TM05G03HMI6

N+P-Channel Enhancement Mode Mosfet

General Description

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

Applications

• Load switch
• PWM

Product Summary

N Channel
V_{DS} = 30V, I_D =4.0A
$R_{DS(ON)}$=29mΩ(typ.)@ V_{GS}=10V
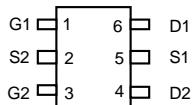
P Channel
V_{DS} = -30V, I_D = -4.0A
$R_{DS(ON)}$=53mΩ(typ.)@ V_{GS}=-10V

100% UIS Tested
100% R_g Tested

Green Product

Top View

G1 1 6 D1
S2 2 5 S1
G2 3 4 D2
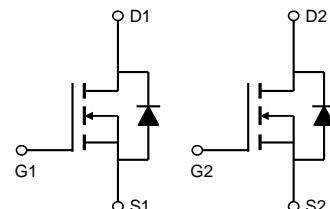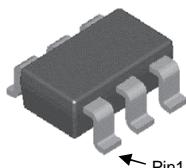
Marking:4G03

MI6:SOT-23-6L

Pin1

Absolute Maximum Ratings (T$_A$=25℃ unless otherwise noted)

Symbol	Parameter	Rating		Units
		N-Channel	P-Channel	
V_{DS}	Drain-Source Voltage	30	-30	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D@T$_C$=25℃	Continuous Drain Current, V_{GS} @ 10V[1]	4	-4.0	A
I_D@T$_C$=100℃	Continuous Drain Current, V_{GS} @ 10V[1]	2	-2.5	A
I_{DM}	Pulsed Drain Current[2]	20	-22	A
EAS	Single Pulse Avalanche Energy[3]	72	79	mJ
I_{AS}	Avalanche Current	21	-21	A
P_D@T$_C$=25℃	Total Power Dissipation[4]	1.5	2.08	W
T$_{STG}$	Storage Temperature Range	-55 to 150	-55 to 150	℃
T$_J$	Operating Junction Temperature Range	-55 to 150	-55 to 150	℃

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R$_{θJA}$	Thermal Resistance Junction-Ambient [1]	---	85	℃/W
R$_{θJC}$	Thermal Resistance Junction-Case[1]	---	50	℃/W

N-Channel Electrical Characteristics (T_J=25 ℃, unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=250µA	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=30V, V_{GS}=0V,	-	-	1.0	µA
I_{GSS}	Gate to Body Leakage Current	V_{DS}=0V, V_{GS}= ±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250µA	1.0	1.5	2.5	V
$R_{DS(on)}$ note2	Static Drain-Source on-Resistance	V_{GS}=10V, I_D=4A	-	29	38	mΩ
		V_{GS}=4.5V, I_D=3A	-	45	65	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}=15V, V_{GS}=0V, f=1.0MHz	-	233	-	pF
C_{oss}	Output Capacitance		-	44	-	pF
C_{rss}	Reverse Transfer Capacitance		-	33	-	pF
Q_g	Total Gate Charge	V_{DS}=15V, I_D=2A, V_{GS}=10V	-	3	-	nC
Q_{gs}	Gate-Source Charge		-	0.5	-	nC
Q_{gd}	Gate-Drain("Miller") Charge		-	0.8	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DS}=15V, I_D=4A, R_{GEN}=3Ω, V_{GS}=10V	-	4	-	ns
t_r	Turn-on Rise Time		-	2.1	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	15	-	ns
t_f	Turn-off Fall Time		-	3.2	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	4.0	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	16	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS}=0V, I_S=4A	-	-	1.2	V

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. Pulse Test: Pulse Width≤300µs, Duty Cycle≤0.5%

