N and P-Channel Enhancement Mode Power MOSFET

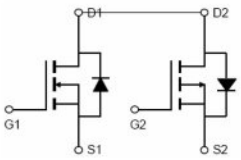
Description

The MJ609 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge.
The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

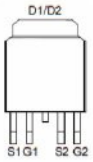
General Features

N channel	p channel
◆ V_{DS}=40V,I_D=21A	V_{DS}=-40V,I_D=-14A
$R_{DS(ON)}$<19mΩ @ V_{GS}=10V	$R_{DS(ON)}$<35mΩ @ V_{GS}=-10V
$R_{DS(ON)}$<29mΩ @ V_{GS}=4.5V	$R_{DS(ON)}$<45mΩ @ V_{GS}=-4.5V

◆ High power and current handing capability
◆ Lead free product is acquired
◆ Surface mount package



Schematic diagram



Marking and pin assignment

100% UIS TESTED! 100% ΔVds TESTED!

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MJ609	MJ609	TO-252-4L	-	-	-

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
Drain Current-Continuou	T_A=25°C	I_D	21	-14	A
	T_A=70°C	I_D	17.5	-11.5	A
Pulsed Drain Current (Note 1)		I_{DM}	40	-40	A
Maximum Power Dissipation	T_A=25°C	P_D	40	40	W
Operating Junction and Storage Temperature Range		T_J,T_{STG}	-55 To 150	-55 To 150	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case (Note 2)	$R_{\theta JC}$	N-Ch	3.1	℃/W
Thermal Resistance,Junction-to-Case (Note 2)	$R_{\theta JC}$	P-Ch	3.1	℃/W

N-Channel 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=10A	-	14	19	mΩ
		V_{GS}=4.5V, I_D=5A	-	19	29	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=10A	-	15	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{lss}	V_{DS}=20V,V_{GS}=0V F=1.0MHz	-	1500	-	PF
Output Capacitance	C_{oss}		-	215	-	PF
Reverse Transfer Capacitance	C_{rss}		-	135	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V, R_L=2Ω V_{GS}=10V,R_{GEN}=3Ω	-	4	-	nS
Turn-on Rise Time	t_r		-	11.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	18	-	nS
Turn-Off Fall Time	t_f		-	5.6	-	nS
Total Gate Charge	Q_g	V_{DS}=20V,I_D=10A V_{GS}=10V	-	24	-	nC
Gate-Source Charge	Q_{gs}		-	4	-	nC
Gate-Drain Charge	Q_{gd}		-	3.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=10A	-	0.8	1.2	V

P-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	-1.0	-1.5	-2.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-7A	-	29	35	mΩ
		V_{GS}=-4.5V, I_D=-4A	-	34	45	mΩ
Forward Transconductance	g_{FS}	V_{DS}=-5V,I_D=-7A	-	15	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{lss}	V_{DS}=-20V,V_{GS}=0V, F=1.0MHz	-	1225	-	PF
Output Capacitance	C_{oss}		-	190	-	PF
Reverse Transfer Capacitance	C_{rss}		-	120	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-20V, R_L=2.3Ω V_{GS}=-10V,R_{GEN}=6Ω	-	10	-	nS
Turn-on Rise Time	t_r		-	15	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	nS
Turn-Off Fall Time	t_f		-	18	-	nS
Total Gate Charge	Q_g	V_{DS}=-20V,I_D=-7A V_{GS}=-10V	-	21	-	nC
Gate-Source Charge	Q_{gs}		-	3.5	-	nC
Gate-Drain Charge	Q_{gd}		-	3.0	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=-14A	-	-	-1.2	V

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.

