N&P-Channel V Complementary MOSFET

Description

The HM609K 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

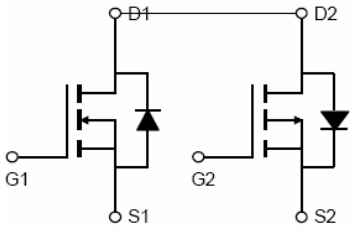
- V_{DS} =40V,I_D = 30A
  $R_{DS(ON)}$ <16mΩ @ V_{GS}=10V
  $R_{DS(ON)}$ <24mΩ @ V_{GS}=4.5V

p channel

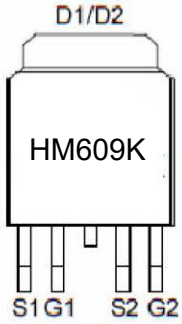
- V_{DS} =-40V,I_D =-18A
  $R_{DS(ON)}$ <45mΩ @ V_{GS}=-10V
  $R_{DS(ON)}$ <65mΩ @ V_{GS}=-4.5V
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Application

- H-bridge
- Inverters



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
HM609K	HM609K	TO-252-4L	-	-	-

Absolute Maximum Ratings (T_C=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℃	I_D	30	-18	A
	T_C=100℃		21	-12.6	
Pulsed Drain Current (Note 1)		I_{DM}	90	-54	A
Maximum Power Dissipation	T_C=25℃	P_D	21		W
Operating Junction and Storage Temperature Range		T_J,T_{STG}	-55 To 175		℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case (Note 2)	$R_{\theta JC}$	7	℃/W

N-Channel 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	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=40V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±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	1.5	2.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=7A	-	12.9	16	mΩ
		V_{GS}=4.5V, I_D=6A	-	18.9	24	mΩ
Forward Transconductance	g_{FS}	V_{DS}=10V,I_D=7A	-	29	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=15V,V_{GS}=0V, F=1.0MHz	-	450	-	PF
Output Capacitance	C_{oss}		-	150	-	PF
Reverse Transfer Capacitance	C_{rss}		-	90	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=15V ,R_L=2.5Ω V_{GS}=10V,R_G=3Ω	-	5	-	nS
Turn-on Rise Time	t_r		-	12	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	19	-	nS
Turn-Off Fall Time	t_f		-	6	-	nS
Total Gate Charge	Q_g	V_{DS}=15V,I_D=6A, V_{GS}=10V	-	9.5		nC
Gate-Source Charge	Q_{gs}		-	2.0		nC
Gate-Drain Charge	Q_{gd}		-	1.9		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=30A	-		1.2	V
Diode Forward Current (Note 2)	I_S		-	-	30	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
5. EAS condition:Tj=25℃,VDD=40V,VG=10V,L=0.5mH,Rg=25Ω

N-Channel Typical Electrical and Thermal Characteristics (Curves)