P-Channel Electrical Characteristics (T$_J$=25 ℃, unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
V$_{(BR)DSS}$	Drain-Source Breakdown Voltage	V$_{GS}$=0V, I$_D$= -250μA	-30	-	-	V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$= -20V, V$_{GS}$=0V,	-	-	-1	μA
I$_{GSS}$	Gate to Body Leakage Current	V$_{DS}$=0V, V$_{GS}$= ±12V	-	-	±100	nA
On Characteristics						
V$_{GS(th)}$	Gate Threshold Voltage	V$_{DS}$=V$_{GS}$, I$_D$= -250μA	-1.0	-1.5	-2.5	V
R$_{DS(on)}$	Static Drain-Source on-Resistance note2	V$_{GS}$= -4.5V, I$_D$= -3A	-	53	65	mΩ
		V$_{GS}$= -2.5V, I$_D$= -2A	-	75	93	
Dynamic Characteristics						
C$_{iss}$	Input Capacitance	V$_{DS}$= -10V, V$_{GS}$=0V, f=1.0MHz	-	393	-	pF
C$_{oss}$	Output Capacitance		-	47	-	pF
C$_{rss}$	Reverse Transfer Capacitance		-	38	-	pF
Q$_g$	Total Gate Charge	V$_{DS}$= -10V, I$_D$= -2A, V$_{GS}$= -4.5V	-	7.1	-	nC
Q$_{gs}$	Gate-Source Charge		-	1.2	-	nC
Q$_{gd}$	Gate-Drain("Miller") Charge		-	1.5	-	nC
Switching Characteristics						
t$_{d(on)}$	Turn-on Delay Time	V$_{DD}$= -10V, I$_D$= -3A, R$_G$=1Ω, V$_{GEN}$= -4.5V, R$_L$=1.2Ω	-	9	-	ns
t$_r$	Turn-on Rise Time		-	2.88	-	ns
t$_{d(off)}$	Turn-off Delay Time		-	22.3	-	ns
t$_f$	Turn-off Fall Time		-	3.9	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I$_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	-4	A
I$_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-12	A
V$_{SD}$	Drain to Source Diode Forward Voltage	V$_{GS}$=0V, I$_S$= -3A	-	-	-1.2	V

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

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

N-Channel Typical Characteristics

Figure1: Output Characteristics

**Figure 2:** Typical Transfer Characteristics

**Figure 3:** On-resistance vs. Drain Current
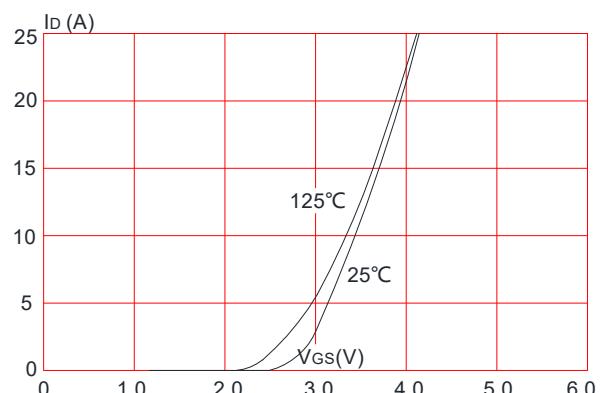
Figure 4: Body Diode Characteristics

**Figure 5:** Gate Charge Characteristics
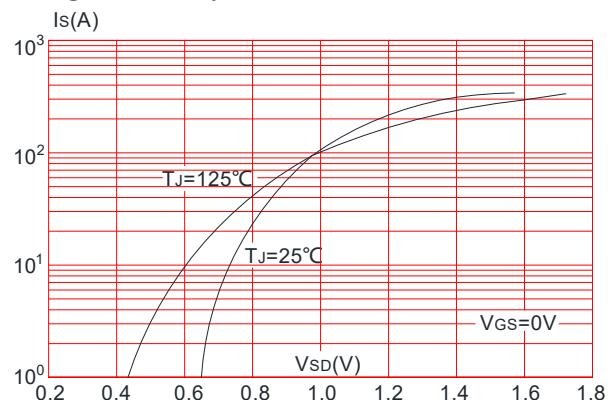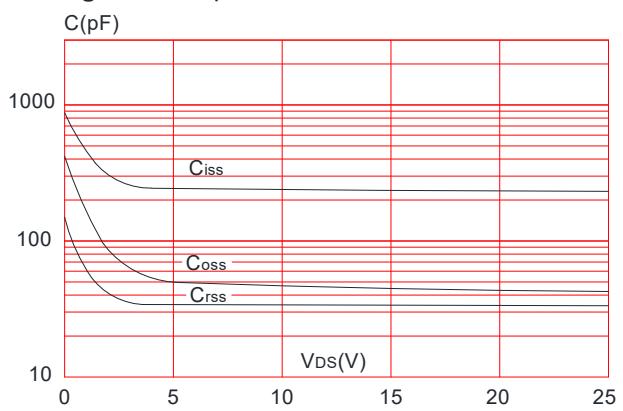
Figure 6: Capacitance Characteristics