N- Channel Typical Electrical and Thermal Characteristics (Curves)

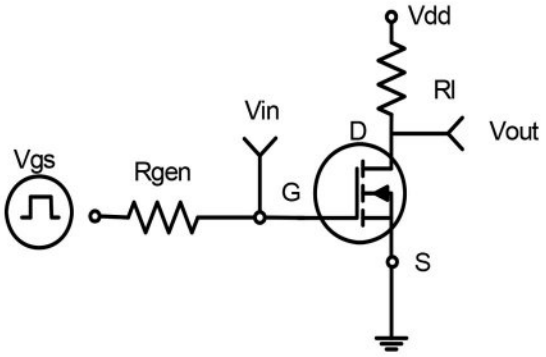


Figure 1 Switching Test Circuit

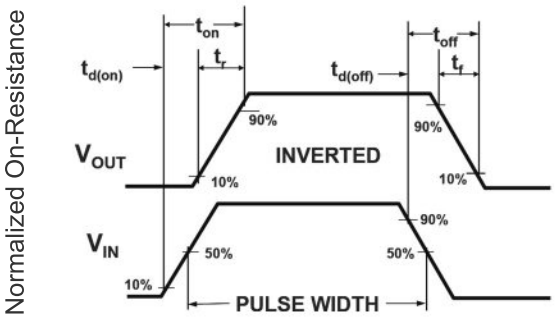


Figure 2 Switching Waveforms

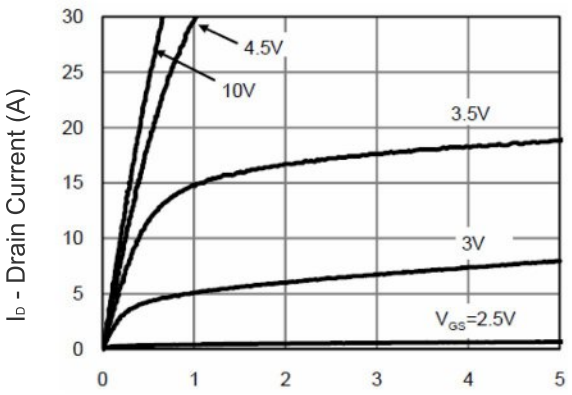


Figure 3 Output Characteristics

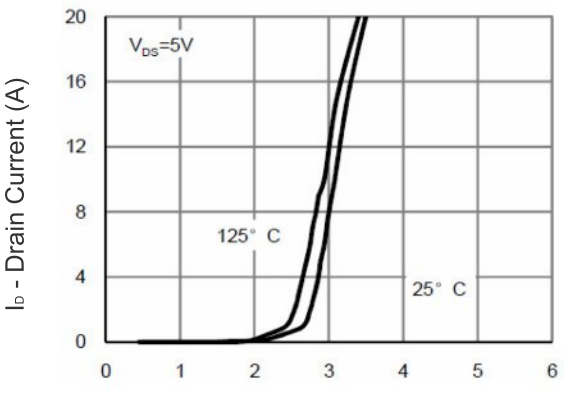


Figure 4 Transfer Characteristics

