

Description:

This N+P Channel MOSFET uses advanced trench technology and design to provide excellent $R_{DS(on)}$ with low gate charge.

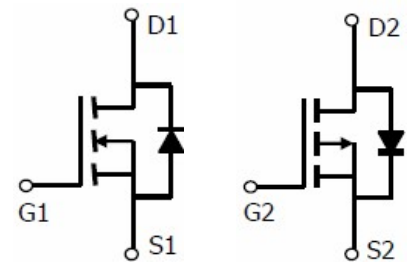
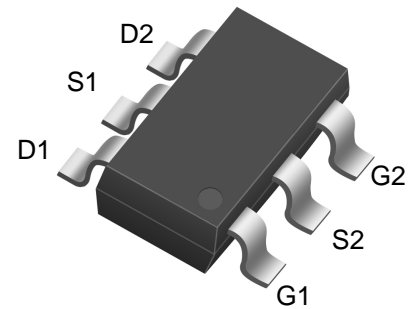
It can be used in a wide variety of applications.

Features:

N-Channel: $V_{DS}=20V, I_D=4A, R_{DS(on)} < 26m\Omega @ V_{GS}=4.5V$ (Typ: $21m\Omega$)

P-Channel: $V_{DS}=-20V, I_D=-3.2A, R_{DS(on)} < 35m\Omega @ V_{GS}=-4.5V$ (Typ: $27m\Omega$)

- 1) Low gate charge.
- 2) Green device available.
- 3) Advanced high cell density trench technology for ultra low $R_{DS(on)}$.
- 4) Excellent package for good heat dissipation.
- 5) MSL3



Package Marking and Ordering Information:

Part NO.	Marking	Package	Packing
DO2003B	2003B	SOT-23-6D	3000pcs/Reel

Absolute Maximum Ratings: ($T_A=25^\circ C$ unless otherwise noted)

Symbol	Parameter	N-Channel	P-Channel	Units
V_{DS}	Drain-Source Voltage	20	-20	V
V_{GS}	Gate-Source Voltage	± 12	± 12	V
I_D	Continuous Drain Current- $T_A=25^\circ C^1$	4	-3.2	A
	Continuous Drain Current- $T_A=100^\circ C^1$	2.8	-2.2	
I_{DM}	Pulsed Drain Current ²	16	-12.8	A
P_D	Power Dissipation	0.7	1.56	W
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150		$^\circ C$

Thermal Characteristics:

Symbol	Parameter	N-CH	P-CH	Units
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	179	80	$^\circ C/W$

N-Channel Electrical Characteristics: ($T_A=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\ \mu\text{A}$	20	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS}=0V, V_{DS}=20V$	---	---	1	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 12V, V_{DS}=0A$	---	---	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\ \mu\text{A}$	0.4	0.6	1	V
$R_{DS(on)}$	Drain-Source On Resistance ³	$V_{GS}=4.5V, I_D=4A$	---	21	26	$\text{m}\Omega$
		$V_{GS}=2.5V, I_D=3A$	---	29	40	$\text{m}\Omega$
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS}=10V, V_{GS}=0V, f=1\text{MHz}$	---	300	---	pF
C_{oss}	Output Capacitance		---	111	---	
C_{rss}	Reverse Transfer Capacitance		---	61	---	
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DS}=10V, I_D=4A,$ $R_{ENG}=3\ \Omega, V_{GS}=4.5V$	---	13	---	ns
t_r	Rise Time		---	57	---	ns
$t_{d(off)}$	Turn-Off Delay Time		---	18	---	ns
t_f	Fall Time		---	10	---	ns
Q_g	Total Gate Charge	$V_{GS}=4.5V, V_{DS}=10V,$ $I_D=4A$	---	4	---	nC
Q_{gs}	Gate-Source Charge		---	0.9	---	nC
Q_{gd}	Gate-Drain "Miller" Charge		---	1.4	---	nC
Drain-Source Diode Characteristics						
V_{SD}	Diode Forward Voltage	$V_{GS}=0V, I_{SD}=4A$	---	---	1.2	V
I_S	Continuous Drain Current	$V_D=V_G=0V$	---	---	4	A
I_{SM}	Pulsed Drain Current		---	---	16	A

Notes:

1. Computed continuous current assumes the condition of $T_{j,Max}$ while the actual continuous current depends on the thermal & electro-mechanical application board design
2. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 0.5\%$

