

Description:

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

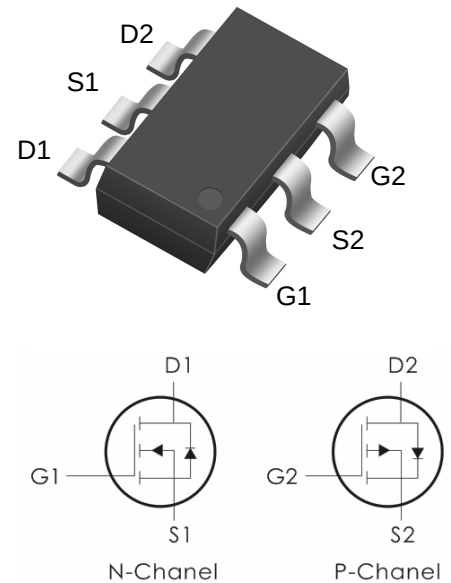
It can be used in a wide variety of applications.

Features:

N-Channel: $V_{DS}=20V, I_D=7A, R_{DS(on)} < 20m\Omega @ V_{GS}=4.5V$ (Type: $15m\Omega$)

P-Channel: $V_{DS}=-20V, I_D=-6A, R_{DS(on)} < 31m\Omega @ V_{GS}=-4.5V$ (Type: $26m\Omega$)

- 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
DO4604A	4604A	SOT-23-6	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	7	-6	A
	Continuous Drain Current- $T_A=100^\circ C$ ¹	4.9	-4.2	
I_{DM}	Pulsed Drain Current ²	28	-24	A
P_D	Power Dissipation - $T_A=25^\circ C$	1	1	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	125	125	$^\circ C/W$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Sourtce Breakdown Voltage	V _{GS} =0V, I _D =250 μ A	20	---	---	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{GS} =0V, V _{DS} =20V	---	---	1	μ A
I _{GSS}	Gate-Source Leakage Current	V _{GS} =± 12V, V _{DS} =0A	---	---	± 100	nA
On Characteristics						
V _{GS(th)}	Gate-Source Threshold Voltage	V _{GS} =V _{DS} , I _D =250 μ A	0.5	0.7	1	V
R _{DS(ON)}	Drain-Source On Resistance ³	V _{GS} =4.5V, I _D =4A	---	15	20	m Ω
		V _{GS} =2.5V, I _D =3A	---	18	23	m Ω
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =10V, V _{GS} =0V, f=1MHz	---	515	---	pF
C _{oss}	Output Capacitance		---	135	---	
C _{rss}	Reverse Transfer Capacitance		---	75	---	
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DS} =10V, I _D =3.5A, R _{ENG} =3 Ω ,V _{GS} =4.5V	---	9	---	ns
t _r	Rise Time		---	30	---	ns
t _{d(off)}	Turn-Off Delay Time		---	35	---	ns
t _f	Fall Time		---	10	---	ns
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =10V, I _D =3.5A	---	12	---	nC
Q _{gs}	Gate-Source Charge		---	2.3	---	nC
Q _{gd}	Gate-Drain “Miller” Charge		---	2.9	---	nC
Drain-Source Diode Characteristics						
V _{SD}	Diode Forward Voltage	V _{GS} =0V, I _{SD} =6.8A	---	---	1.2	V
I _S	Continuous Drain Curren	V _D =V _G =0V	---	---	7	A
I _{SM}	Pulsed Drain Current		---	---	28	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)

