TM4050GD

N+P-Channel Enhancement Mode Mosfet

General Description

- Low $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

Applications

- Load switch
- PWM

General Features

N Channel

V_{DS} =40V I_D =50A

$R_{DS(ON)}$ = 4.2mΩ (typ.) @ V_{GS} =10V

P Channel

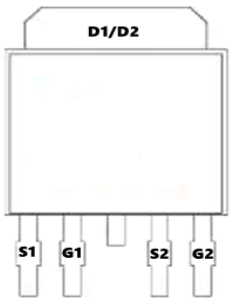
V_{DS} = -40V I_D =-50A

$R_{DS(ON)}$ = 11.5mΩ (typ.) @ V_{GS}=-10V

100% UIS Tested

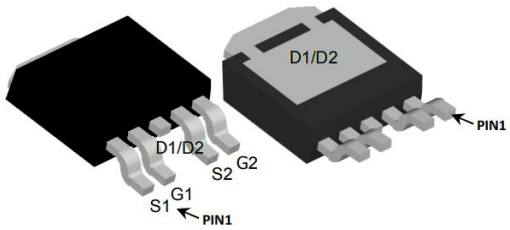
100% R_g Tested

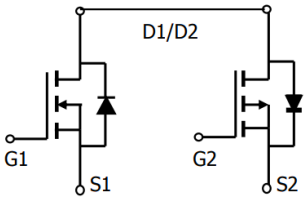
Green Product



Marking: 50G04

GD:TO-252-4L





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

Symbol	Parameter	N-Channel	P-Channel	Units
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D	Continuous Drain Current TC=25℃	50	-50	A
	Continuous Drain Current-TC=100℃	35	-20	
	Pulsed Drain Current[1]	250	-130	
P_D	Power Dissipation T_C =25℃	55	55	W
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150		℃

Thermal Characteristics:

Symbol	Parameter	Max	Units
$R_{\Theta JC}$	Thermal Resistance,Junction to Case	2.3	℃/W
$R_{\Theta JA}$	Thermal Resistance,Junction to Ambient	62	

N-CH Electrical Characteristics: (T_C=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Sourtce Breakdown Voltage	V_{GS}=0V,I_D=250μA	40	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS}=0V, V_{DS}=-40V	---	---	1	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V, V_{DS}=0A	---	---	±100	nA
On Characteristics						
$V_{GS(th)}$	GATE-Source Threshold Voltage	V_{GS}=V_{DS}, I_D=250μA	1	1.6	2.5	V
$R_{DS(ON)}$	Drain-Source On Resistance[3]	V_{GS}=10V,I_D=20A	---	4.2	5.5	mΩ
		V_{GS}=4.5V,I_D=10A	---	5.3	7	
G_{FS}	Forward Transconductance	V_{DS}=10V, I_D=10A	---	16	---	S
Dynamic Characteristics[4]						
C_{iss}	Input Capacitance	V_{DS}=25V, V_{GS}=0V, f=1MHz	---	2380	3400	pF
C_{oss}	Output Capacitance		---	230	385	
C_{rss}	Reverse Transfer Capacitance		---	148	210	
Switching Characteristics[4]						
$t_{d(on)}$	Turn-On Delay Time [2,3]	V_{DD}=20V, I_D=1A, R_{GEN}=3.3Ω , V_{GS}=10V	---	14.2	28	ns
t_r	Rise Time[2,3]		---	18.3	36	ns
$t_{d(off)}$	Turn-Off Delay Time[2,3]		---	38.8	76	ns
t_f	Fall Time[2,3]		---	13.9	28	ns
Q_g	Total Gate Charge[3]	V_{GS}=4.5V, V_{DS}=32V, I_D=10A	---	25	50	nC
Q_{gs}	Gate-Source Charge		---	6.5	13	nC
Q_{gd}	Gate-Drain “Miller” Charge		---	12.1	24	nC
Drain-Source Diode Characteristics						
V_{SD}	Drain Diode Forward Voltage[3]	V_{GS}=0V,I_S=1A	---	---	1	V
LS	Continuous Source Current	V_G=V_D=0V , Force Current	---	---	50	A
Ism	Pulsed Source Current		---	----	160	A