N-Typical Characteristics: ($T_A=25^\circ C$ unless otherwise noted)

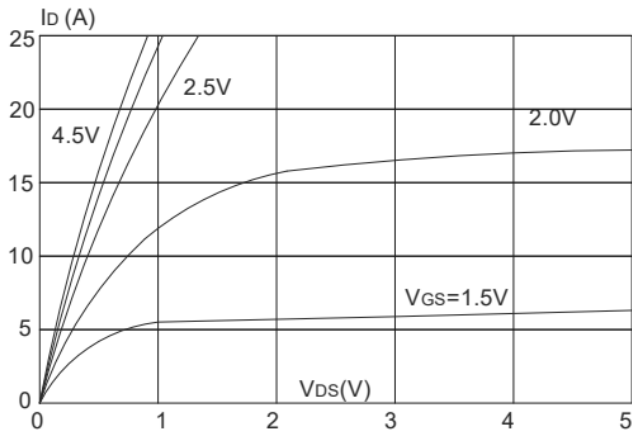


Figure 1: Output Characteristics

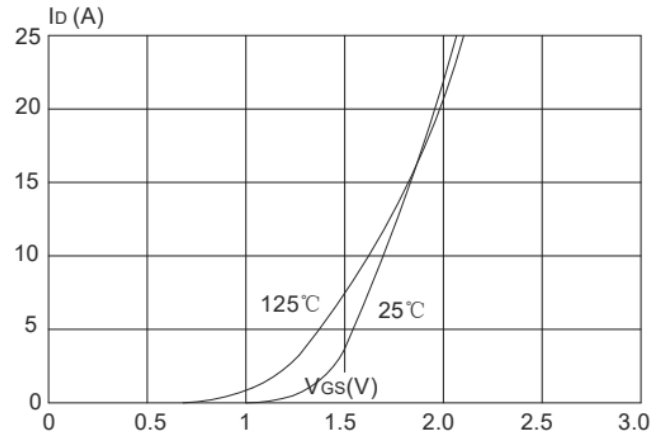


Figure 2: Typical Transfer Characteristics

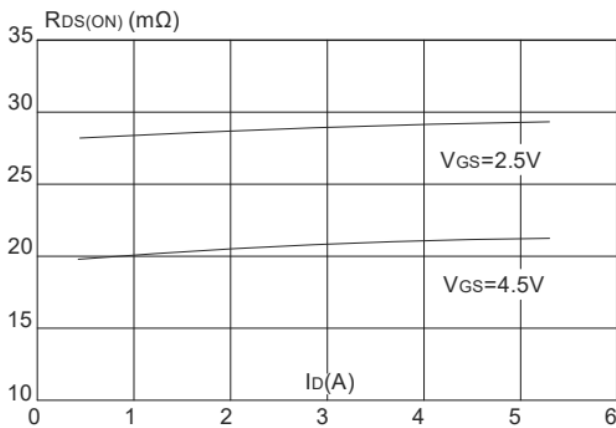


Figure 3: On-resistance vs. Drain Current

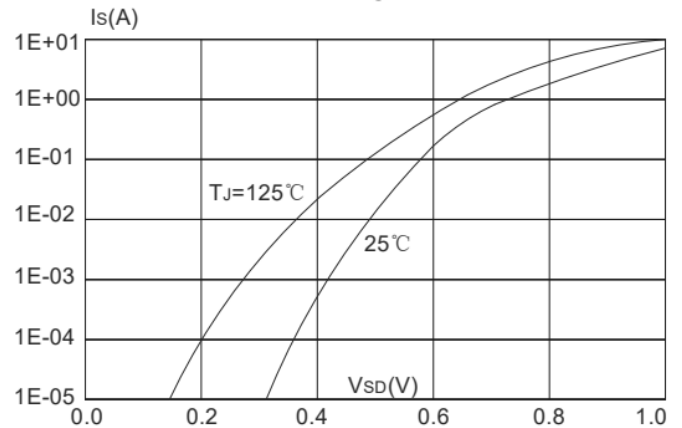


Figure 4: Body Diode Characteristics

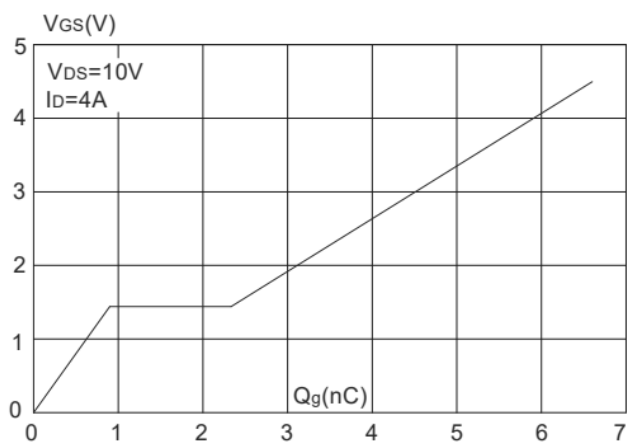


Figure 5: Gate Charge Characteristics

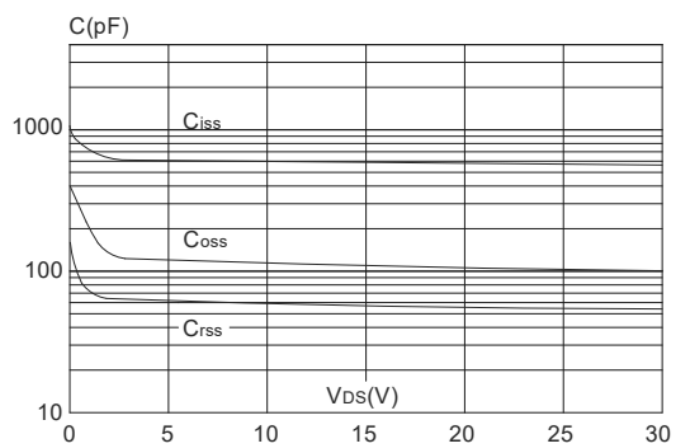


Figure 6: Capacitance Characteristics

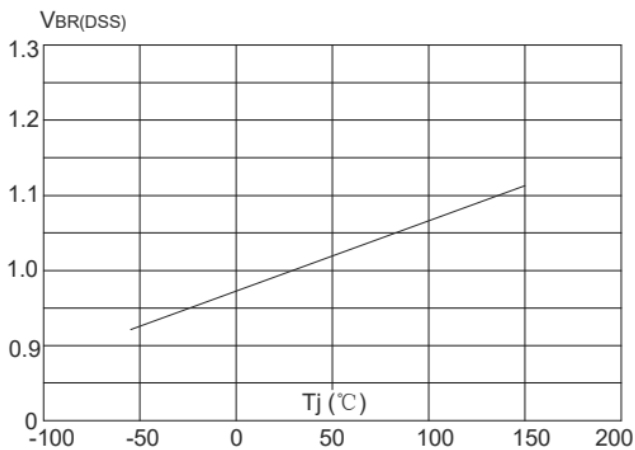


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

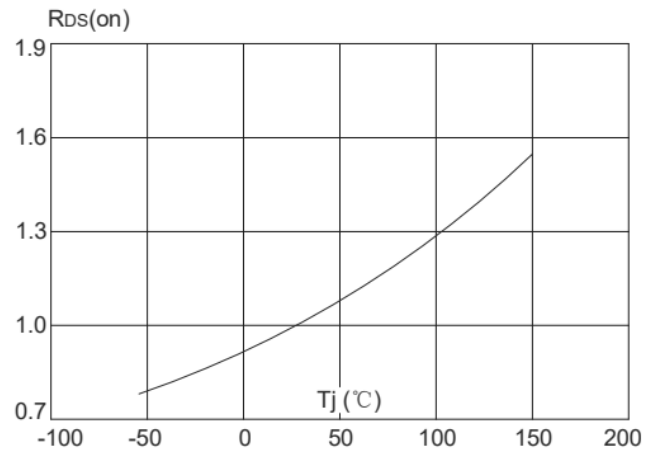


Figure 8: Normalized on Resistance vs. Junction Temperature

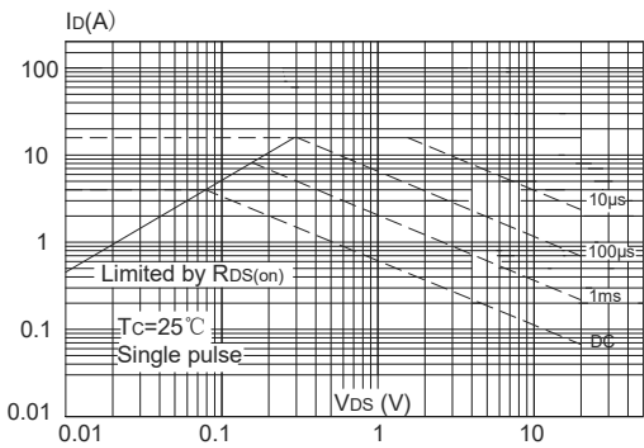


Figure 9: Maximum Safe Operating Area

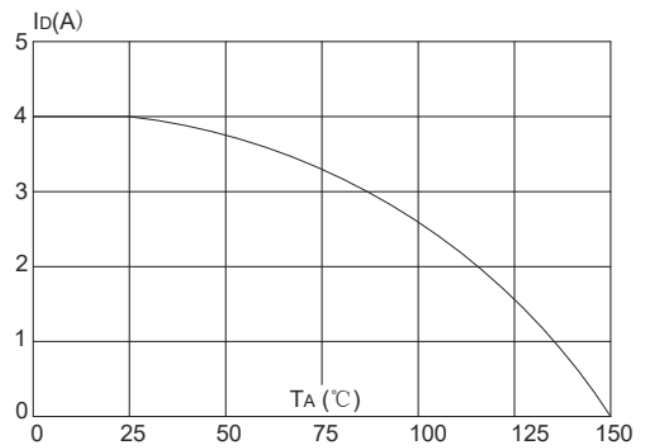