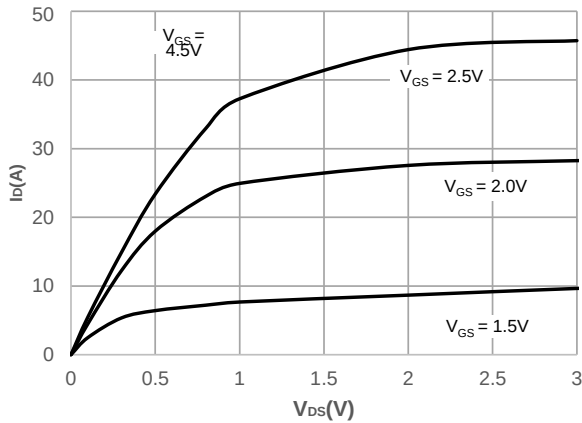


Figure 1: Output Characteristics

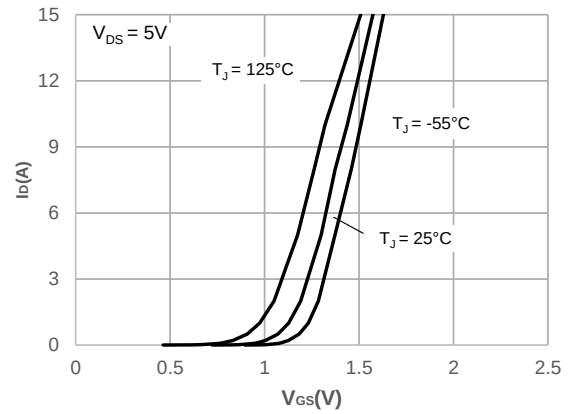


Figure 2: Typical Transfer Characteristics

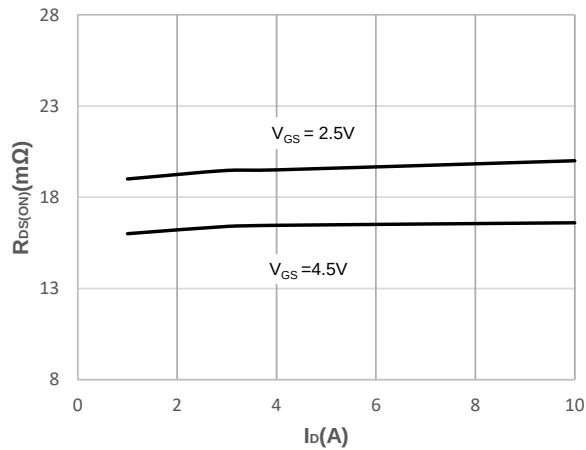


Figure 3: On-resistance vs. Drain Current

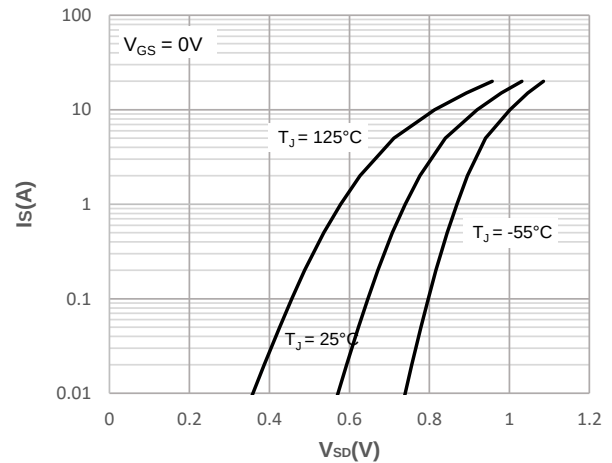


Figure 4: Body Diode Characteristics

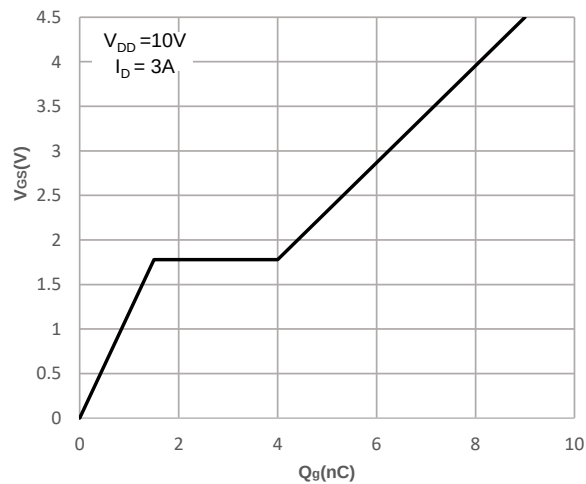


Figure 5: Gate Charge Characteristics

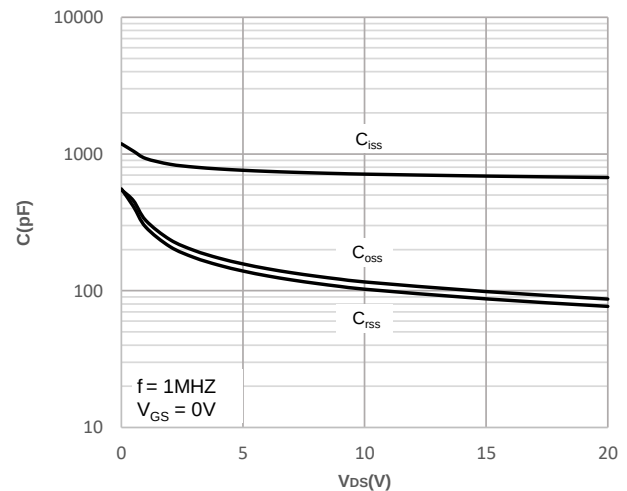


Figure 6: Capacitance Characteristics

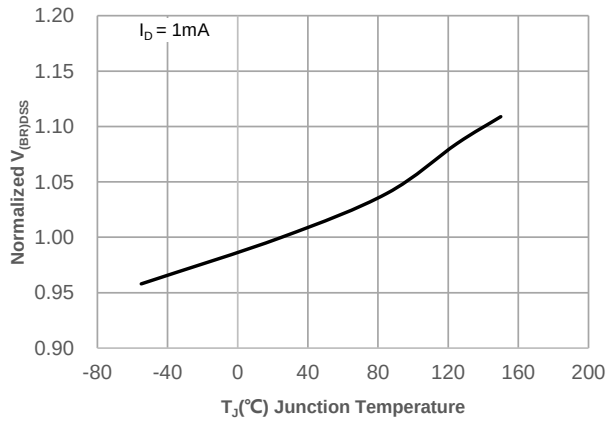


Figure 7: Normalized Breakdown voltage vs. Junction Temperature

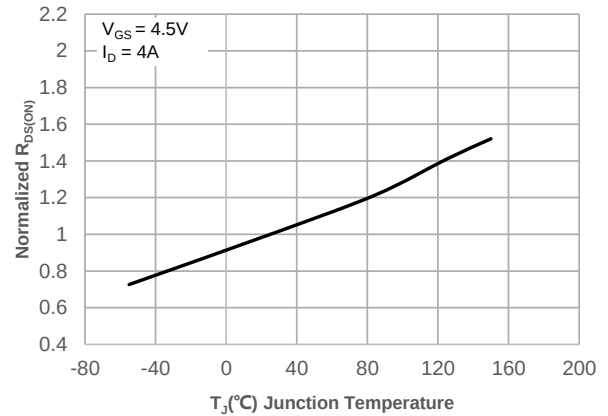


Figure 8: Normalized on Resistance vs. Junction Temperature

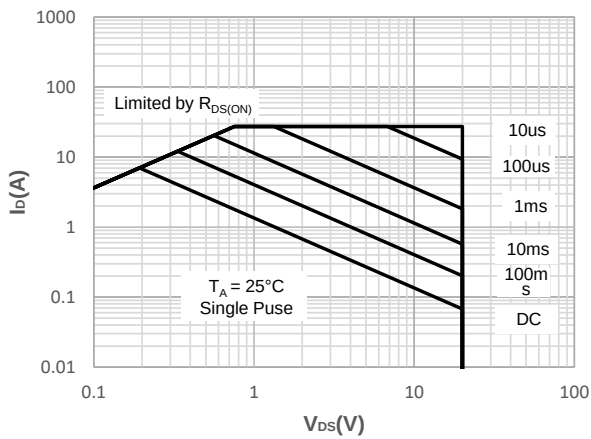


Figure 9: Maximum Safe Operating Area

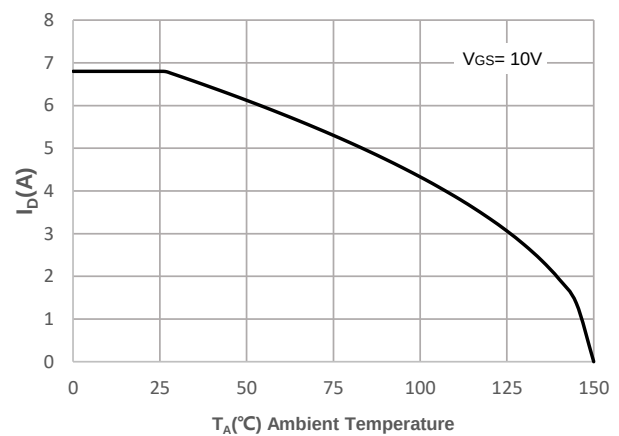