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature
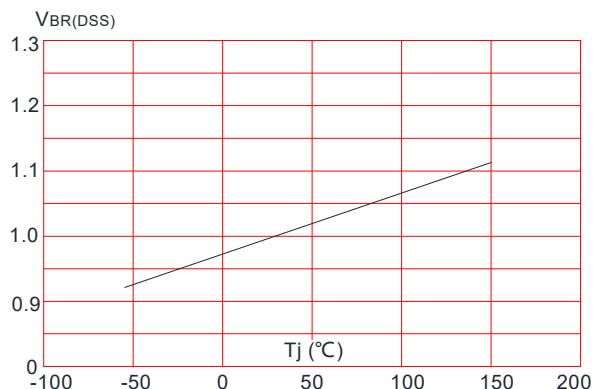
Figure 8: Normalized on Resistance vs. Junction Temperature
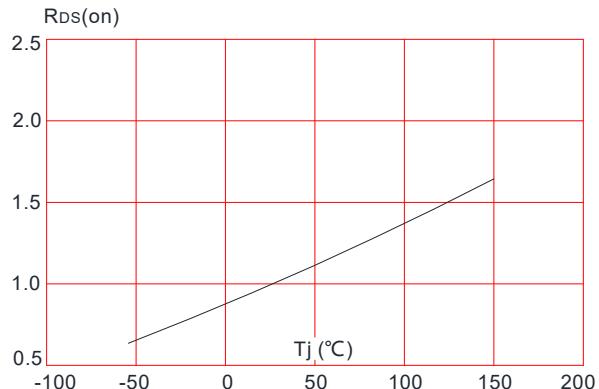
Figure 9: Maximum Safe Operating Area
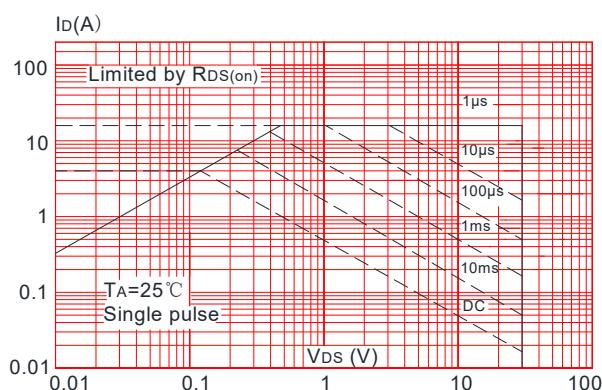
Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature
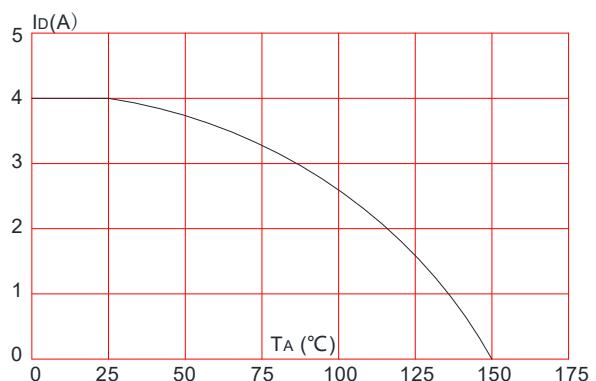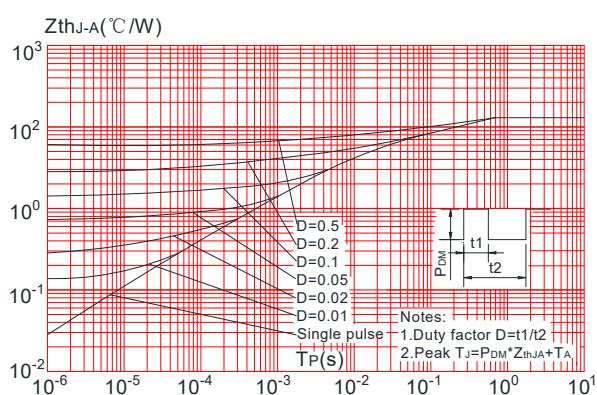
Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