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

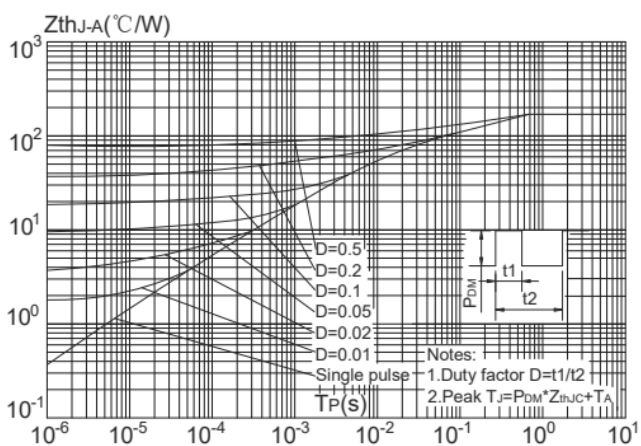


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

P-Channel Electrical Characteristics: ($T_A=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\ \mu\text{A}$	-20	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS}=0V, V_{DS}=-20V$	---	---	-1	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 12V, V_{DS}=0A$	---	---	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\ \mu\text{A}$	-0.4	-0.6	-1	V
$R_{DS(on)}$	Drain-Source On Resistance ³	$V_{GS}=-4.5V, I_D=-3A$	---	27	35	$\text{m}\Omega$
		$V_{GS}=-2.5V, I_D=-2A$	---	38	50	
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS}=-10V, V_{GS}=0V, f=1\text{MHz}$	---	514	---	pF
C_{oss}	Output Capacitance		---	54	---	
C_{rss}	Reverse Transfer Capacitance		---	19	---	
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=-10V, I_D=-1A$ $V_{GS}=-4.5V, R_{GEN}=25\ \Omega$	---	4	---	ns
t_r	Rise Time		---	17.3	---	ns
$t_{d(off)}$	Turn-Off Delay Time		---	40.6	---	ns
t_f	Fall Time		---	11.3	---	ns
Q_g	Total Gate Charge		---	6.3	---	nC
Q_{gs}	Gate-Source Charge	$V_{GS}=-4.5V, V_{DS}=-10V,$	---	0.8	---	nC
Q_{gd}	Gate-Drain "Miller" Charge	$I_D=-3A$	---	1.5	---	nC
Drain-Source Diode Characteristics						
I_S	Continuous Drain to Source Diode	$V_D=V_G=0V$	---	---	-3.2	A
I_{SM}	Pulsed Drain to Source Diode		---	---	-12.8	---
V_{SD}	Source-Drain Diode Forward Voltage	$V_{GS}=0V, I_S=-1A$	---	---	-1	V

Notes:

1. Computed continuous current assumes the condition of $T_{j,Max}$ while the actual continuous current depends on the thermal & electro-mechanical application board design
2. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 0.5\%$

P-Typical Characteristics: ($T_A=25^\circ C$ unless otherwise noted)

