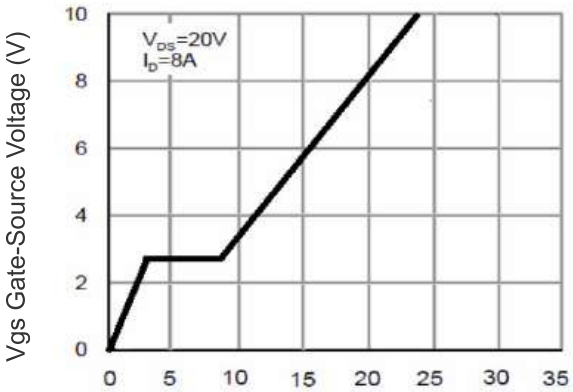


Figure 9 Gate Charge

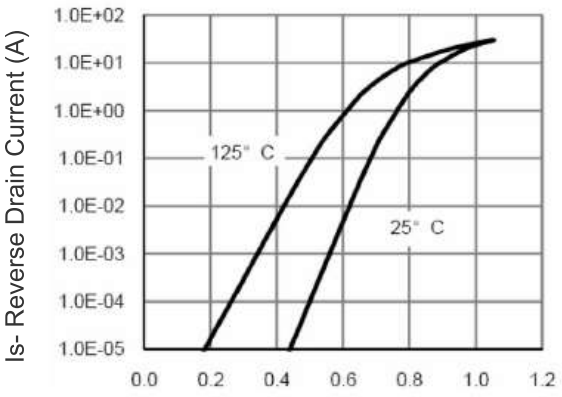


Figure 10 Source- Drain Diode Forward

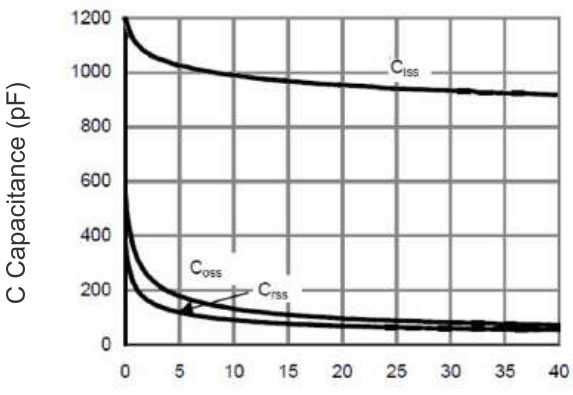


Figure 11 Capacitance vs Vds

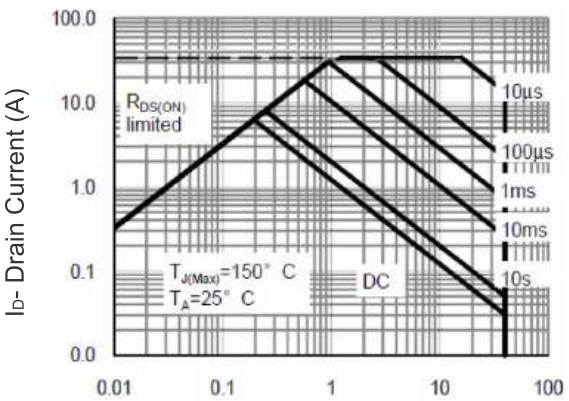


Figure 12 Safe Operation Area

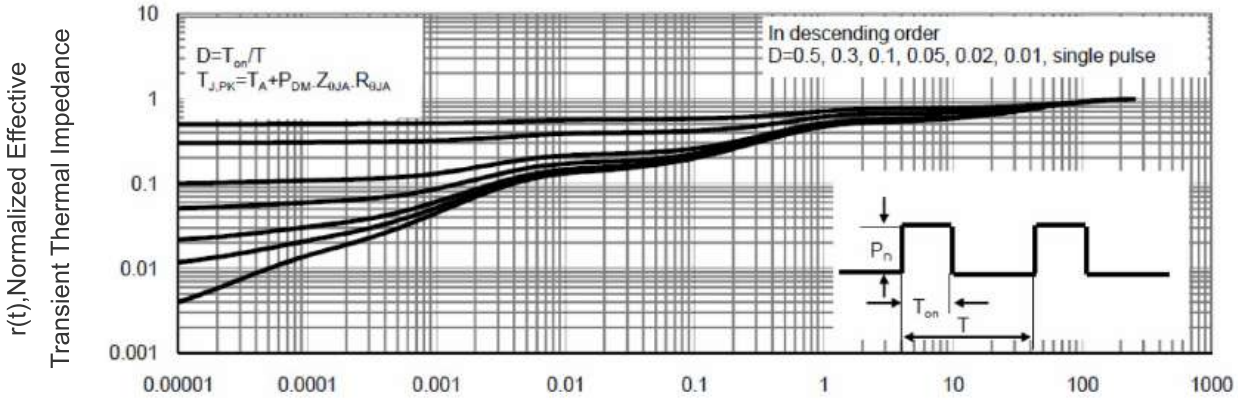


Figure 13 Normalized Maximum Transient Thermal Impedance

N2-CH Electrical Characteristics (T_A=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	40	45	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=40V,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	1.6	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=10A	-	11.7	14	mΩ
		V_{GS}=4.5V, I_D=8A	-	15.6	20	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=10A	-	75	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{lss}	V_{DS}=20V,V_{GS}=0V, F=1.0MHz	-	1780	-	PF
Output Capacitance	C_{oss}		-	209	-	PF
Reverse Transfer Capacitance	C_{rss}		-	160	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V, R_L=2Ω 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=10A V_{GS}=10V	-	38.2	-	nC
Gate-Source Charge	Q_{gs}		-	5.6	-	nC
Gate-Drain Charge	Q_{gd}		-	7.4	-	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		-	-	12	A
Reverse Recovery Time	t_{rr}	T_J=25°C, I_F=10A 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

N2-Typical Electrical and Thermal Characteristics (Curves)