Typical Characteristics: (T_C=25℃ unless otherwise noted)

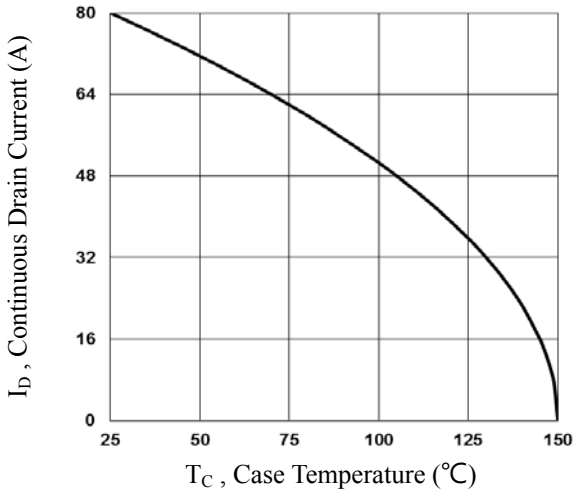


Fig.1 Continuous Drain Current vs. T_C

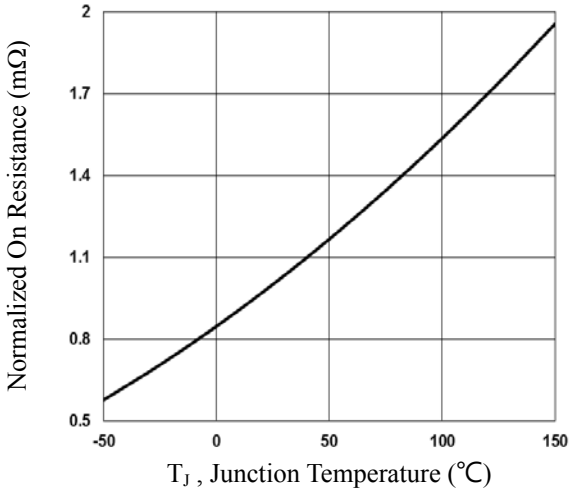


Fig.2 Normalized RDSON vs. T_J

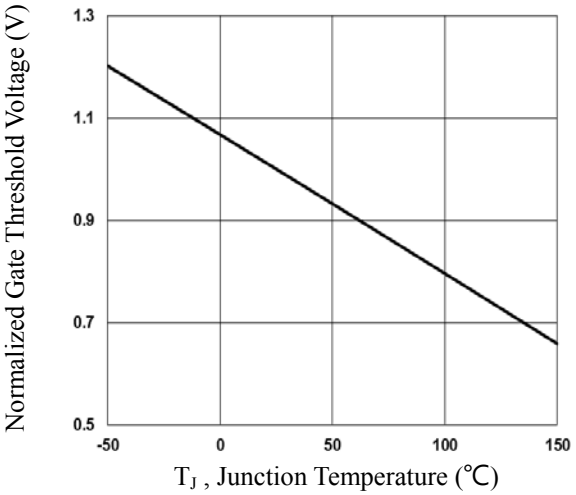


Fig.3 Normalized V_{th} vs. T_J

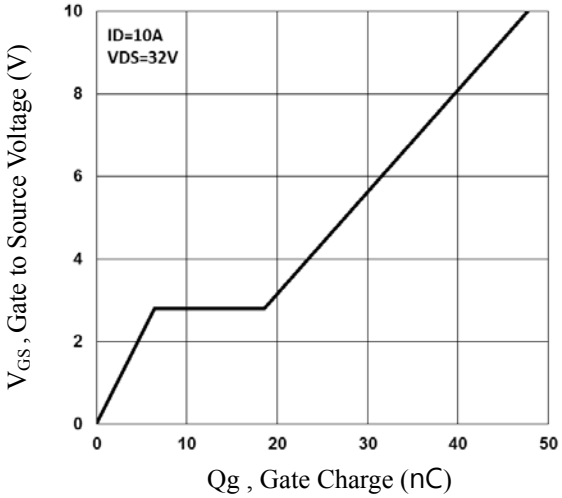


Fig.4 Gate Charge Waveform

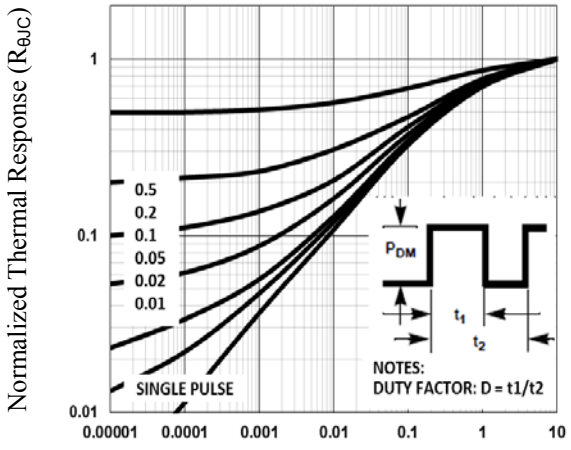


Fig.5 Normalized Transient Impedance

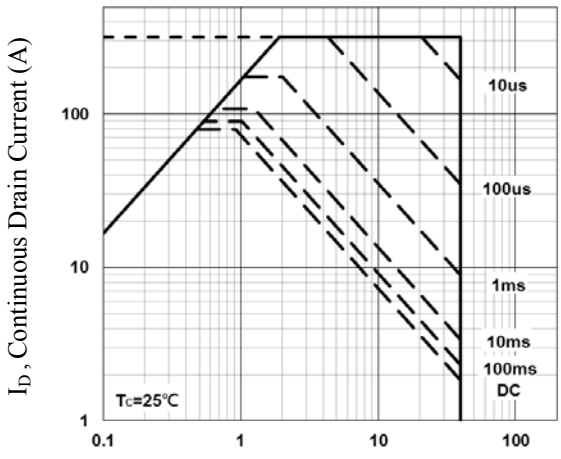


Fig.6 Maximum Safe Operation Area

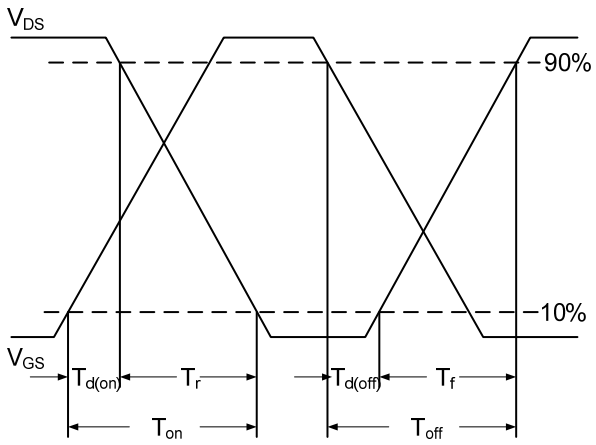


Fig.7 Switching Time Waveform

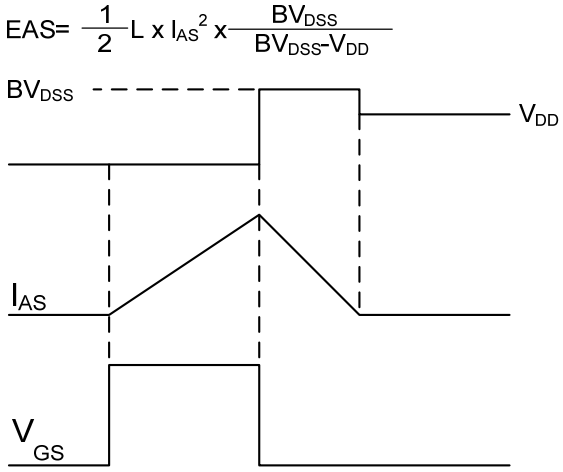


Fig.8 EAS Waveform