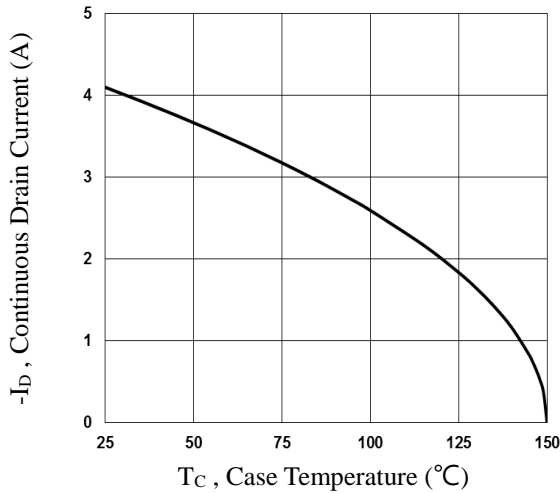


Fig.1 Continuous Drain Current vs. T_c

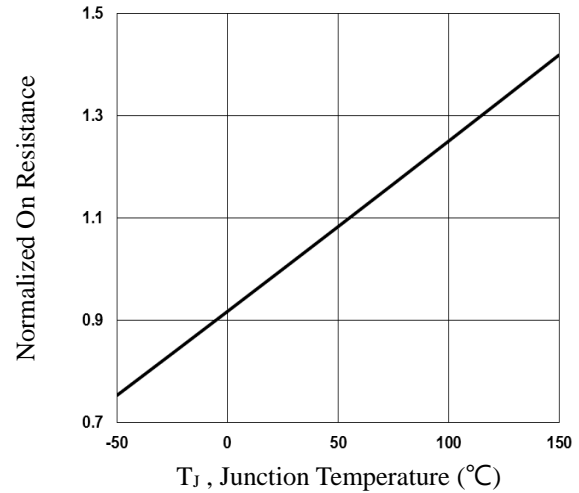


Fig.2 Normalized $R_{DS(on)}$ vs. T_j

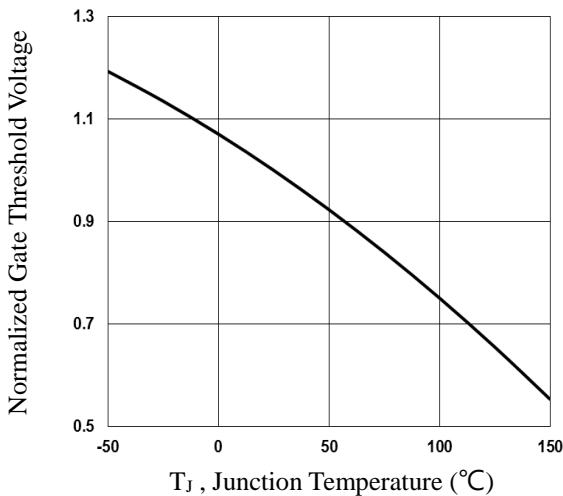


