KJ20Y04K

N+P Channel Enhancement Mode MOSFET

1. Product Information

Features

Advanced Trench Technology

Excellent $R_{DS(ON)}$, Low gate charge

Applications

Boost driver

Brushless motor

Quick reference

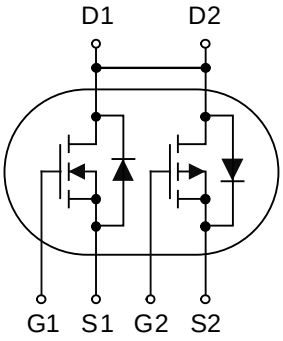
$B_V \geqq 40$ V, $I_D \leqq 20$ A

$R_{DS(ON)} \leqq 32$ mΩ@V_{GS} = -10 V(Type: 24 mΩ)

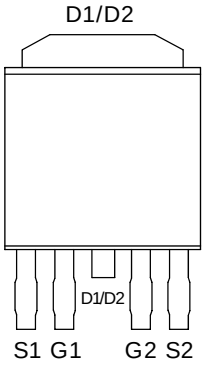
$B_V \geqq -40$ V, $I_D \leqq -18$ A

$R_{DS(ON)} \leqq 348$ mΩ@V_{GS} = -10 V(Type: 42 mΩ)

Schematic diagram



Pin Assignment



Top View
TO-252-4L

Package Marking and Ordering Information

Product Name	Package	Marking		Reel Size	Quantity(pcs)
KJ20Y04K	TO-252-4L	KJ20Y04K YWWXXX	YWWXXX: Date Code	13 inch	2500

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

Symbol	Parameter	Values		Unit
		N-CH	P-CH	
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D (T_C=25℃)	Continuous Drain Current	20	-18	A
I_D (T_C=100℃)	Continuous Drain Current	15	-16	A
I_{DM}	Pulsed Drain Current [a]	35	-36	A
E_{AS}	Single Pulse Avalanche Energy [b]	15	45	mJ
I_{AS}	Repetitive Avalanche Current [a]	10	-10	A
P_D (T_C=25℃)	Total Power Dissipation	20	25	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55~150	-55~150	℃
$R_{\theta JA}$	Maximum Junction-to-Ambient	62		℃/W
$R_{\theta JC}$	Maximum Junction-to-Case	5		℃/W

3. Electrical Characteristics (T_C=25℃, unless otherwise noted)

N-Channel

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{DS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=250μA	40	44	-	V
$\triangle V_{DS}/\triangle T_J$	V_{DS} Temperature Coefficient	Reference to 25℃, I_D=1mA	-	0.2	-	V/℃
$V_{GS(th)}$	Gate-Source Threshold Voltage	V_{DS}=V_{GS}, I_D=250μA	1.0	1.5	2.5	V
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=32V, V_{GS}=0V, T_J=25℃	-	-	1	μA
		V_{DS}=32V, V_{GS}=0V, T_J=55℃	-	-	5	
$R_{DS(ON)}$	Drain-Source on-Resistance [2]	V_{GS}=10V, I_D=4A	-	24	32	mΩ
		V_{GS}=4.5V, I_D=3A	-	38	48	
gfs	Forward Transconductance	V_{DS}=5V, I_D=4A	-	8	-	S
R_g	Gate Resistance	V_{DS}=15V, V_{GS}=4.5V, I_D=3A	-	2.4	4.8	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1.0 MHz	-	452	-	pF
C_{oss}	Output Capacitance		-	51	-	
C_{rss}	Reverse Transfer Capacitance		-	38	-	
Q_g	Total Gate Charge	V_{GS}=4.5V, V_{DS}=15V, I_D=3A	-	5	-	nC
Q_{gs}	Gate-Source Charge		-	1.54	-	
Q_{gd}	Gate-Drain Charge		-	1.84	-	
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=15V, V_{GS}=10V, I_D=1A, R_g=3.3Ω	-	7.8	-	ns
t_r	Turn-on Rise Time		-	2.1	-	
$t_{d(off)}$	Turn-off Delay Time		-	29	-	
t_f	Turn-off Fall Time		-	2.1	-	
I_S	Continuous Source Current	V_{GS}=V_{DS}=0V, Force Current	-	-	4.5	A
I_{SM}	Pulsed Diode Forward Current [a]		-	-	14	A
V_{SD}	Body Diode Voltage	V_{GS}=0V , I_S=1A , T_J=25℃	-	-	1.2	V