P-CH Electrical Characteristics: (T_C=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Sourtce Breakdown Voltage	V_{GS}=0V,I_D=250μA	-40	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS}=0V, V_{DS}=-40V,T_J=25℃	---	---	-1	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V, V_{DS}=0A	---	---	±100	nA
On Characteristics						
$V_{GS(th)}$	GATE-Source Threshold Voltage	V_{GS}=V_{DS}, I_D=250μA	-1	-1.6	-2.5	V
$R_{DS(ON)}$	Drain-Source On Resistance	V_{GS}=-10V,I_D=-10A	---	11.5	15	mΩ
		V_{GS}=-4.5V,I_D=-8A	---	16	22	
G_{FS}	Forward Transconductance	V_{DS}=-10V, I_D=-10A	---	13	---	S
Dynamic Characteristics[4]						
C_{iss}	Input Capacitance	V_{DS}=-25V, V_{GS}=0V, f=1MHz	---	2557	3800	pF
C_{oss}	Output Capacitance		---	220	320	
C_{rss}	Reverse Transfer Capacitance		---	127	180	
Switching Characteristics[4]						
$t_{d(on)}$	Turn-On Delay Time[3,4]	V_{DD}=-20V, I_D=-1A, R_G=6Ω, V_{GS}=-10V	---	23	40	ns
t_r	Rise Time[3,4]		---	10	20	ns
$t_{d(off)}$	Turn-Off Delay Time[3,4]		---	135	250	ns
t_f	Fall Time[3,4]		---	46	90	ns
Q_g	Total Gate Charge[3,4]	V_{GS}=-4.5V, V_{DS}=-32V, I_D=-10A	---	22.2	40	nC
Q_{gs}	Gate-Source Charge[3,4]		---	8.2	16	nC
Q_{gd}	Gate-Drain "Miller" Charge[3,4]		---	8.8	16	nC
Drain-Source Diode Characteristics						
V_{SD}	Source Drain Diode Forward Voltage [2]	V_{GS}=0V,I_S=-1A,T_J=25℃	---	---	-1	V

Notes:
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V_{DD}=25V,V_{GS}=10V,L=0.1mH,I_{AS}=51A.,R_G=25 ,Starting T_J=25℃.
3. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
4. Essentially independent of operating temperature.

Typical Characteristics: (T_C=25℃ unless otherwise noted)