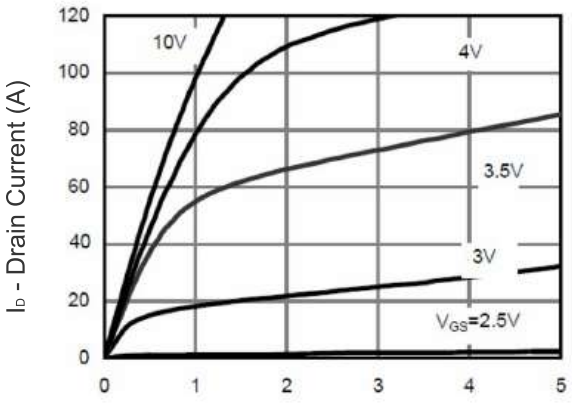


Figure 1 Output Characteristics

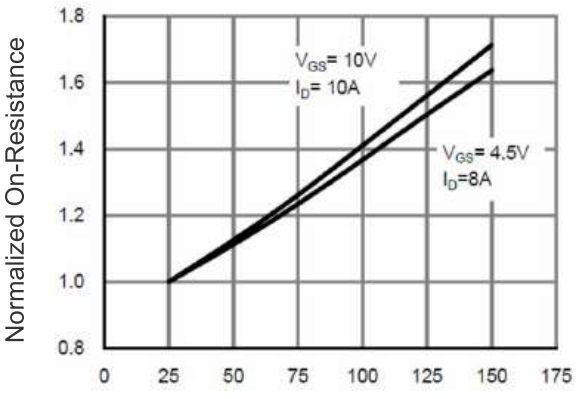


Figure 4 Rdson-Junction Temperature

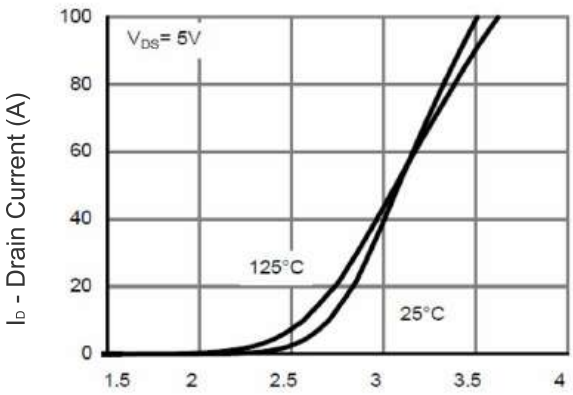


Figure 2 Transfer Characteristics

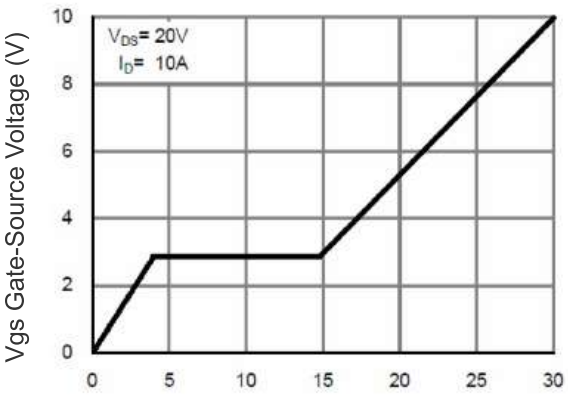


Figure 5 Gate Charge

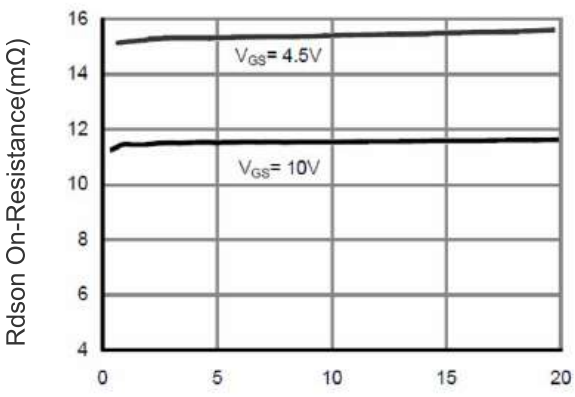