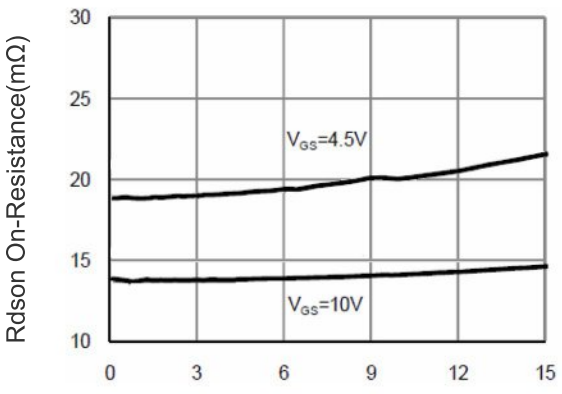


Figure 5 Drain-Source On-Resistance

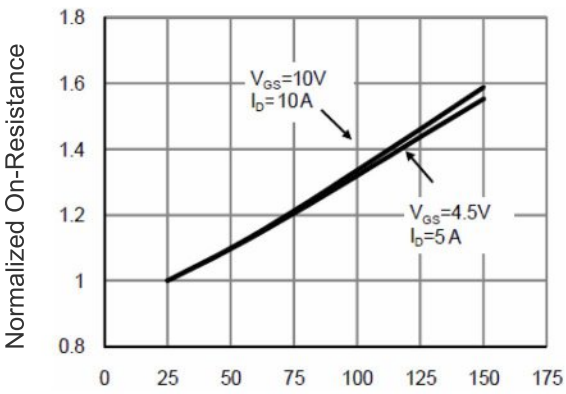


Figure 6 Drain-Source On-Resistance

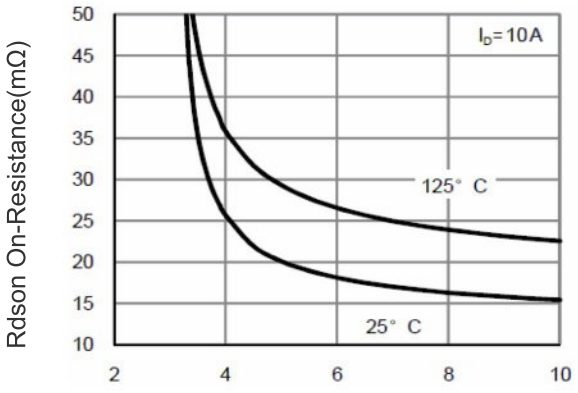


Figure7 Rdson vs Vgs

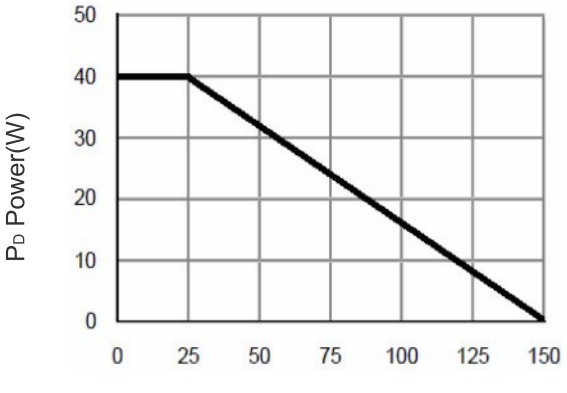


Figure 8 Power Dissipation

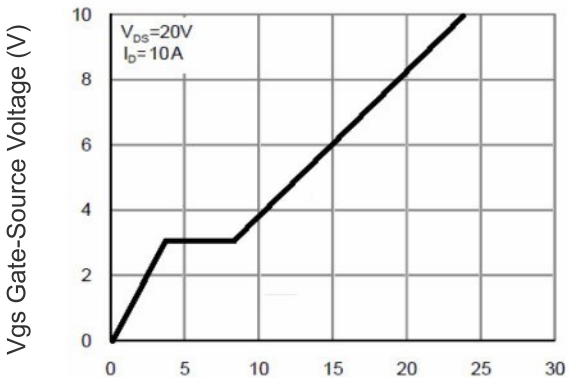


Figure 9 Gate Charge