Notes:
1. Duty factor $D=t1/t2$
2. Peak $T_J = P_{DM} * Z_{thJA} + T_A$

https://www.tmc.com.tw

P-Typical Characteristics

Fig 1: Output Characteristics

Fig 2: Transfer Characteristics

Fig 3: Rds(on) vs Drain Current and Gate Voltage
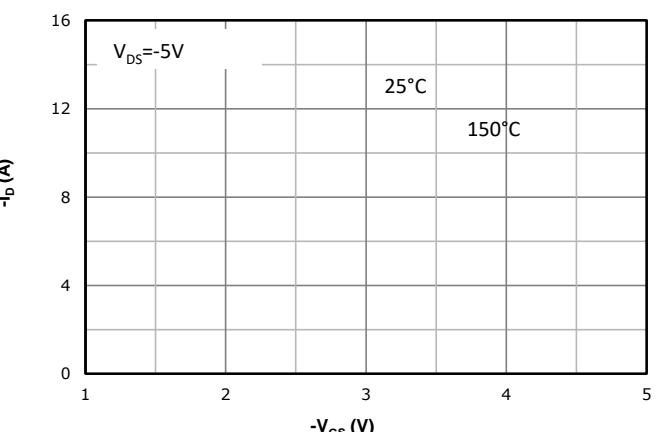
Fig 4: Rds(on) vs Gate Voltage

Fig 5: Rds(on) vs. Temperature
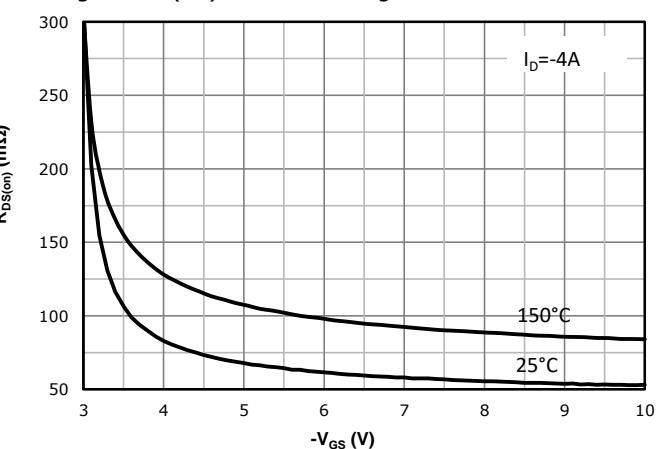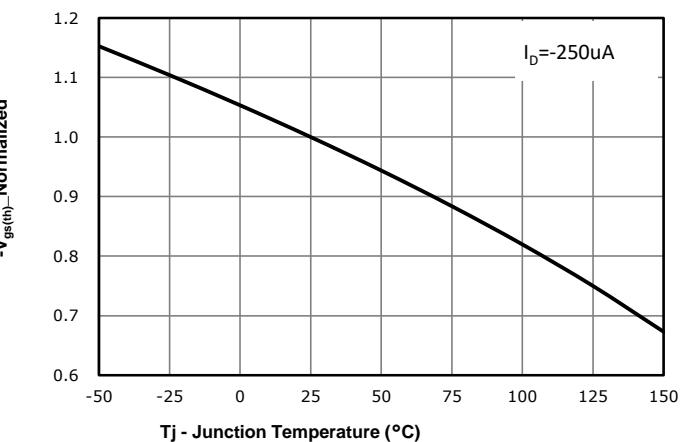
Fig 6: Vgs(th) vs. Temperature

Fig 7: BVdss vs. Temperature

I_D=-250uA

-BVdss_Normalized

Tj - Junction Temperature (°C)
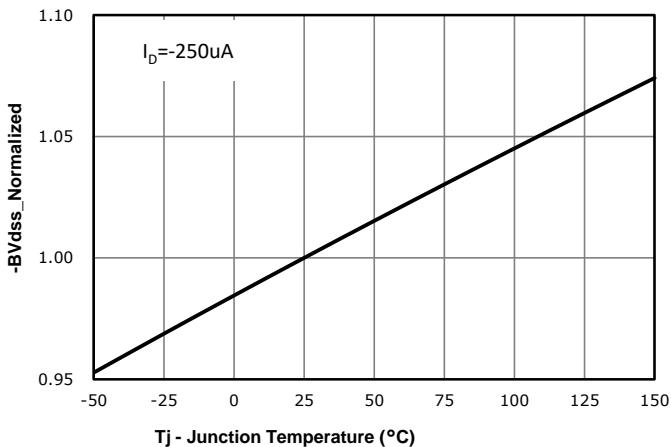
Fig 8: Body-diode Forward Characteristics