Notes:

1. The data tested by surface mounted on a 1 inch^2 FR-4 board with 2 OZ copper.
2. The data tested by pulsed , pulse width ≦ 300μs , duty cycle ≦ 2%.
3. The E_{AS} data shows Max. rating. The test condition is V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=10A.
4. The power dissipation is limited by 150℃ junction temperature.
5. The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

P-Channel

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{DS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=-250μA	-40	-	-	V
$\triangle V_{DS}/\triangle T_J$	V_{DS} Temperature Coefficient	Reference to 25℃, I_D=-1mA	-	-0.02	-	V/℃
$V_{GS(th)}$	Gate-Source Threshold Voltage	V_{DS}=V_{GS}, I_D=-250μA	-1.0	-1.6	-2.5	V
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-32V, V_{GS}=0V, T_J=25℃	-	-	1	μA
		V_{DS}=-32V, V_{GS}=0V, T_J=55℃	-	-	5	
$R_{DS(ON)}$	Drain-Source on-Resistance [2]	V_{GS}=-10V, I_D=-5A	-	42	48	mΩ
		V_{GS}=-4.5V, I_D=-3A	-	48	60	
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, f=1.0 MHz	-	1000	-	pF
C_{oss}	Output Capacitance		-	160	-	
C_{rss}	Reverse Transfer Capacitance		-	100	-	
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-20V, I_D=-6A	-	15.8	-	nC
Q_{gs}	Gate-Source Charge		-	3.5	-	
Q_{gd}	Gate-Drain Charge		-	3.2	-	
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=-15V, V_{GS}=-10V, I_D=-1A, R_g=3.3Ω	-	5.2	-	ns
t_r	Turn-on Rise Time		-	7	-	
$t_{d(off)}$	Turn-off Delay Time		-	23	-	
t_f	Turn-off Fall Time		-	8	-	
I_S	Continuous Source Current	V_{GS}=V_{DS}=0V, Force Current	-	-	-5.7	A
V_{SD}	Body Diode Voltage	V_{GS}=0V , I_S=-1A , T_J=25℃	-	-	-1.2	V

Notes:

1. The data tested by surface mounted on a 1 inch^2 FR-4 board with 2 OZ copper.
2. The data tested by pulsed , pulse width ≦ 300μs , duty cycle ≦ 2%.
3. The E_{AS} data shows Max. rating. The test condition is V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-15A.
4. The power dissipation is limited by 150℃ junction temperature.
5. The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