Fig.3 Normalized V_{th} vs. T_j

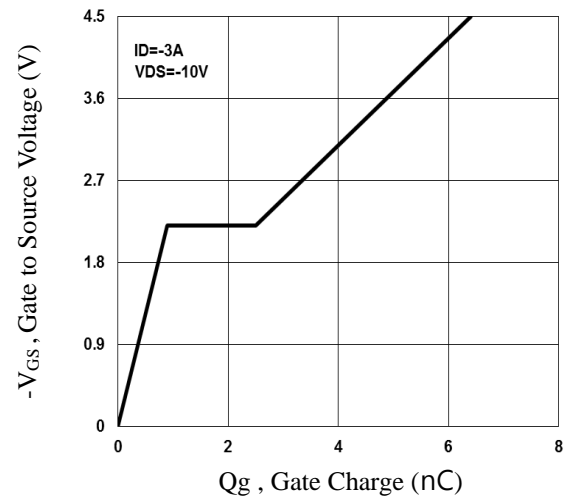


Fig.4 Gate Charge Waveform

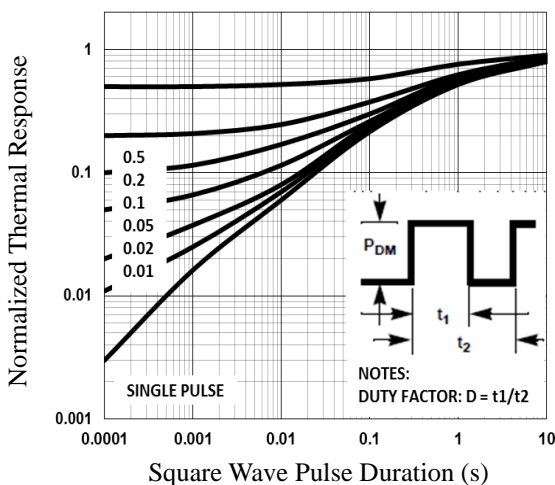


Fig.5 Normalized Transient Impedance

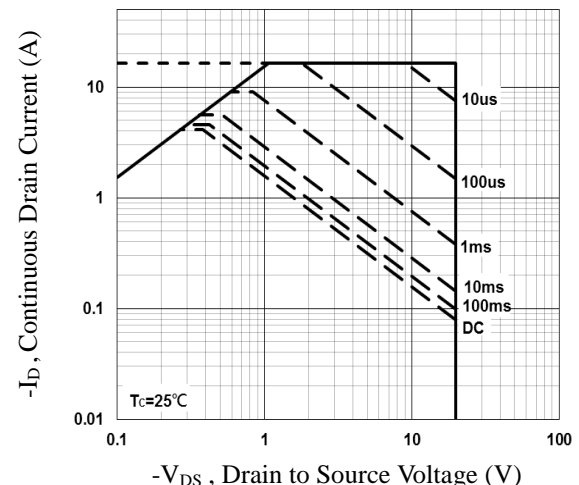