$-I_S$ - Diode Current(A)

150°C

25°C

$-V_{SD}$ - Diode Forward Voltage(V)
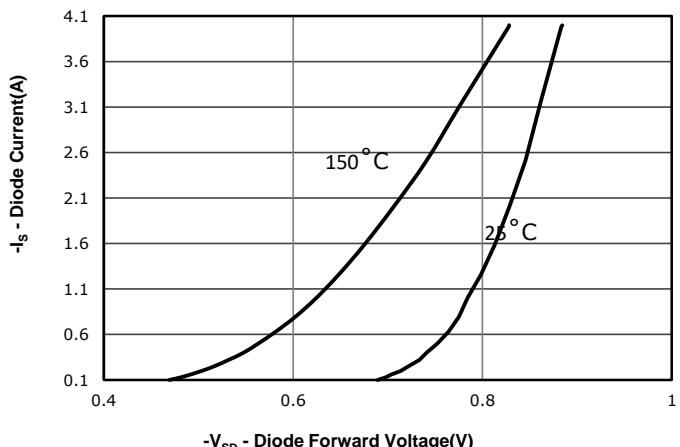
Fig 9: Gate Charge Characteristics

$-V_{GS}$ (V)

V_{DS}=-15V
I_D=-4A

Qg (nC)

Fig 10: Capacitance Characteristics

C - Capacitance (PF)

Ciss

Coss

Crss

V_{GS}=0V
f=1MHz

$-V_{DS}$ (V)
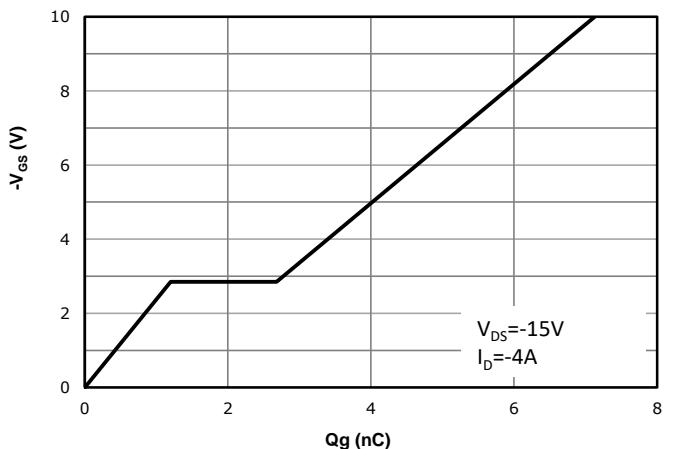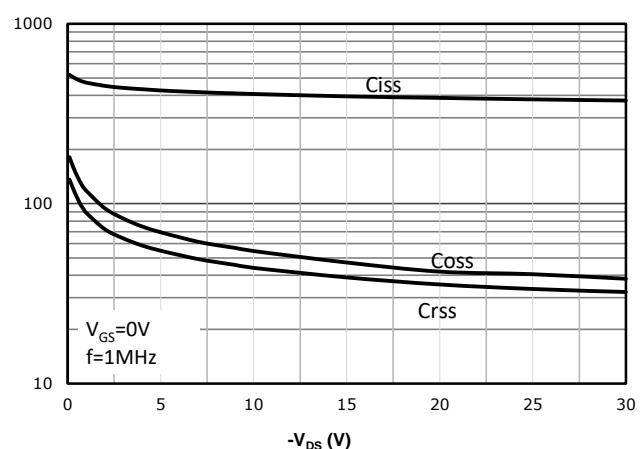
Fig 11: Drain Current Derating

$-I_D$ (A)