4. Typical Characteristics

N-Channel

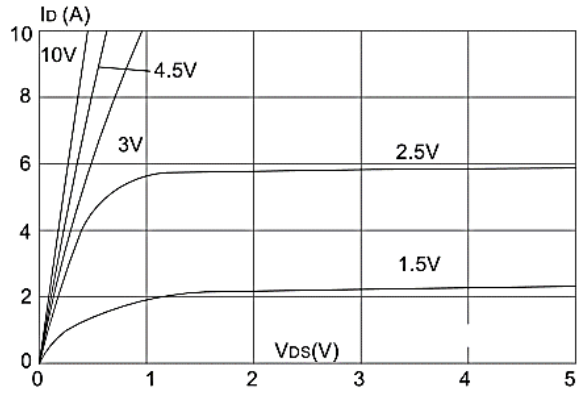


Figure 1. Output Characteristics

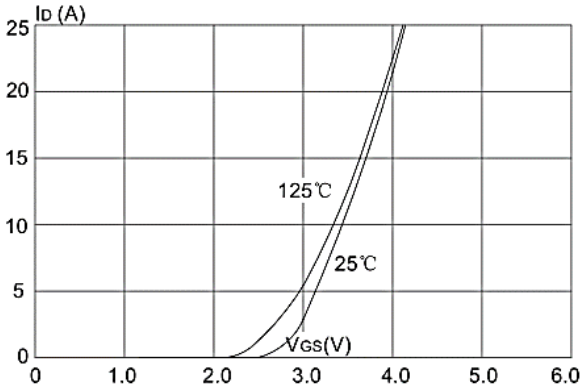


Figure 2. Typical Transfer Characteristics

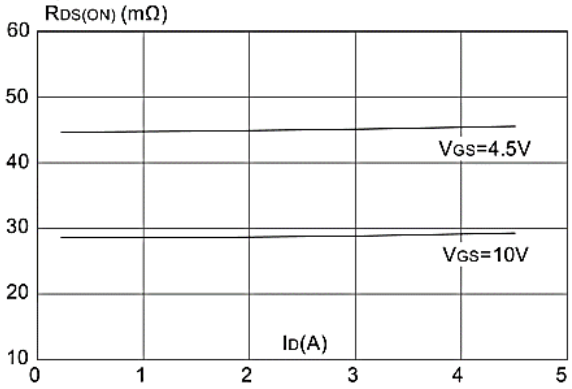


Figure 3. On-resistance vs. Drain Current

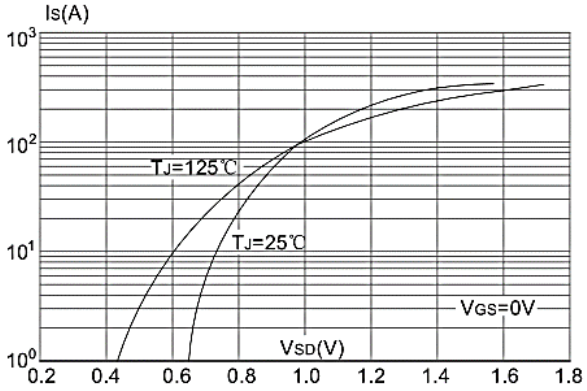


Figure 4. Body Diode Characteristics

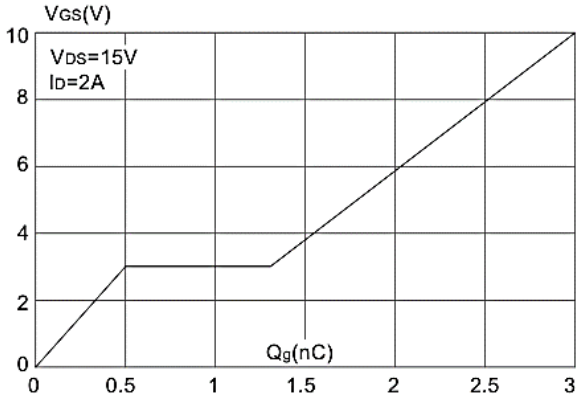


Figure 5. Gate Charge Characteristics

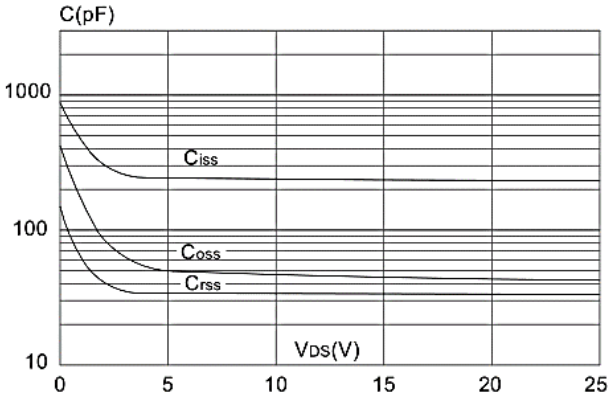