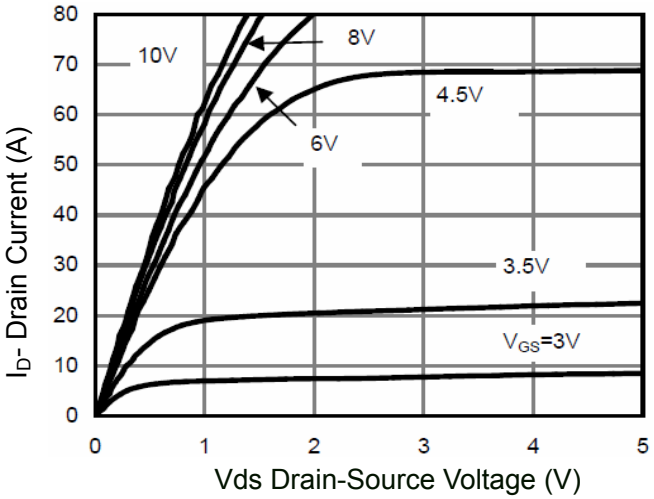


Figure 1 Output Characteristics

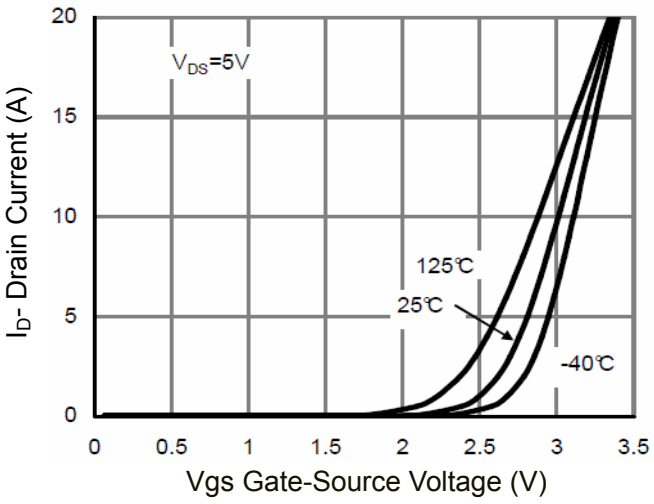


Figure 2 Transfer Characteristics

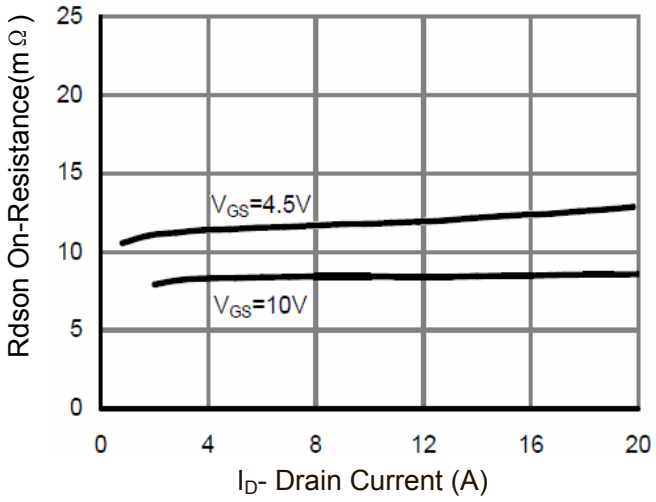


Figure 3 Rdson- Drain Current

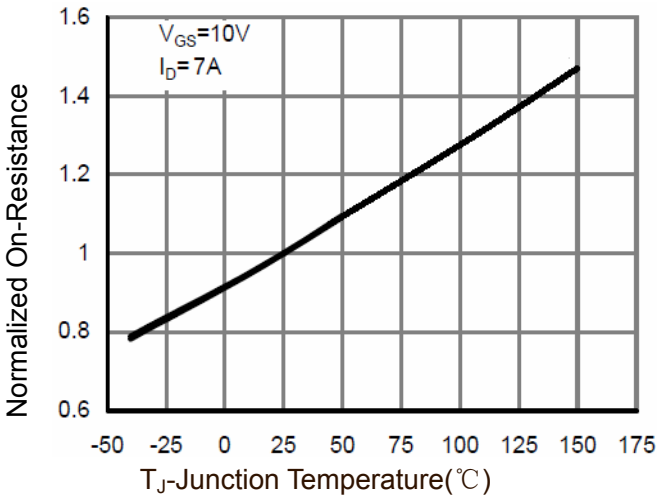


Figure 4 Rdson-Junction Temperature

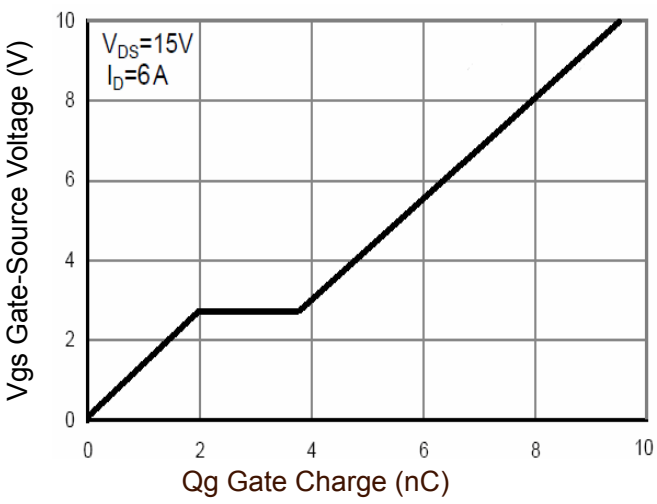


Figure 5 Gate Charge

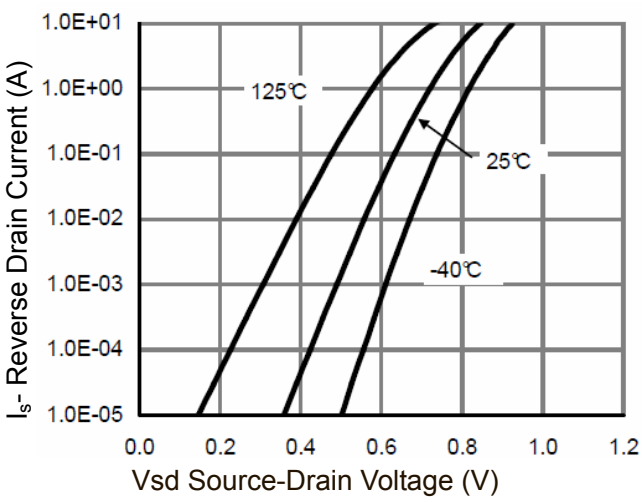


Figure 6 Source- Drain Diode Forward

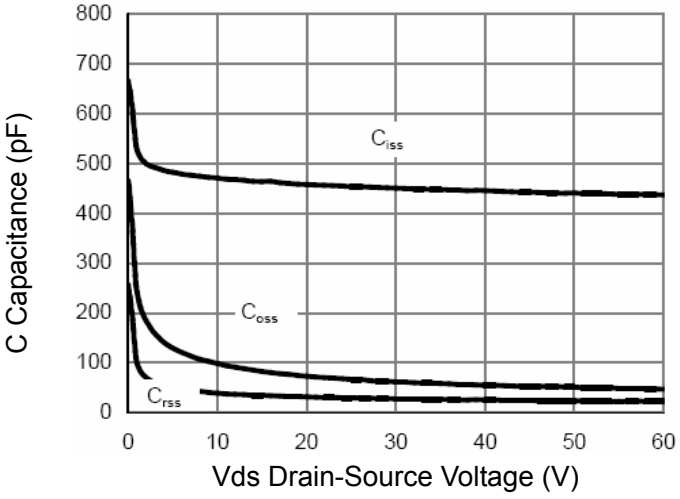


Figure 7 Capacitance vs Vds

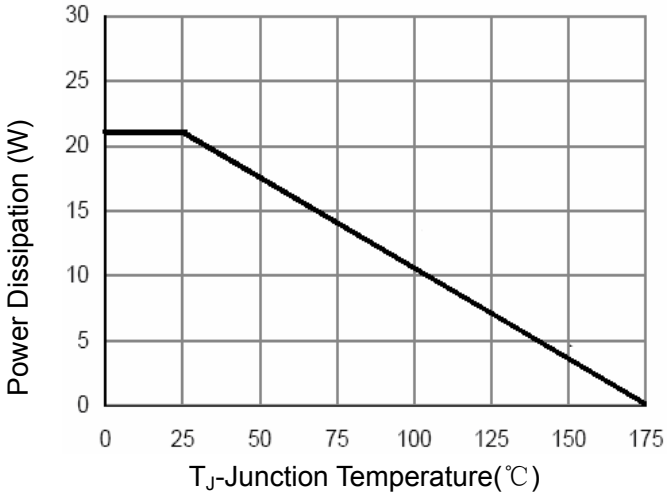


Figure 9 Figure 9 Power De-rating

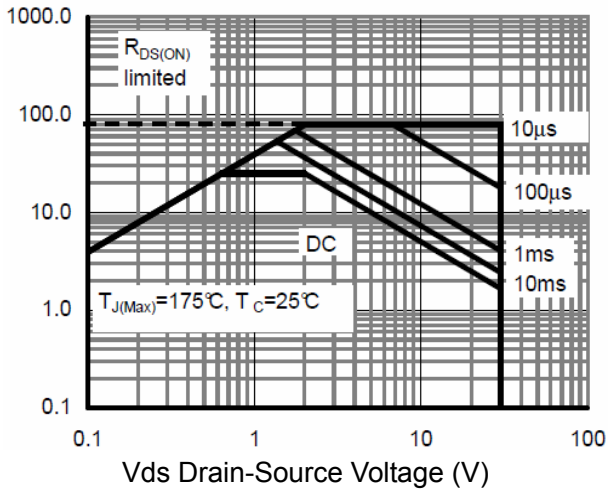