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

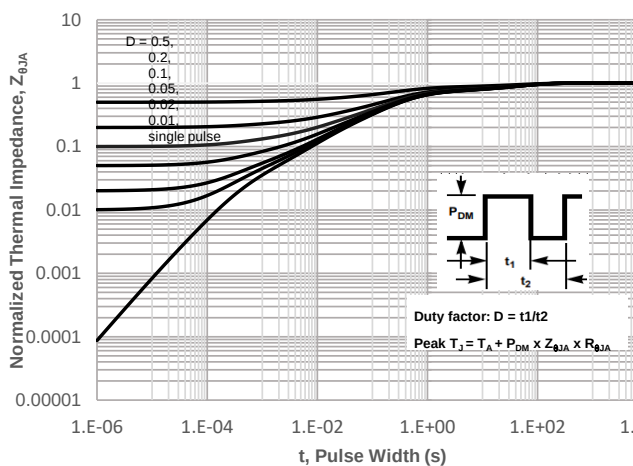


Figure 11: Normalized Maximum Transient Thermal Impedance

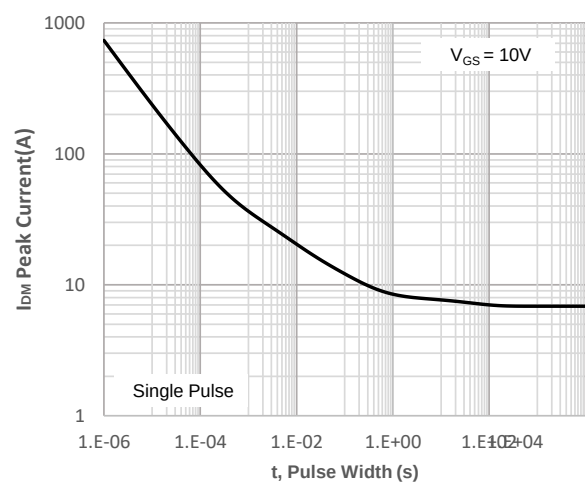


Figure 12: Peak Current Capacity

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-Sourctce Breakdown Voltage	V _{GS} =0V, I _D =250 μ A	-20	---	---	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{GS} =0V, V _{DS} =-20V	---	---	-1	μ A
I _{GSS}	Gate-Source Leakage Current	V _{GS} =± 12V, V _{DS} =0A	---	---	± 100	nA
On Characteristics						
V _{GS(th)}	Gate-Source Threshold Voltage	V _{GS} =V _{DS} , I _D =250 μ A	-0.5	---	-1	V
R _{DS(ON)}	Drain-Source On Resistance ³	V _{GS} =-4.5V, I _b =-4.1A	---	26	31	m Ω
		V _{GS} =-2.5V, I _b =-3A	---	31	36	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =10V, V _{GS} =0V, f=1MHz	---	788.5	---	pF
C _{oss}	Output Capacitance		---	138	---	
C _{rss}	Reverse Transfer Capacitance		---	89	---	
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = -10V, I _D =-3.3A V _{GS} = -4.5V, R _{GEN} =1 Ω	---	10	---	ns
t _r	Rise Time		---	33	---	ns
t _{d(off)}	Turn-Off Delay Time		---	52	---	ns
t _f	Fall Time		---	53	---	ns
Q _g	Total Gate Charge	V _{GS} =-10V, V _{DS} =-4.5V, I _D =-2A	---	9.24	---	nC
Q _{gs}	Gate-Source Charge		---	1.4	---	nC
Q _{gd}	Gate-Drain “Miller” Charge		---	1.9	---	nC
Drain-Source Diode Characteristics						
I _S	Continuous Drain to Source Diode	V _D =V _G =0V	---	---	-6	A
I _{SM}	Pulsed Drain to Source Diode		---	---	-24	A
V _{SD}	Source-Drain Diode Forward Voltage	V _{GS} =0V, I _S =-4.1A	---	---	-1.2	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)