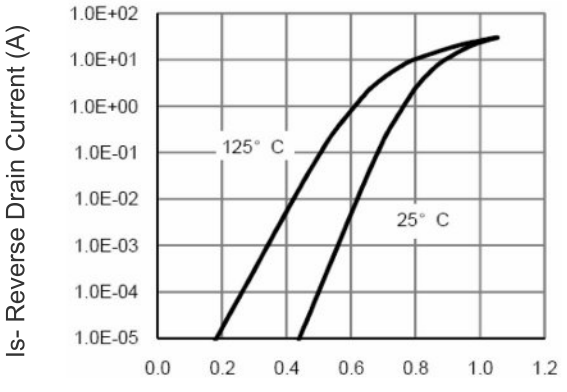


Figure 10 Source- Drain Diode Forward

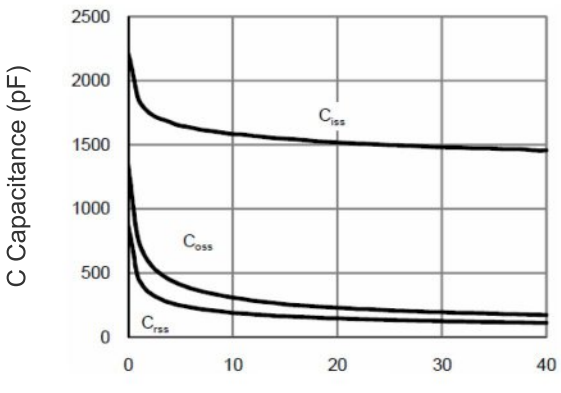


Figure 11 Capacitance vs Vds

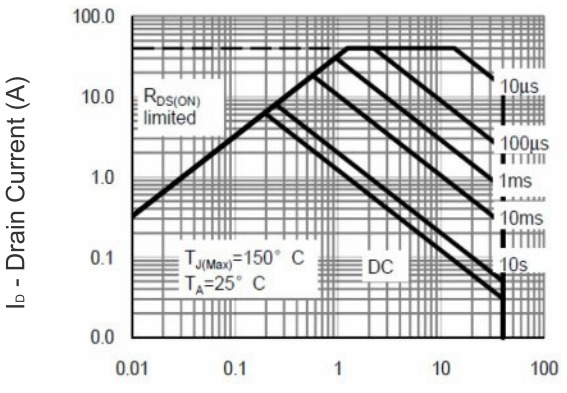


Figure 12 Safe Operation Area

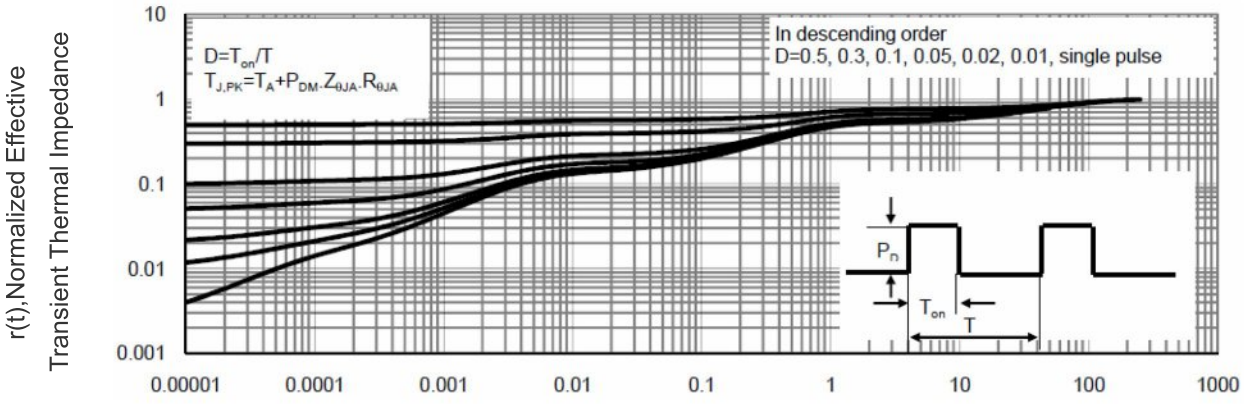


Figure 13 Normalized Maximum Transient Thermal Impedance

P- Channel Typical Electrical and Thermal Characteristics (Curves)