Fig.6 Maximum Safe Operation Area

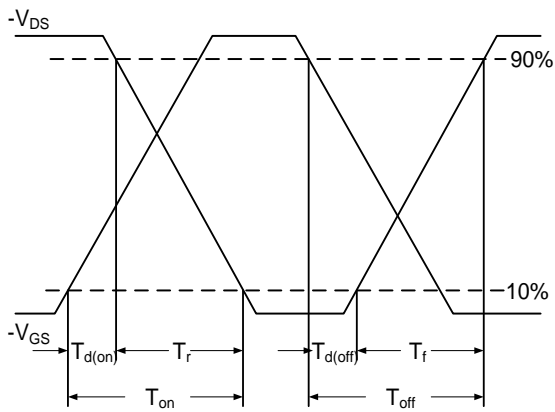


Fig.7 Switching Time Waveform

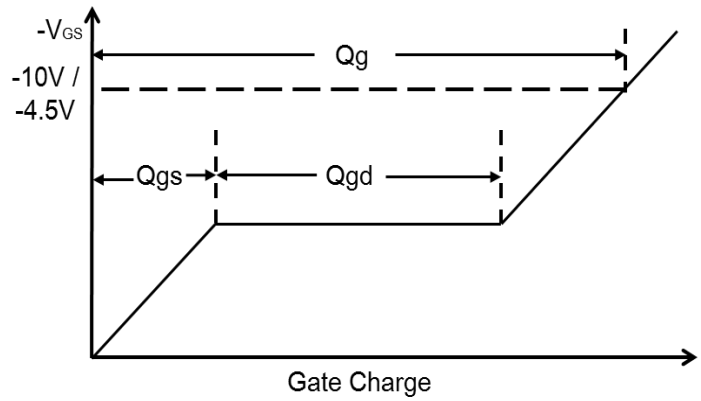
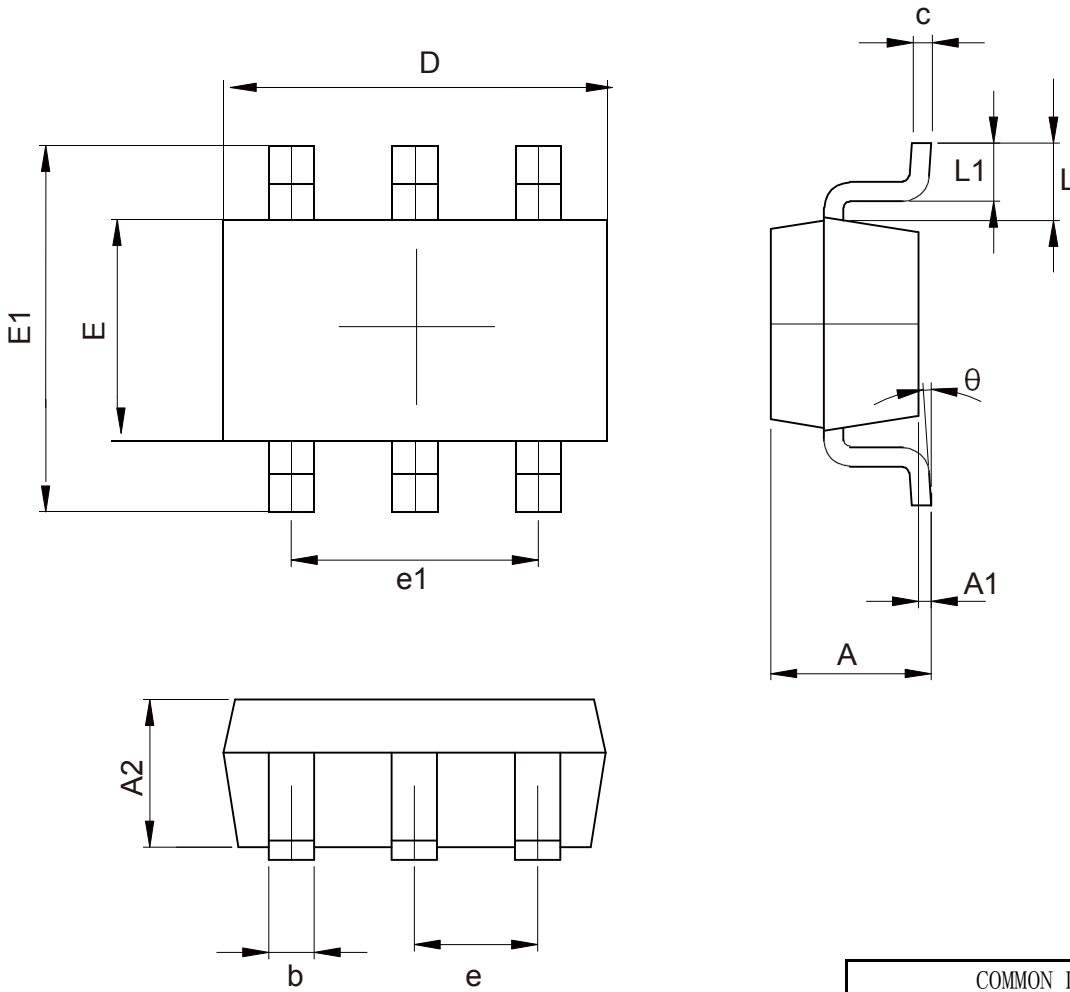