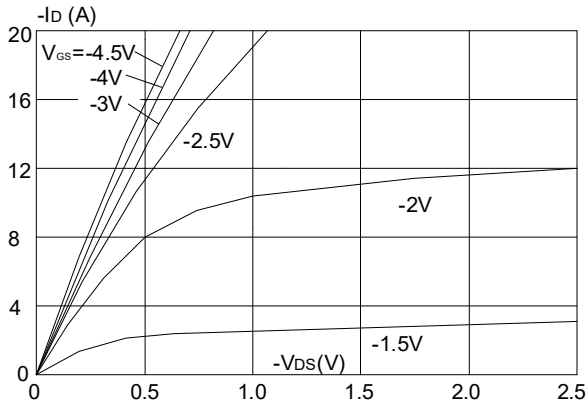


Figure1: Output Characteristics

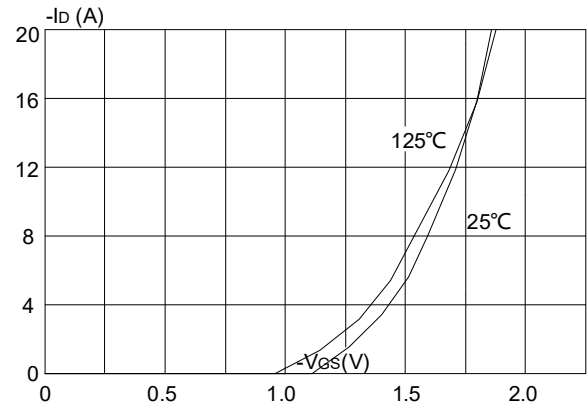


Figure 2: Typical Transfer Characteristics

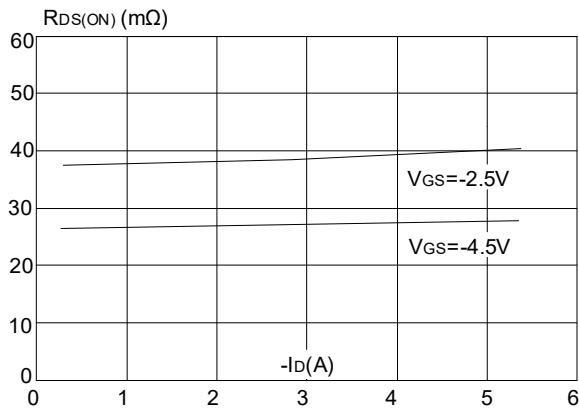


Figure 3: On-resistance vs. Drain Current

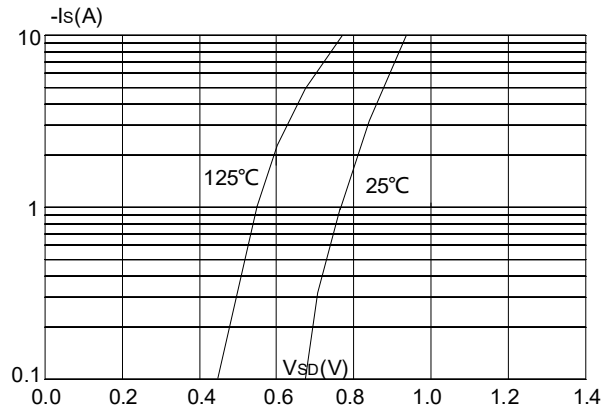


Figure 4: Body Diode Characteristics