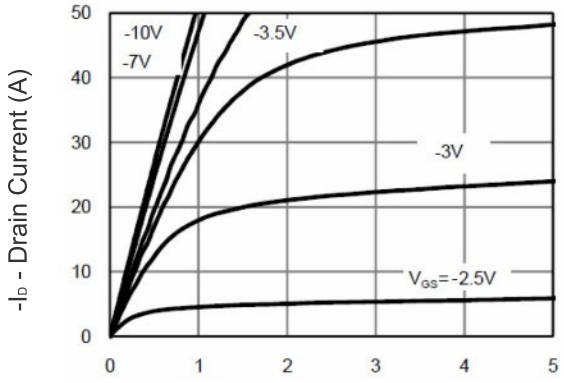


Figure 1 Output Characteristics

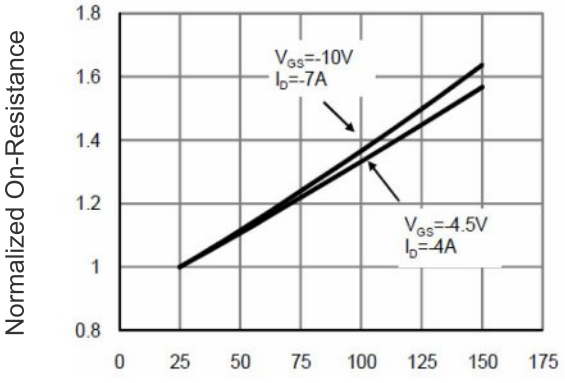


Figure 4 Rdson-Junction Temperature

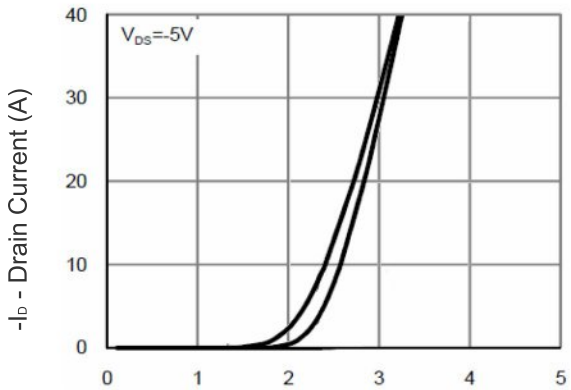


Figure 2 Transfer Characteristics

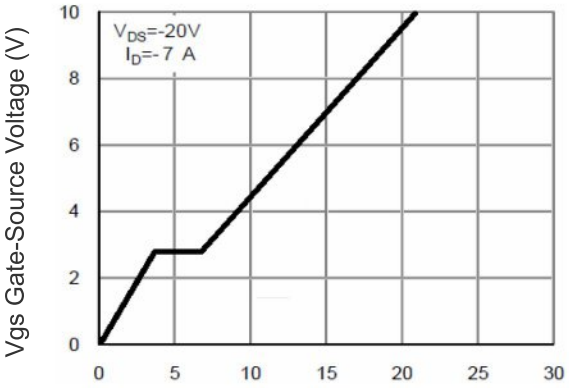


Figure 5 Gate Charge

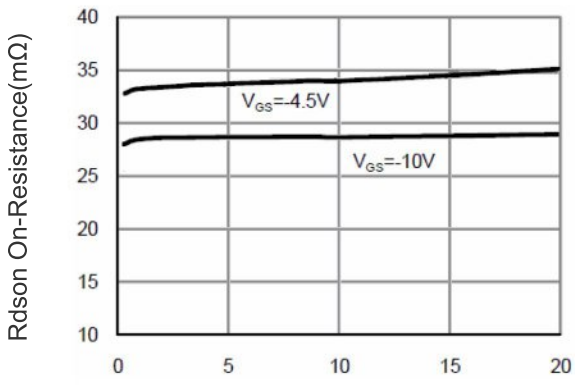


Figure 3 Rdson- Drain Current

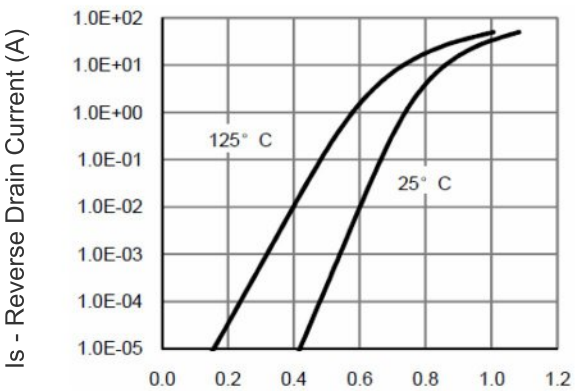


Figure 6 Source- Drain Diode Forward

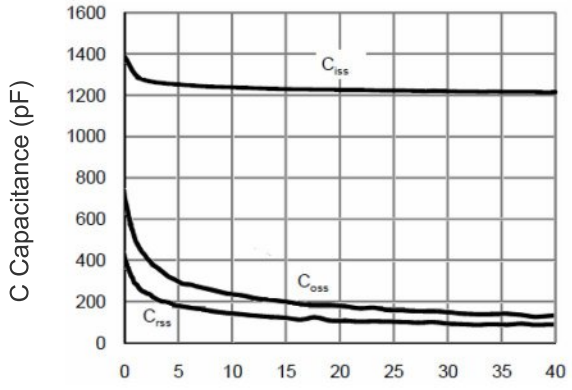


Figure 7 Capacitance vs Vds

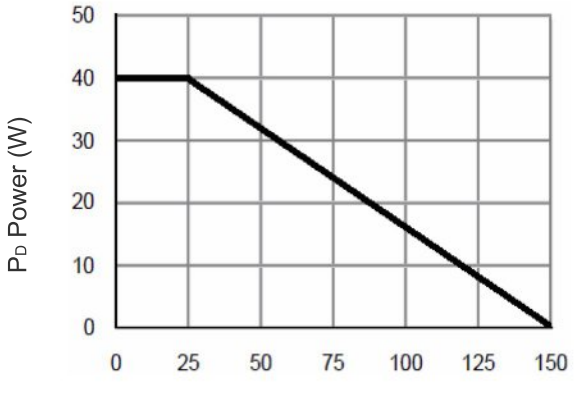


Figure 9 Power Dissipation

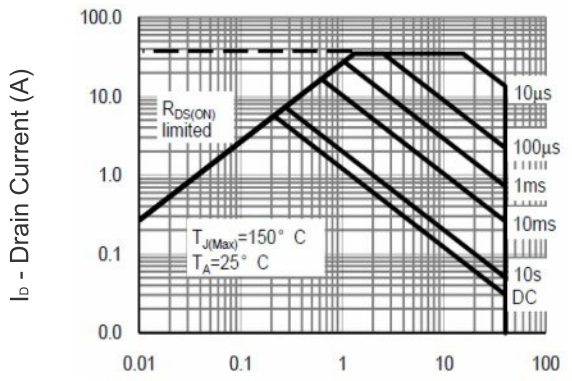


Figure 8 Safe Operation Area

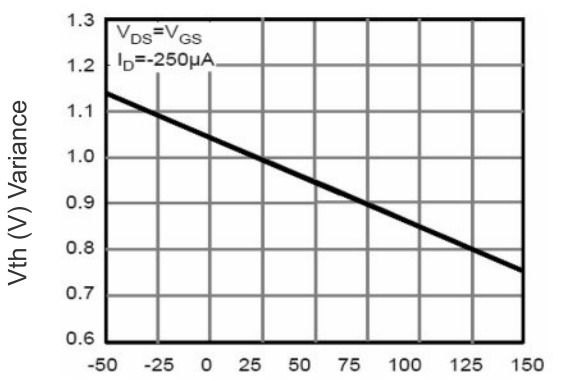


Figure 10 $V_{GS(th)}$ vs Junction Temperature