Figure 6. Capacitance Characteristics

4. Typical Characteristics (Cont.)

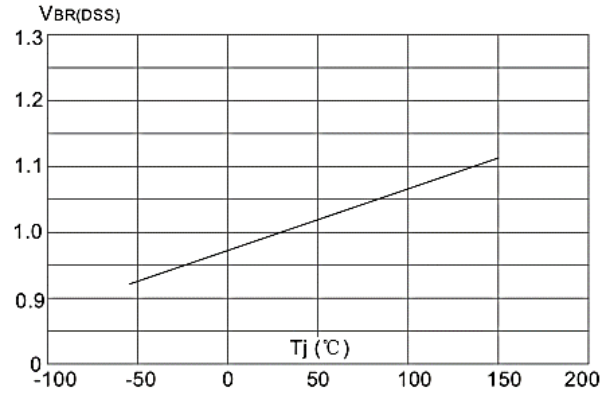


Figure 7. Normalized Breakdown Voltage vs. Junction Temperature

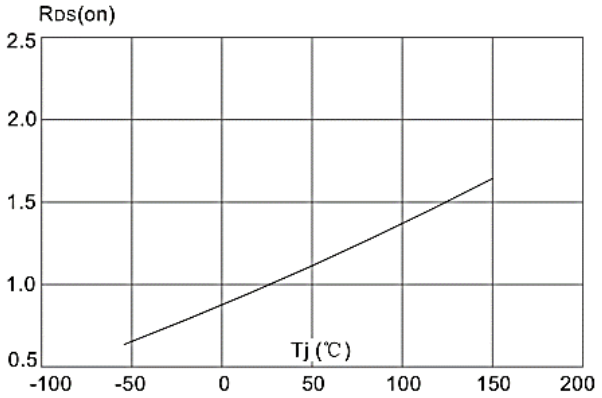


Figure 8. Normalized on Resistance vs Junction Temperature

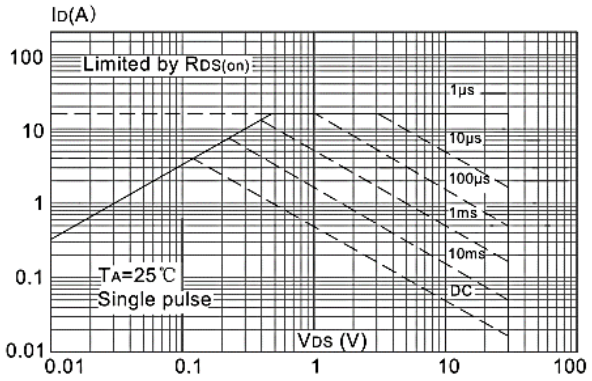


Figure 9. Maximum Safe Operating Area vs. Case Temperature

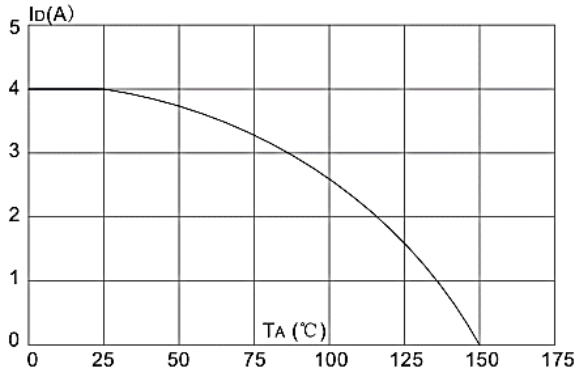


Figure 10. Maximum Continuous Drain Current

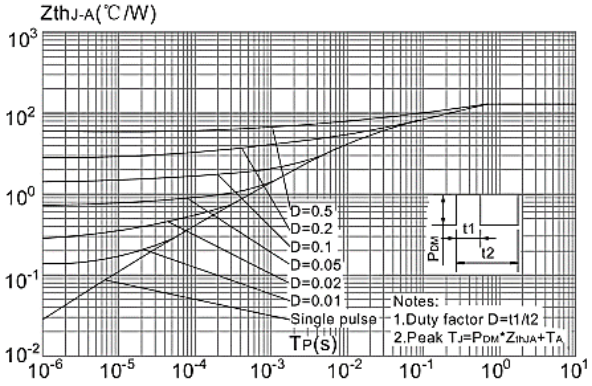