Fig.8 Gate Charge Waveform

SOT-23-6D Package Outline Data

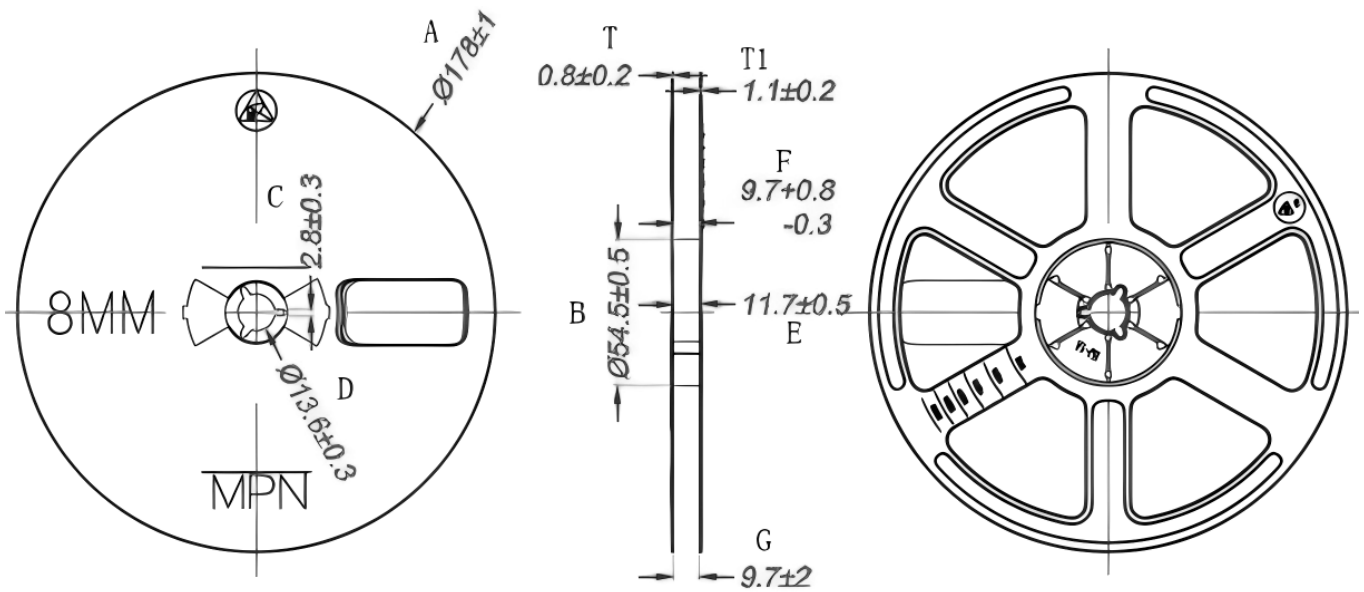


COMMON DIMENSIONS			
CUNITS MEASURE=MILLIMETER			
SYMBOL	MIN	NOM	MAX
A	1.050	---	1.300
A1	0.000	---	0.200
A2	1.050	---	1.200
b	0.300	0.400	0.500
c	0.100	---	0.200
D	2.820	2.900	3.020
E	1.500	1.600	1.700
E1	2.650	2.800	2.950
e	0.950TYP		
e1	1.800	1.900	2.000
L	0.6REF		
L1	0.300	0.450	0.600
θ	0°	--	8°

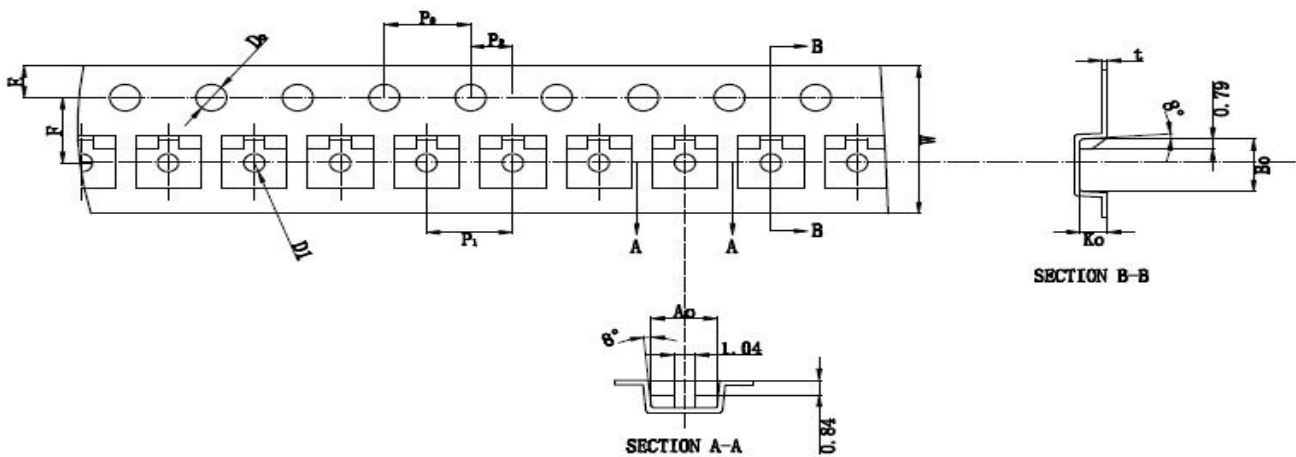
Unit:mm

Tape & Reel Information

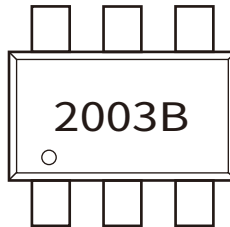
Dimensions in mm



PKG TYPE	W	P	E	F	D	D1	Po	Po10	P2	A0	B0	K0	T
SOT23-6	8.00	4.00	1.75	3.50	1.50	1.00	4.00	40.00	2.00	3.13	3.22	1.30	0.20
Tolerance	± 0.2	± 0.1	± 0.1	± 0.1	± 0.1	± 0.1	± 0.1	± 0.2	± 0.1	± 0.1	± 0.1	± 0.1	± 0.03



Marking Information:



Previous Version

Version	Date	Subjects (major changes since last revision)
1.0	2025-01-09	Release of final version

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