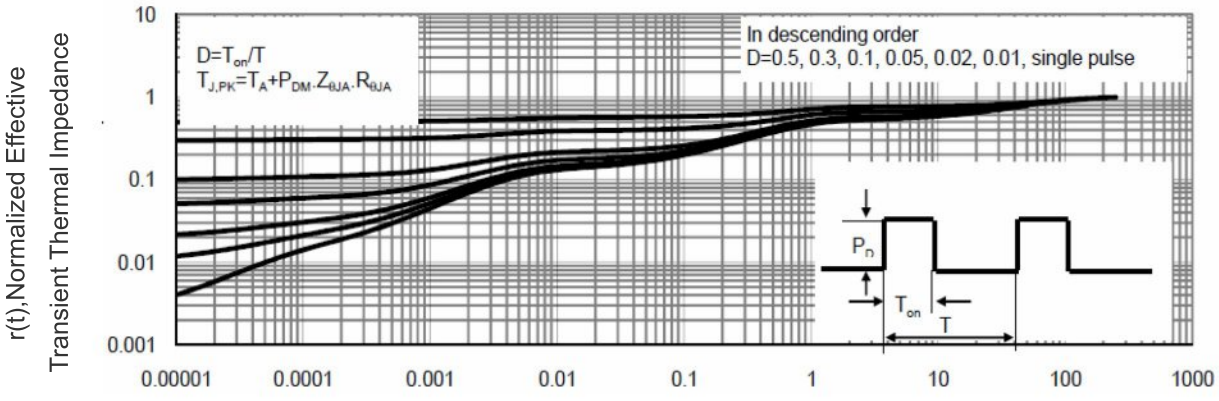
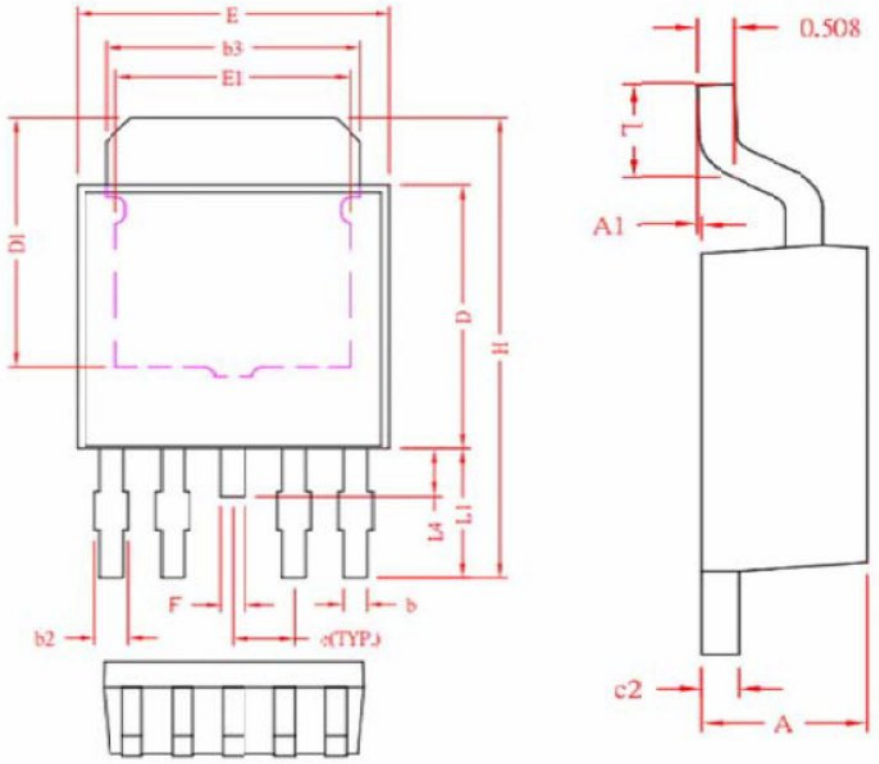


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252-4L Package Information



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0	0.08	0.15
b	0.45	0.53	0.60
b2	0.50	0.65	0.80
b3	5.20	5.35	5.50
c2	0.45	0.50	0.55
D	5.40	5.60	5.80
D1	4.57	-	-
E	6.40	6.60	6.80
E1	3.81	-	-
e	1.27 REF.		
F	0.40	0.50	0.60
H	9.40	9.80	10.20
L	1.40	1.59	1.77
L1	2.40	2.70	3.00
L4	0.80	1.00	1.20

Attention:

Any and all MJ power products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your MJ power representative nearest you before using any MJ power products described or contained herein in such applications.

MJ power assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all MJ power products described or contained herein.

Specifications of any and all MJ power products described or contained herein stipulate the erformance, characteristics,and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer’s products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer’s products or equipment.

MJ power Semiconductor CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.

In the event that any or all MJ power products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.

Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. MJ power believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the MJ power product that you intend to use.

This catalog provides information as of Sep.2010. Specifications and information herein are subject to change without notice.