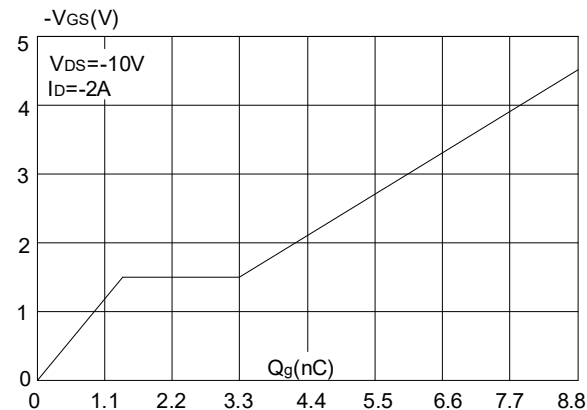


Figure 5: Gate Charge Characteristics

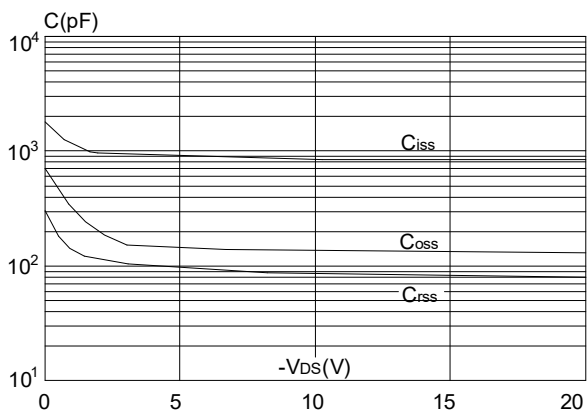


Figure 6: Capacitance Characteristics

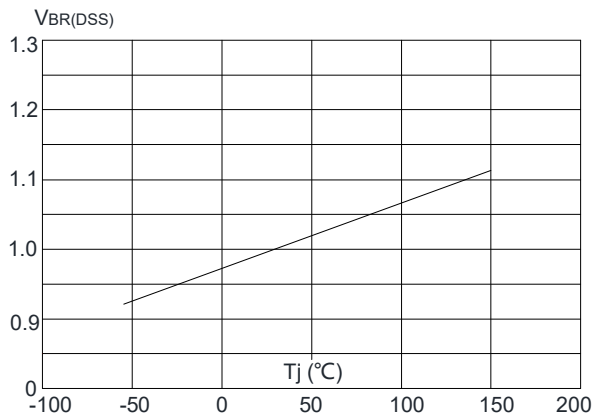


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

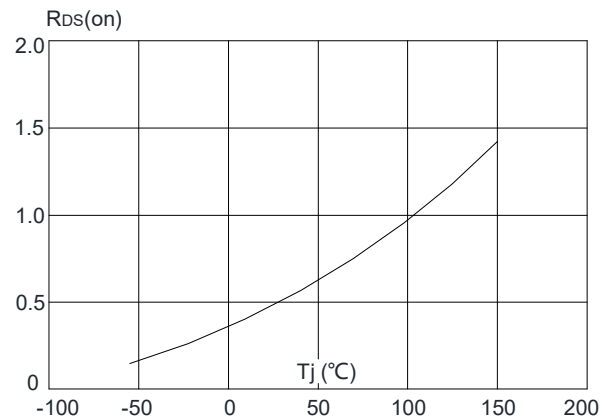


Figure 8: Normalized on Resistance vs. Junction Temperature