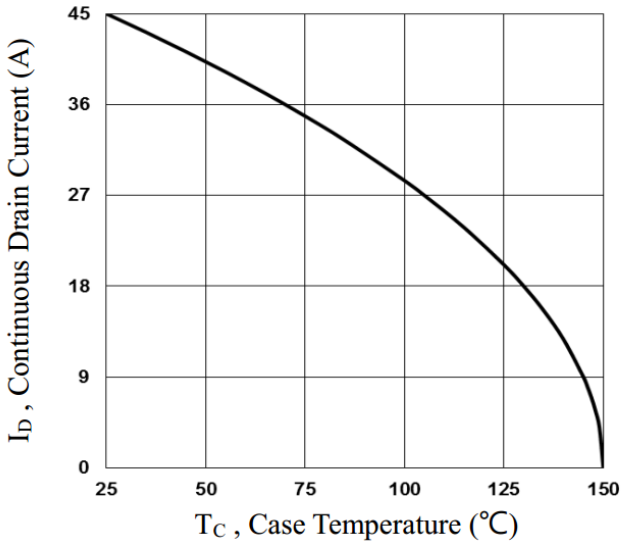


Fig.1 Continuous Drain Current vs. T_C

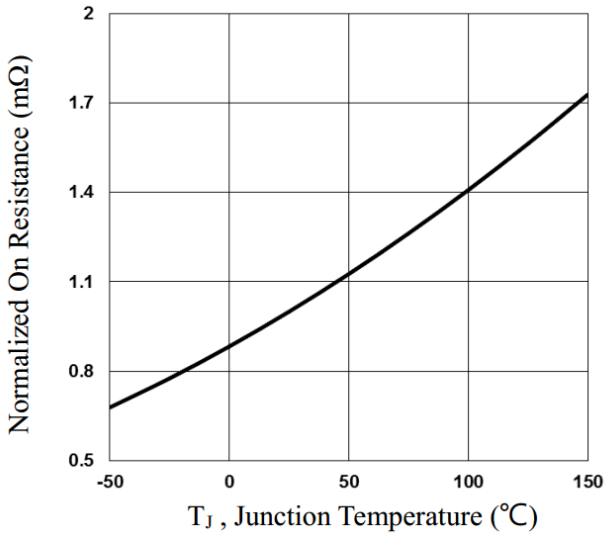


Fig.2 Normalized RDSON vs. T_J

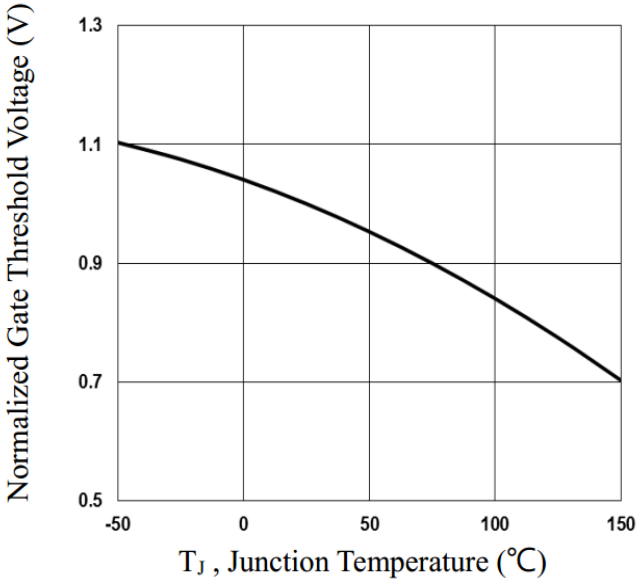


Fig.3 Normalized V_{th} vs. T_J

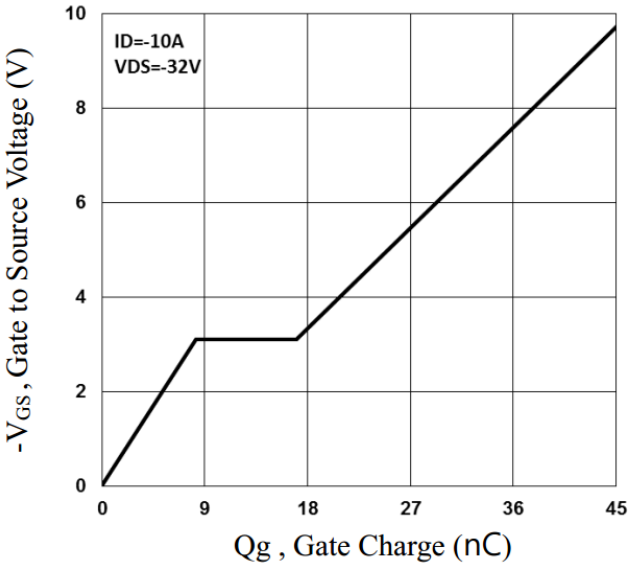


Fig.4 Gate Charge Waveform

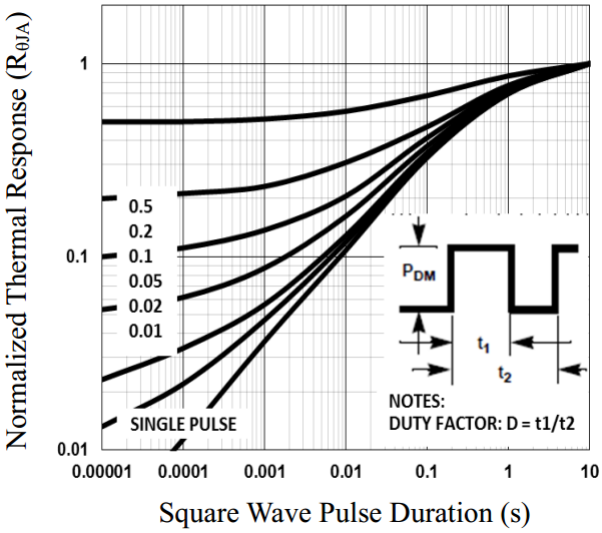


Fig.5 Normalized Transient Impedance