Tc - Case Temperature (°C)
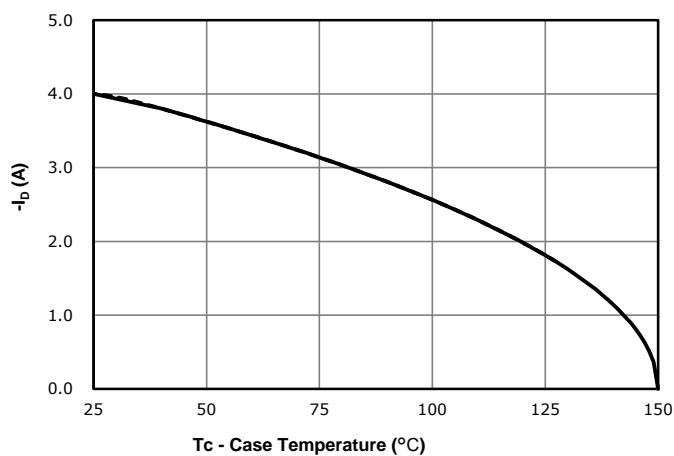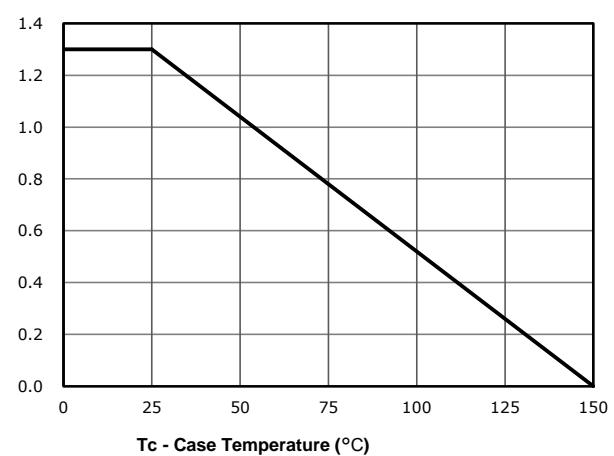
Fig 12: Power Dissipation

P_{tot} (W)

Tc - Case Temperature (°C)