Figure 8 Safe Operation Area

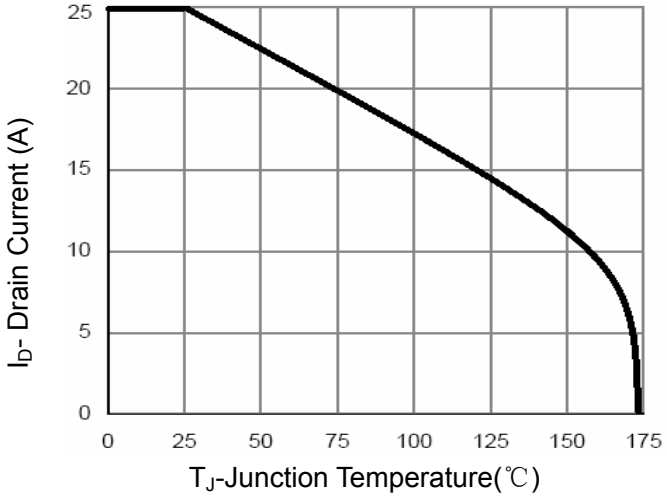


Figure 10 Current De-rating

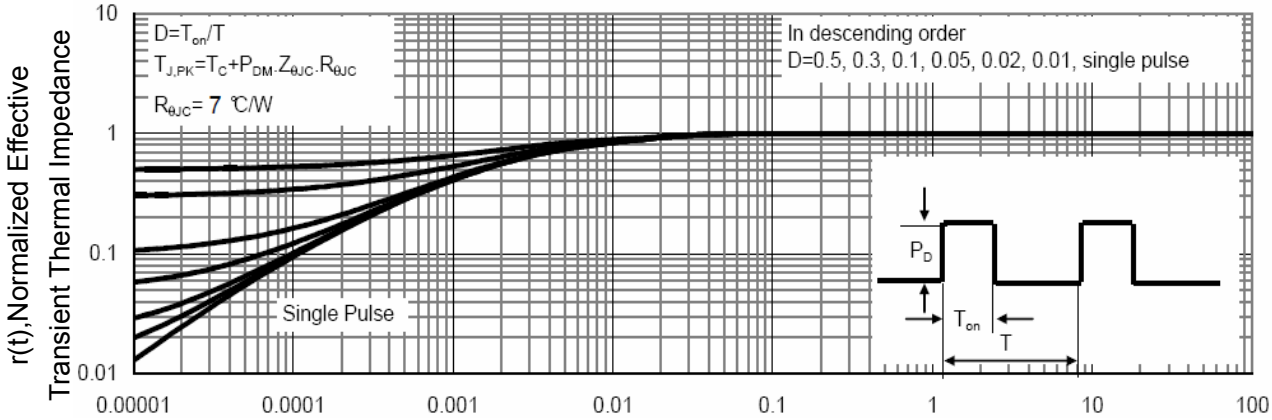


Figure 11 Normalized Maximum Transient Thermal Impedance

P-Channel 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	-40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-40V,V_{GS}=0V	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250μA	-1.3	-	-2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-6A	-	-	45	mΩ
		V_{GS}=-4.5V, I_D=-5A		-	65	
Forward Transconductance	g_{FS}	V_{DS}=-5V,I_D=-6A	-	15	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=-40V,V_{GS}=0V, F=1.0MHz	-	920	-	PF
Output Capacitance	C_{oss}		-	140	-	PF
Reverse Transfer Capacitance	C_{rss}		-	90	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-15V ,R_L=2.5Ω V_{GS}=-10V,R_G=3Ω	-	8	-	nS
Turn-on Rise Time	t_r		-	30	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	22	-	nS
Turn-Off Fall Time	t_f		-	26	-	nS
Total Gate Charge	Q_g	V_{DS}=-15V,I_D=-6A, V_{GS}=-10V	-	16.2		nC
Gate-Source Charge	Q_{gs}		-	2.9		nC
Gate-Drain Charge	Q_{gd}		-	3.6		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=-6A	-		-1.2	V
Diode Forward Current (Note 2)	I_S		-	-	-18	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF =-6A di/dt = 100A/μs (Note3)	-	23	-	nS
Reverse Recovery Charge	Qrr		-	14	-	nC