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

4. Typical Characteristics (Cont.)

P-Channel

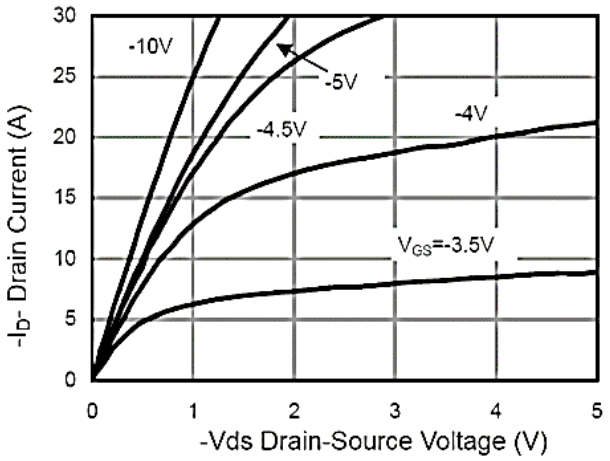


Figure 1 Output Characteristics

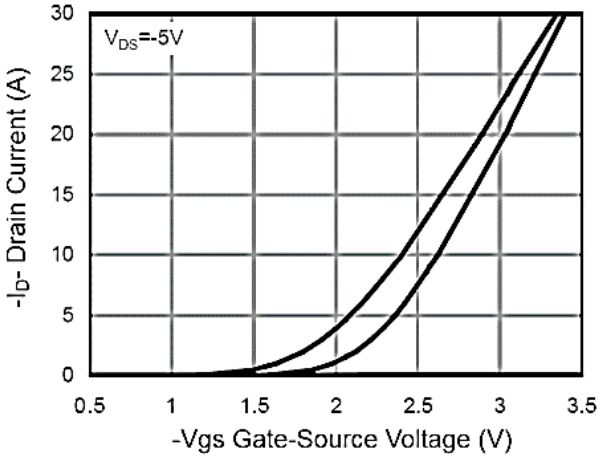


Figure 2 Transfer Characteristics

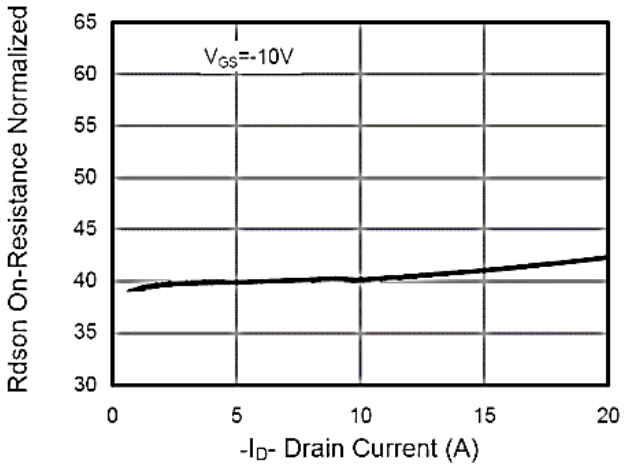


Figure 3 Rdson- Drain Current

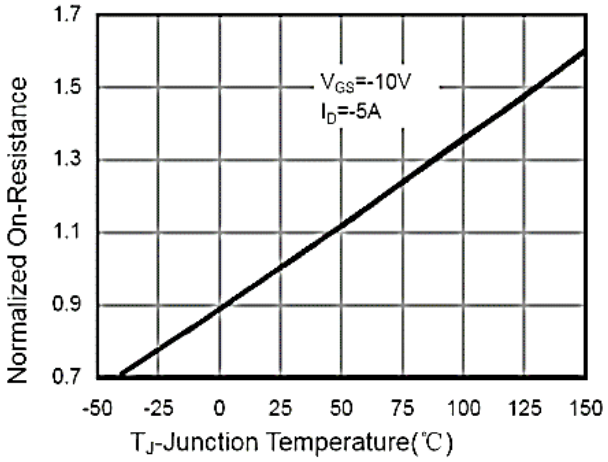


Figure 4 Rdson-Junction Temperature

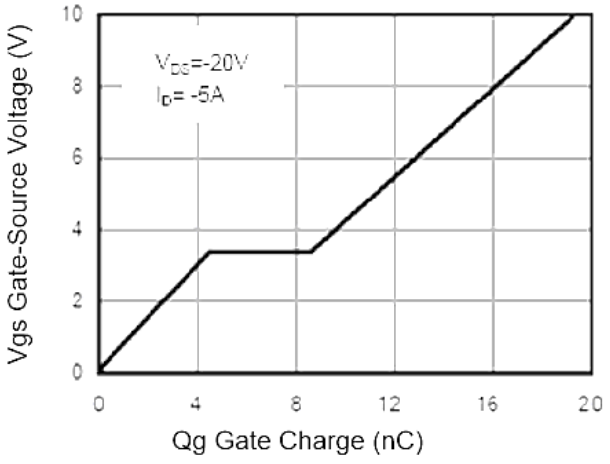


Figure 5 Gate Charge

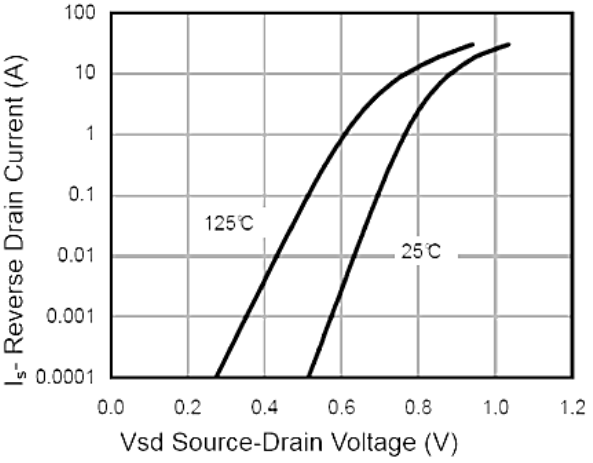