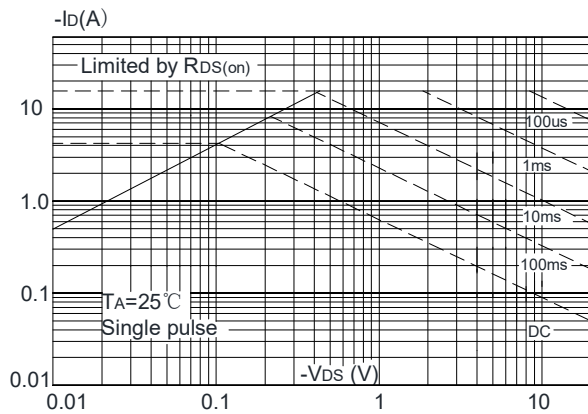


Figure 9: Maximum Safe Operating Area

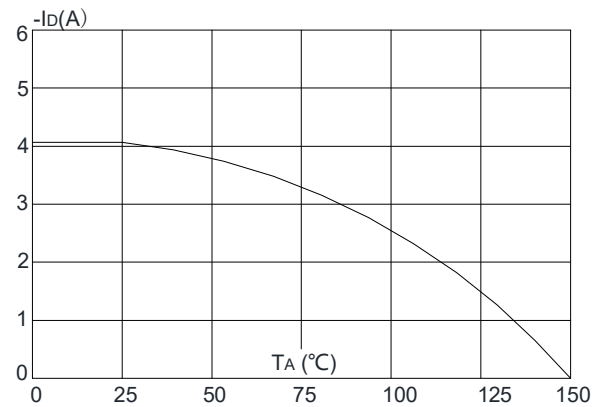


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

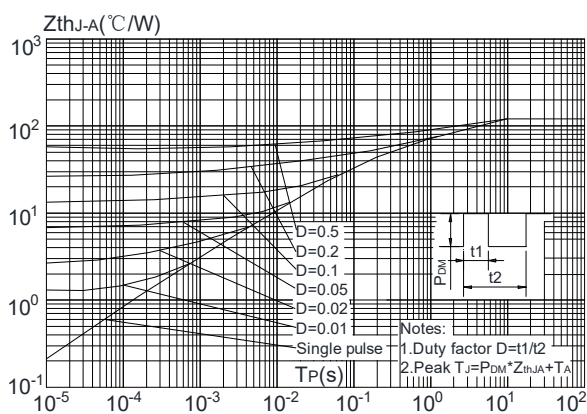
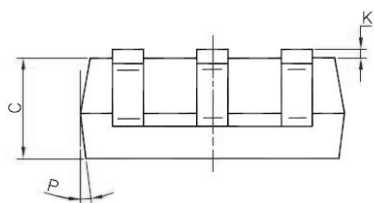
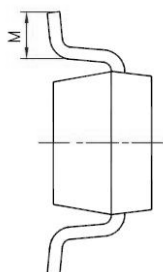
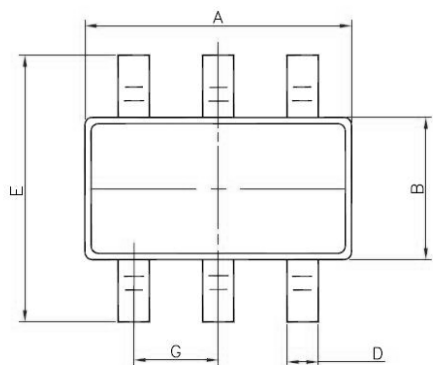