P-Channel Typical Electrical and Thermal Characteristics (Curves)

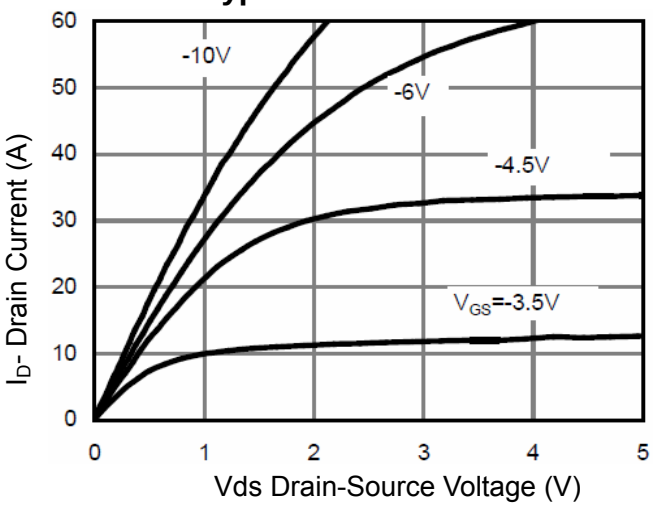


Figure 1 Output Characteristics

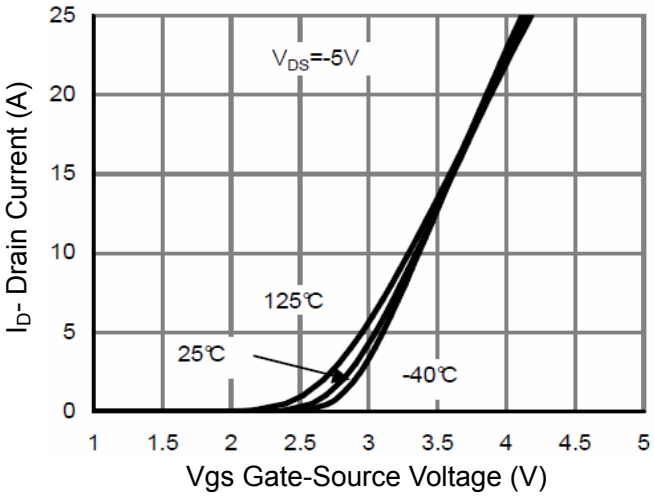


Figure 2 Transfer Characteristics

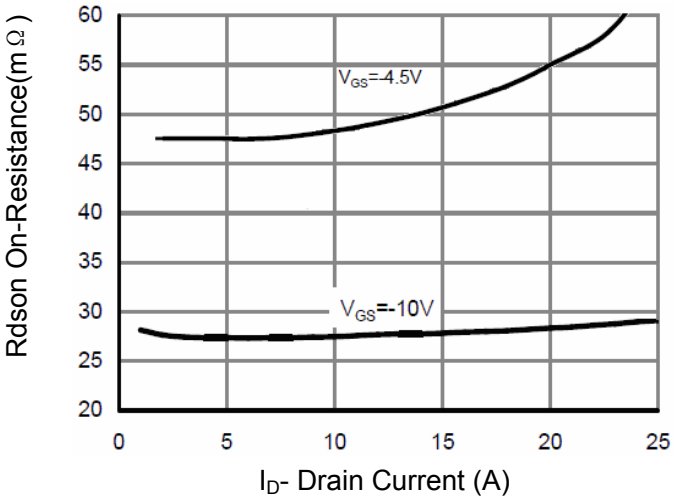


Figure 3 Rdson- Drain Current

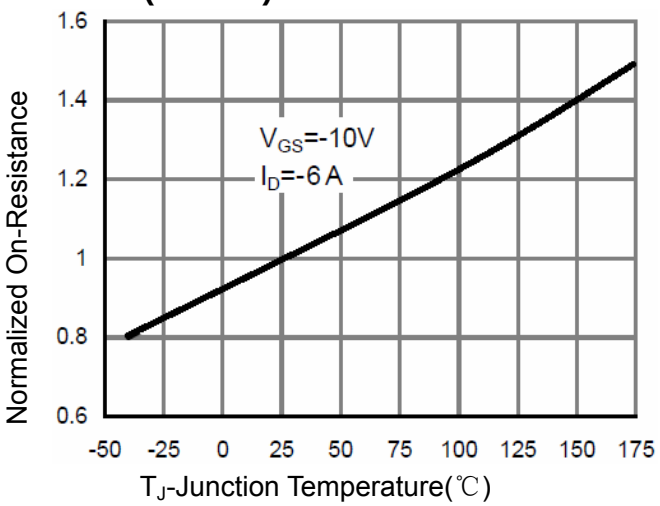


Figure 4 Rdson-Junction Temperature