Figure 6 Source- Drain Diode Forward

4. Typical Characteristics (Cont.)

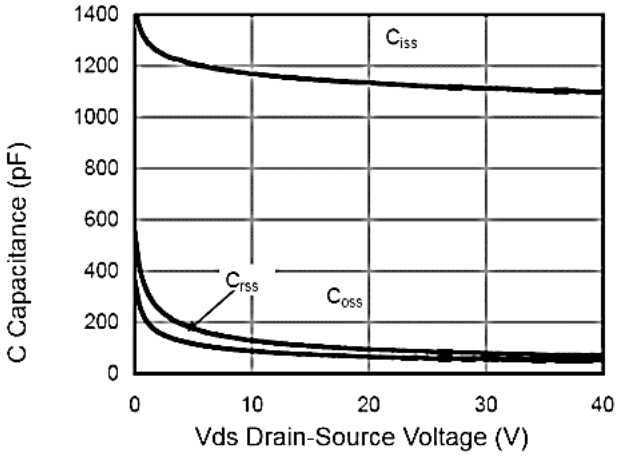


Figure 7 Capacitance vs Vds

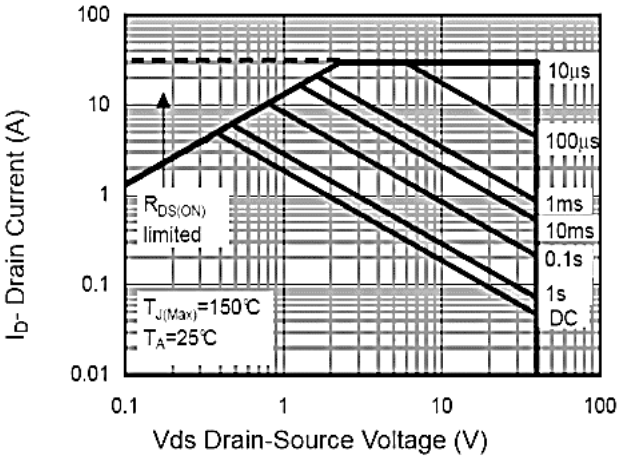


Figure 8 Safe Operation Area

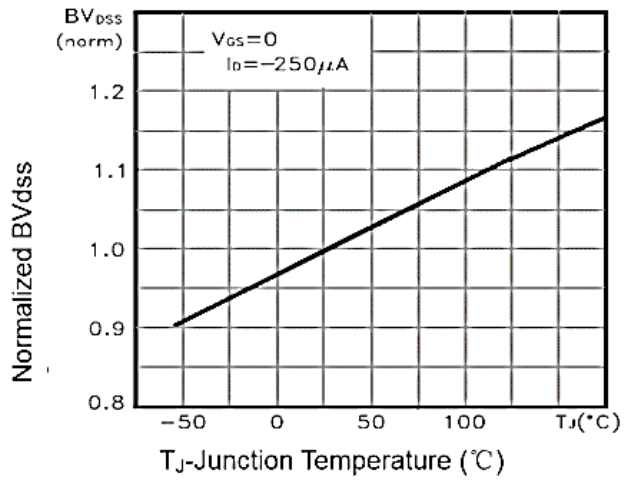


Figure 9 BV_{DSS} vs Junction Temperature

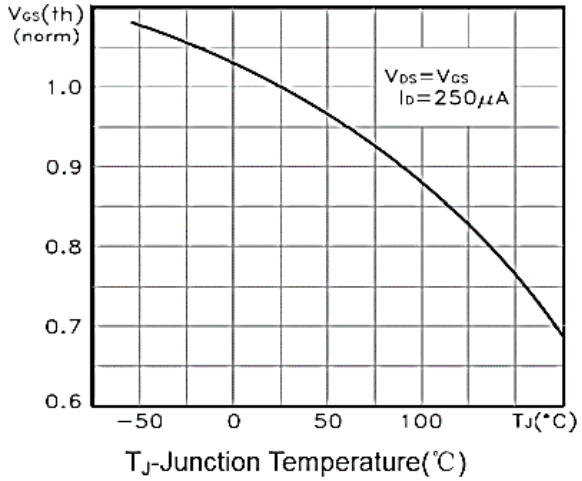


Figure 10 $V_{GS(th)}$ vs Junction Temperature

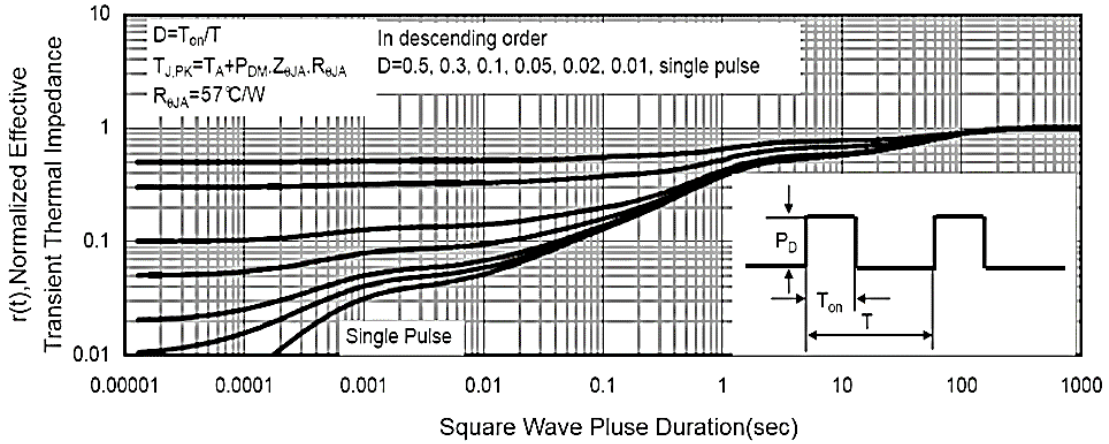
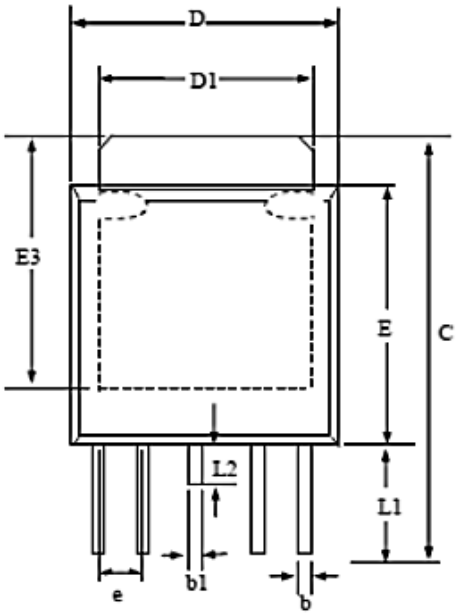
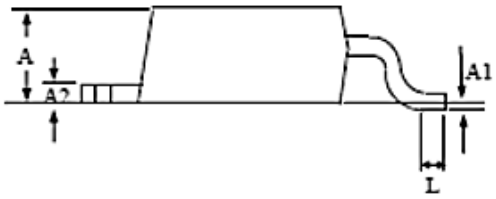


Figure 11 Normalized Maximum Transient Thermal Impedance

5. Package Mechanical Data

TO-252-4L Package





SYMBOLS	Millimeters		
	MIN	NOM	MAX
D	6.30	6.55	6.80
D1	4.80	5.35	5.90
C	9.30	9.75	10.20
E	5.30	5.80	6.30
E3	4.50	5.15	5.80
L	0.90	1.35	1.80
L1	2.00	2.53	3.05
L2	0.50	0.85	1.20
b	0.30	0.50	0.70
b1	0.40	0.60	0.80
A	2.10	2.30	2.50
A2	0.40	0.53	0.65
A1	0.00	0.10	0.20
e	1.20	1.30	1.40

1.All Dimensions Are in Millimeters.

2.Dimension Does Not Include Mold Protrusions.