Fig 13: Safe Operating Area
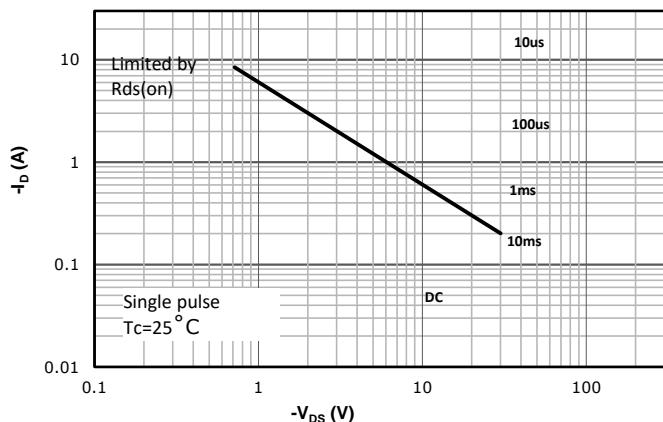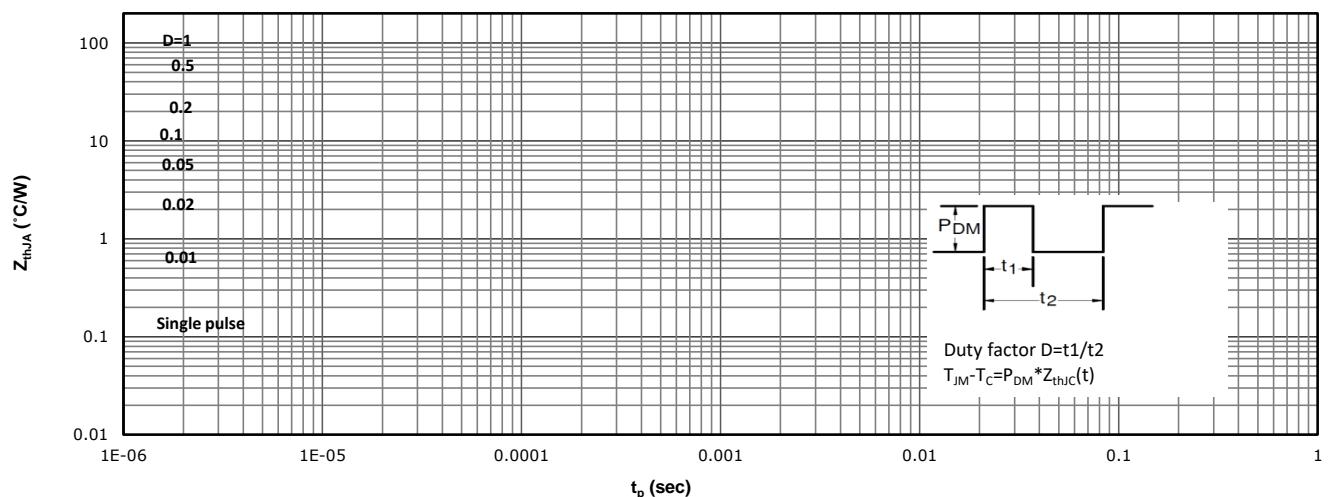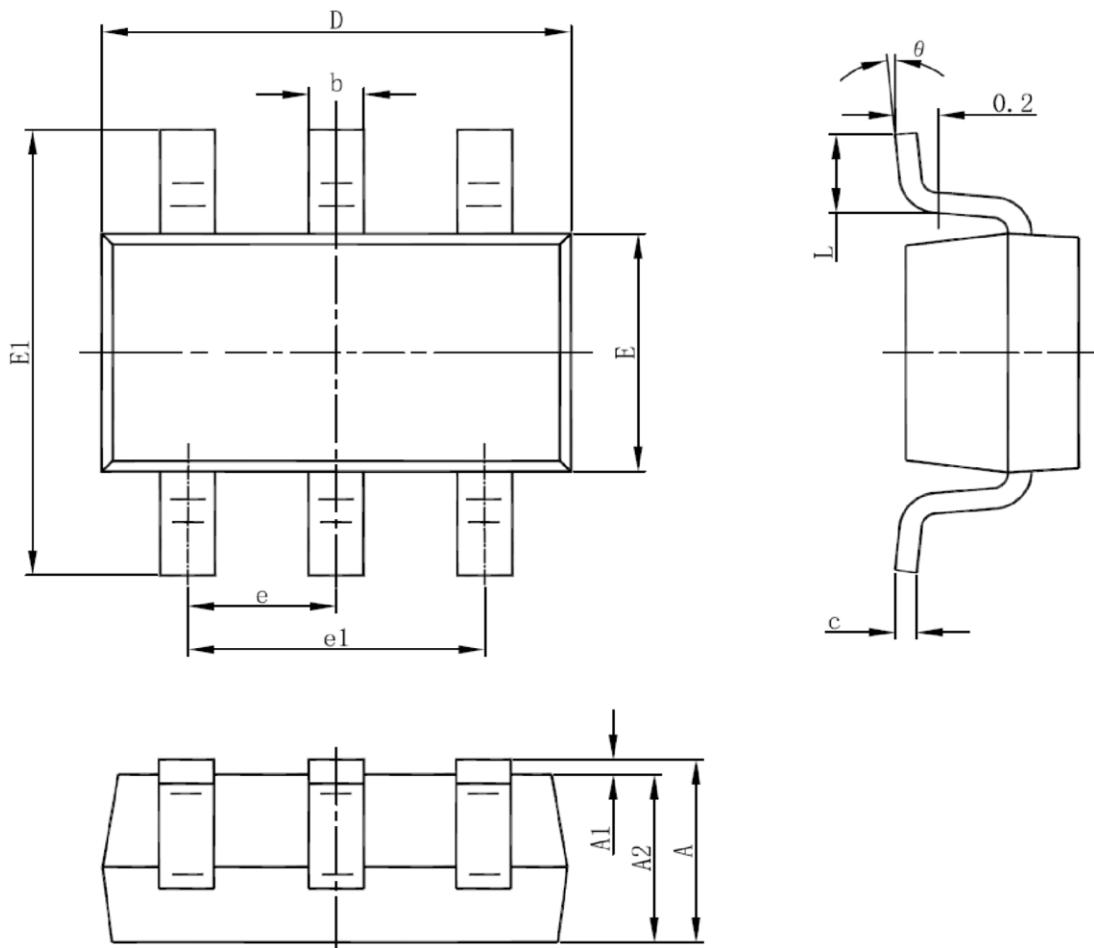
Fig 14: Max. Transient Thermal Impedance

$$Duty\ factor\ D=t1/t2$$
$$T_{JM}-T_C=P_{DM}*Z_{thJC}(t)$$

Package Mechanical Data：SOT-23-6L

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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