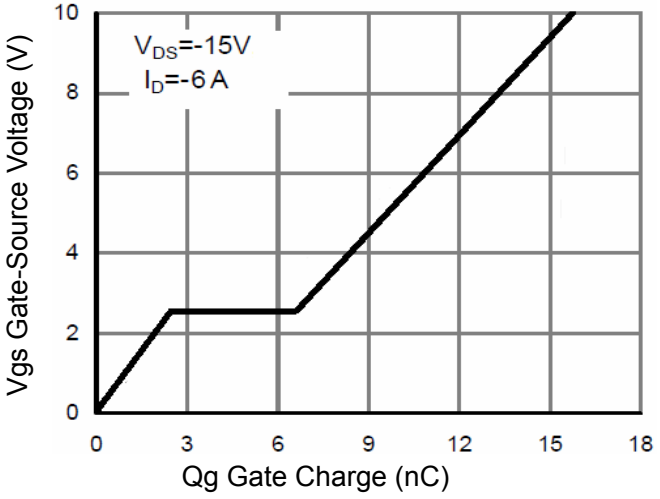


Figure 5 Gate Charge

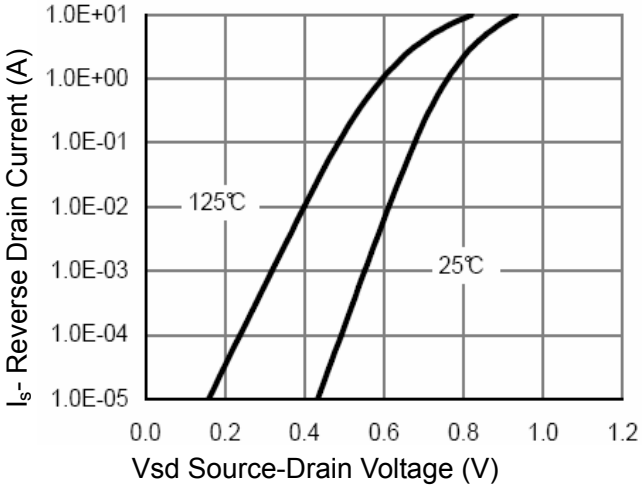


Figure 6 Source- Drain Diode Forward

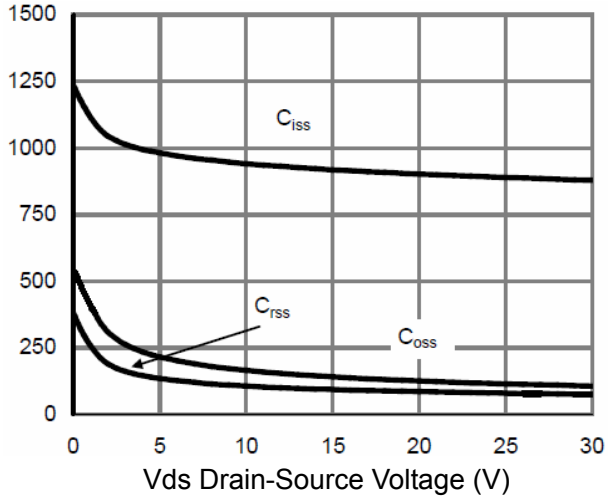


Figure 7 Capacitance vs Vds

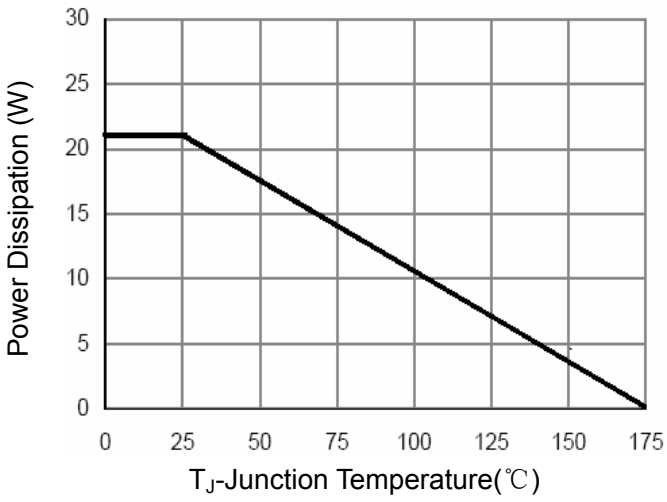


Figure 9 Power De-rating

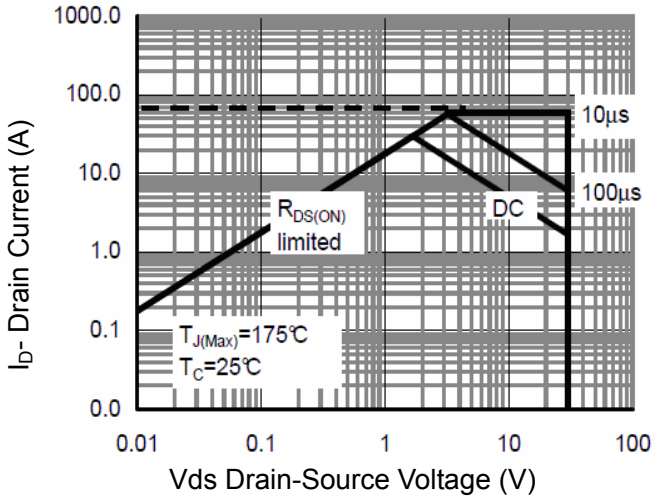


Figure 8 Safe Operation Area

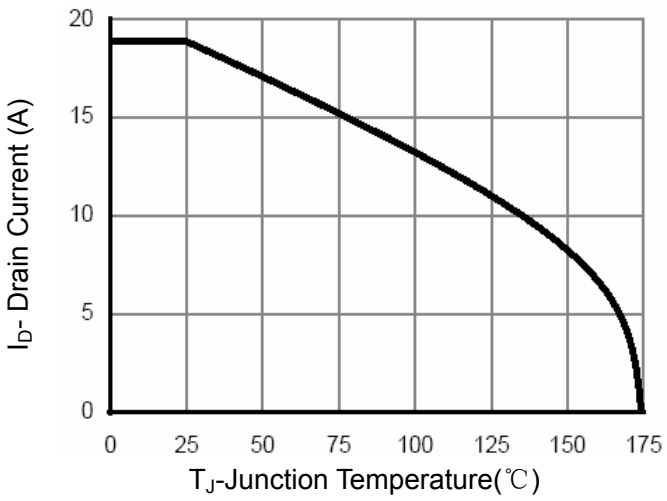