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

SOT-23-6 Package Outline Data

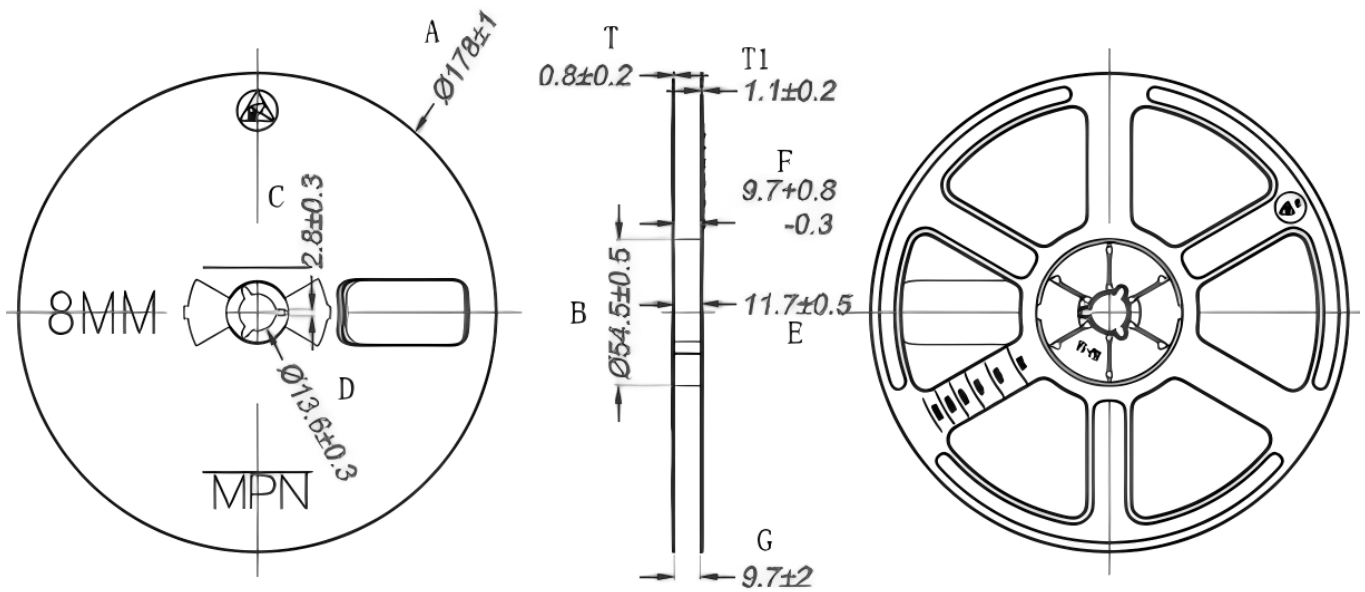


DIM	MILLIMETERS
A	2.82~3.02
B	1.60 ± 0.10
C	1.10 ± 0.05
D	0.40 ± 0.10
E	2.65~2.95
G	0.95typ
K	0.00~0.10
M	0.20MIN
P	9 ± 2°

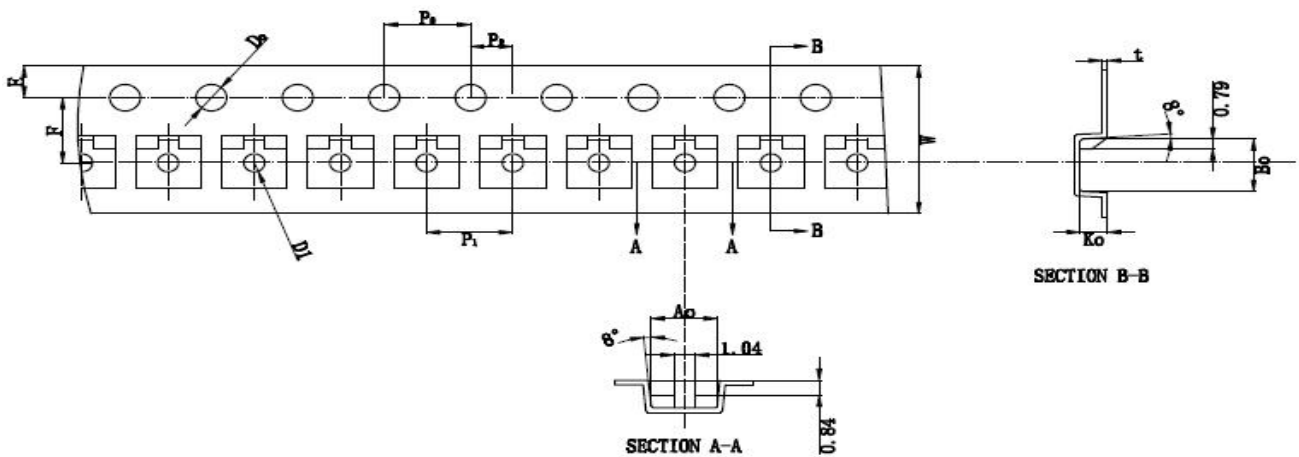
UNIT: mm

Tape & Reel Information

Dimensions in mm

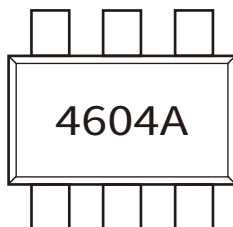


PKG TYPE	W	P	E	F	D	D1	Po	Po10	P2	A0	B0	K0	T
SOT23-6	8.00	4.00	1.75	3.50	1.50	1.00	4.00	40.00	2.00	3.13	3.22	1.30	0.20
Tolerance	± 0.2	± 0.1	± 0.1	± 0.1	± 0.1	± 0.1	± 0.1	± 0.2	± 0.1	± 0.1	± 0.1	± 0.1	± 0.03



Pulling direction 

Marking Information:



Previous Version

Version	Date	Subjects (major changes since last revision)
1.1	2025-04-02	Release of final version

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