Figure 3 Rdson- Drain Current

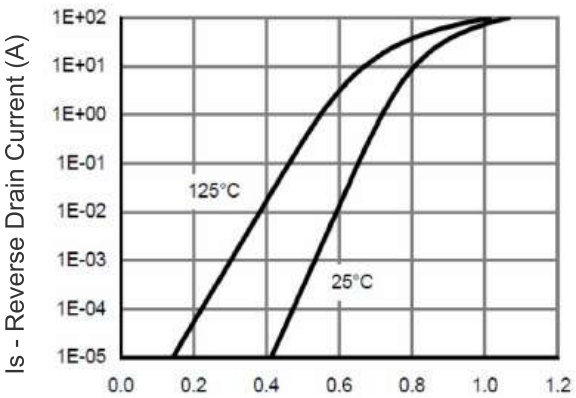


Figure 6 Source- Drain Diode Forward

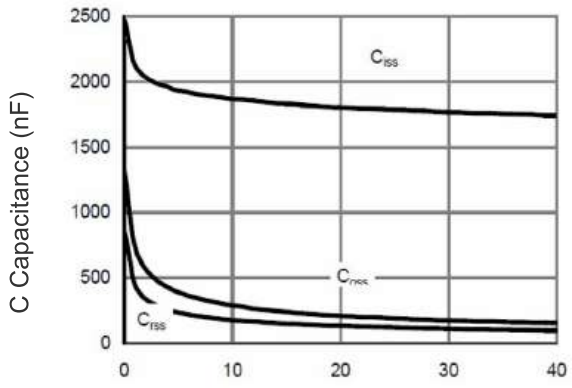


Figure 7 Capacitance vs Vds

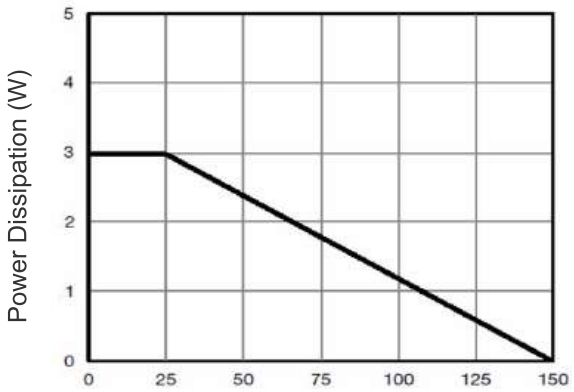


Figure 9 Power De-rating

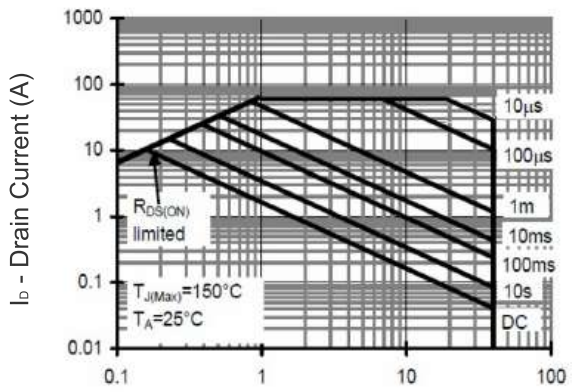


Figure 8 Safe Operation Area