Figure 10 Current De-rating

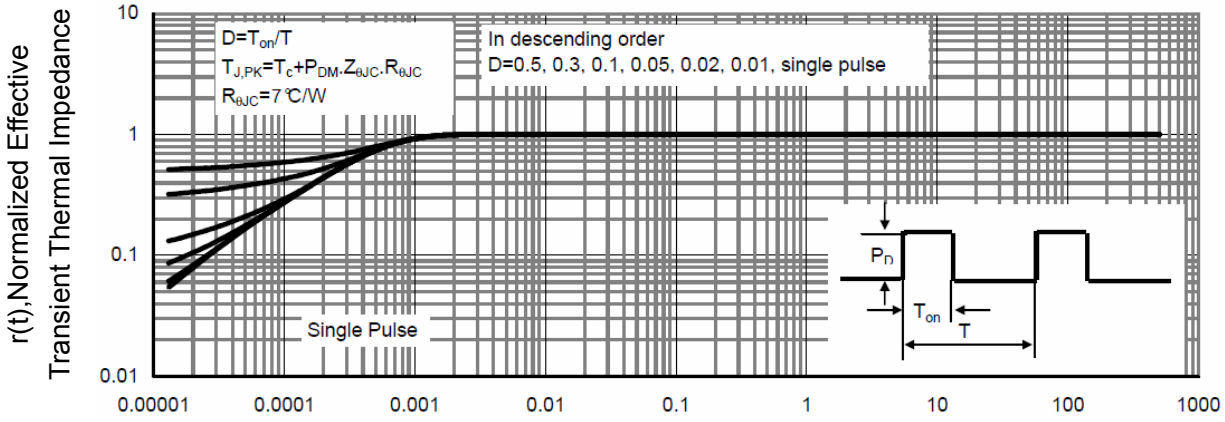
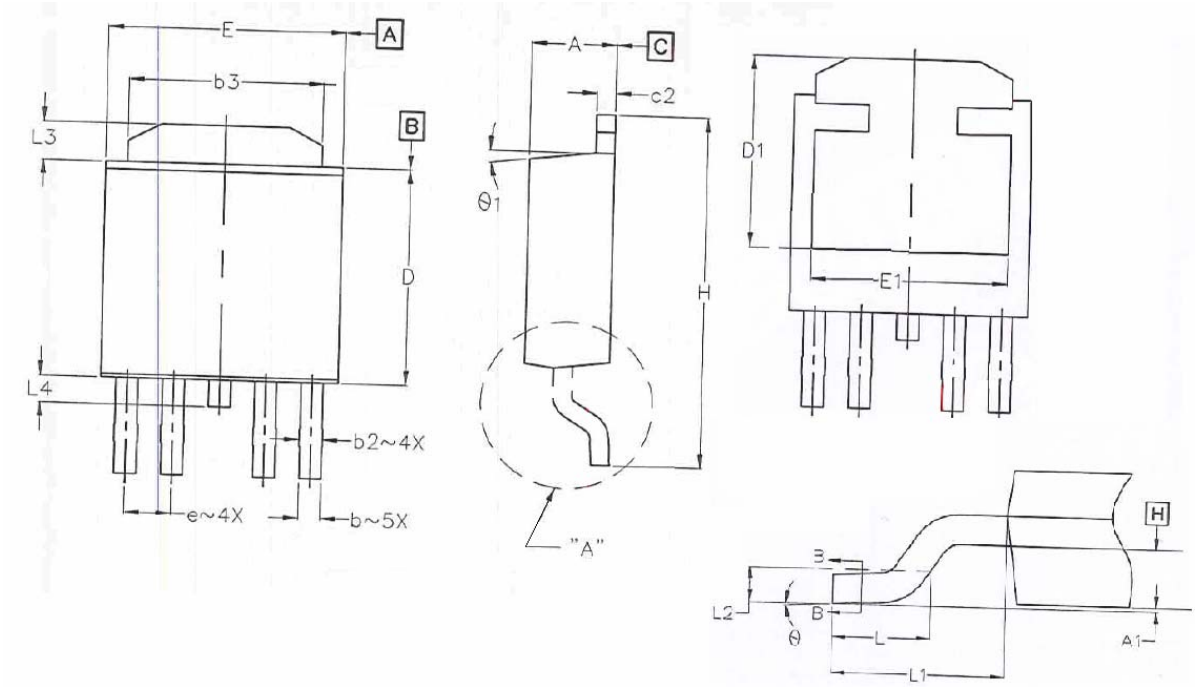


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252-4L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.184	2.387	0.086	0.094
A1	-	0.127	-	0.094
b	0.508	0.711	0.020	0.028
b1	0.508	0.660	0.020	0.026
b2	0.610	0.787	0.024	0.031
b3	4.953	5.461	0.195	0.215
c	0.460	0.610	0.018	0.024
c1	0.410	0.559	0.016	0.022
C2	0.460	12.950	0.498	0.510
D	4.980	5.180	0.196	0.204
D1	2.650	2.950	0.104	0.116
E	7.900	8.100	0.311	0.319
E1	0.000	0.300	0.000	0.012
e	12.900	13.400	0.508	0.528
H	2.850	3.250	0.112	0.128
L	1.397	1.778	0.055	0.070
L1	2.743	BSC	0.108	BSC
L2	0.508	BSC	0.020	BSC
L3	0.889	1.270	0.035	0.050
L4	-	1.015	-	0.040
θ	0°	10°	0°	10°
θ1	0°	15°	0°	15°