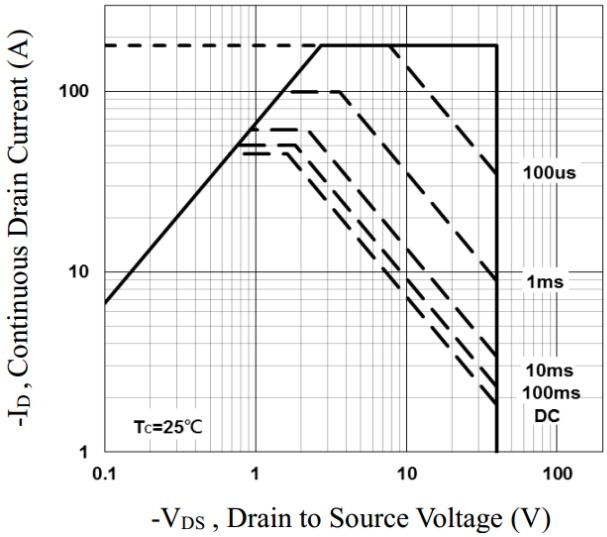


Fig.6 Maximum Safe Operation Area

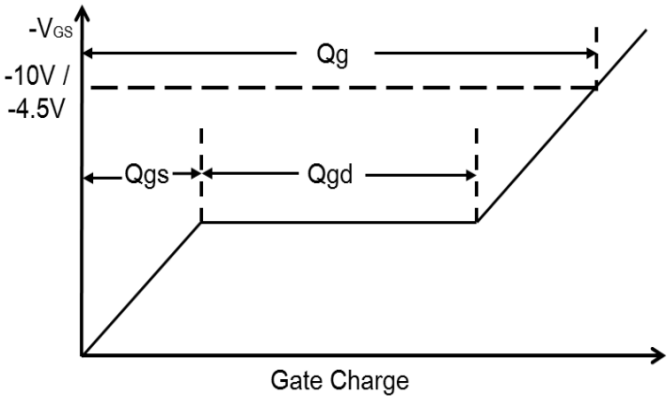


Fig.7 Switching Time Waveform

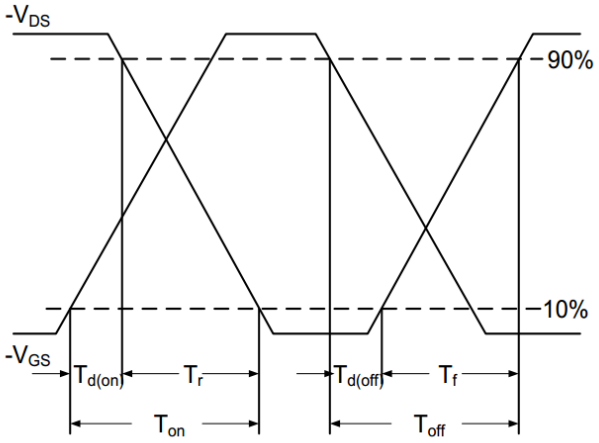
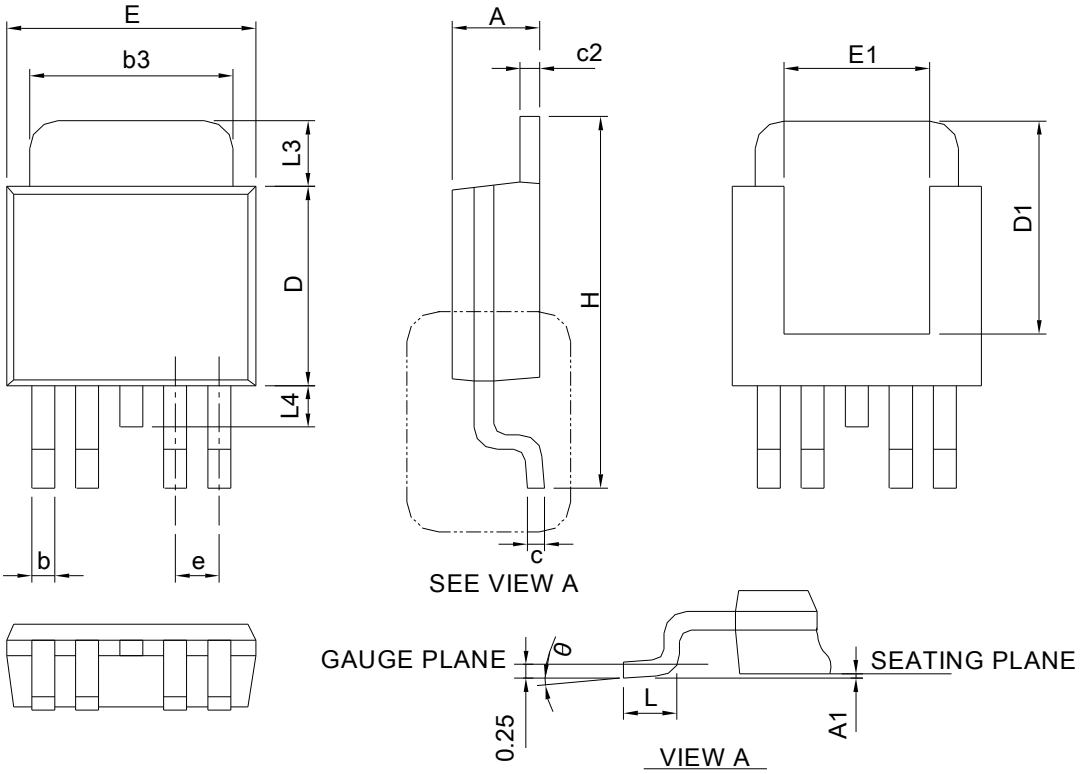


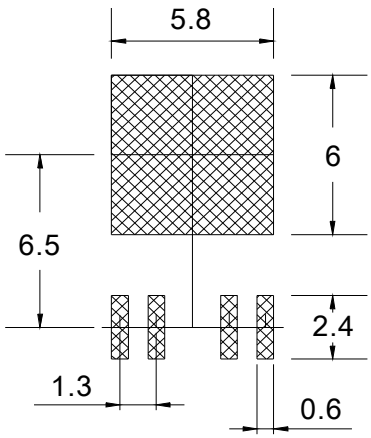
Fig.8 Gate Charge Waveform

Package Mechanical Data:TO-252-4L



SYMBOL	TO-252-4			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1	-	0.2	-	0.008
b	0.50	0.71	0.020	0.028
b3	4.32	5.46	0.170	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.236
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.236
e	1.30 BSC		0.051 BSC	
H	9.40	10.41	0.370	0.410
L	1.40	1.78	0.055	0.070
L3	0.89	2.03	0.035	0.080
L4	-	1.02	-	0.040
θ	0°	8°	0°	8°

RECOMMENDED LAND PATTERN



UNIT: mm