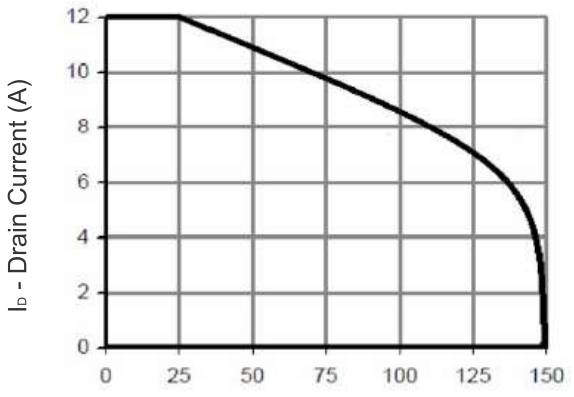


Figure 10 Current De-rating

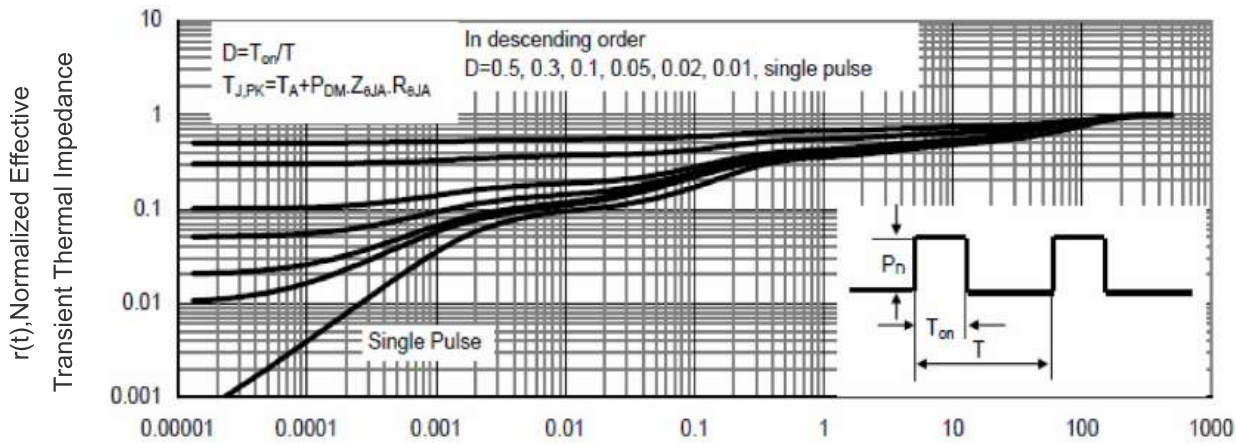
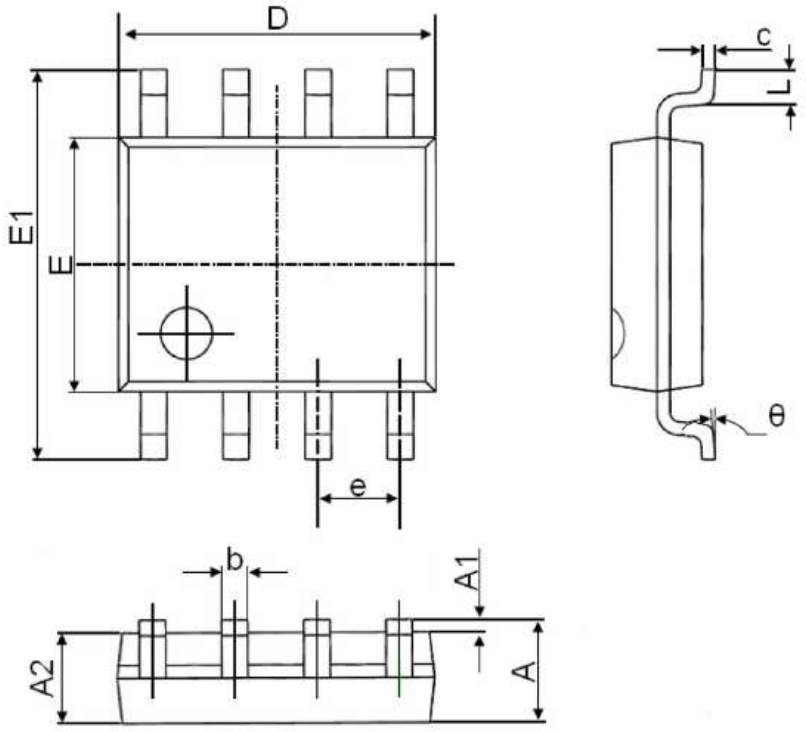


Figure 11 Normalized Maximum Transient Thermal Impedance

SOP-8 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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