

AP3003

N and P-Channel Enhancement Mosfet

Feature

● N-Channel

$V_{DD}=30V, I_D=5.8A$

$R_{DS(on)} < 38m\Omega @ V_{GS}=4.5V \text{ Typ}=24m\Omega$

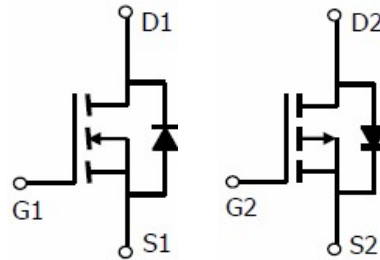
$R_{DS(on)} < 58m\Omega @ V_{GS}=2.5V \text{ Typ}=35m\Omega$

● P-Channel

$V_{DD}=-30V, I_D=-4.2A$

$R_{DS(on)} < 68m\Omega @ V_{GS}=-4.5V \text{ Typ}=53m\Omega$

$R_{DS(on)} < 96m\Omega @ V_{GS}=-2.5V \text{ Typ}=75m\Omega$



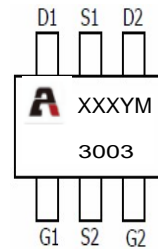
N-channel

P-channel

- Lead free product is acquired
- High power and current handling capability
- Surface mount package

Application

- Interfacing Switching
- Load Switching
- Power management



Marking and pin assignment

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
3003	AP3003	SOT23-6	-	-	3000

ABSOLUTE MAXIMUM RATINGS ($T_a=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V_{DS}	30	-30	V
Gate-Source Voltage	V_{GS}	± 12	± 12	V
Continuous Drain Current ($T_a = 25^\circ\text{C}$)	I_D	5.8	-4.2	A
Continuous Drain Current ($T_a = 100^\circ\text{C}$)	I_D	3.6	-2.6	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	23	-16.8	A
Power Dissipation	P_D	1.7	1.7	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	74	74	$^\circ\text{C/W}$
Junction Temperature	T_J	150	150	$^\circ\text{C}$
Storage Temperature	T_{STG}	-55~ +150	-55~ +150	$^\circ\text{C}$

N-CH ELECTRICAL CHARACTERISTICS(T_a=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D =250μA	30	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =30V, V _{GS} = 0V	-	-	1	μA
Gate-body leakage current	I _{GSS}	V _{GS} =±12V, V _{DS} = 0V	-	-	±100	nA
Gate threshold voltage ⁽³⁾	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	0.4	1.0	1.5	V
Drain-source on-resistance ⁽³⁾	R _{DS(on)}	V _{GS} =4.5V, I _D =5A	-	24	38	mΩ
		V _{GS} =2.5V, I _D =1A	-	35	58	
Dynamic characteristics						
Input Capacitance	C _{iss}	V _{DS} =15V, V _{GS} =0V, f =1MHz	-	700	-	pF
Output Capacitance	C _{oss}		-	66	-	
Reverse Transfer Capacitance	C _{rss}		-	52	-	
Switching characteristics						
Turn-on delay time	t _{d(on)}	V _{DD} =15V, I _D =4.0A, V _{GS} =4.5V, R _G =10Ω	-	12	-	ns
Turn-on rise time	t _r		-	52	-	
Turn-off delay time	t _{d(off)}		-	17	-	
Turn-off fall time	t _f		-	10	-	
Total Gate Charge	Q _g	V _{DS} =15V, I _D =4.0A, V _{GS} =4.5V	-	4.8	-	nC
Gate-Source Charge	Q _{gs}		-	1.2	-	
Gate-Drain Charge	Q _{gd}		-	1.7	-	
Source-Drain Diode characteristics						
Diode Forward voltage ⁽³⁾	V _{DS}	V _{GS} =0V, I _S =5.8A	-	-	1.2	V
Diode Forward current ⁽⁴⁾	I _S		-	-	5.8	A

Notes:

1. Repetitive Rating: pulse width limited by maximum junction temperature
2. Pulse Test: pulse width≤300μs, duty cycle≤2%
3. Surface Mounted on FR4 Board, t≤10 sec

P-CH ELECTRICAL CHARACTERISTICS(T_a=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D = -250μA	-30			V
Zero gate voltage drain current	I _{DSS}	V _{DS} = -30V, V _{GS} = 0V			-1	μA
Gate-body leakage current	I _{GSS}	V _{GS} = ±12V, V _{DS} = 0V			±100	nA
Gate threshold voltage ⁽²⁾	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250μA	-0.5	-0.9	-1.3	V
Drain-source on-resistance ⁽²⁾	R _{DS(on)}	V _{GS} = -4.5V, I _D = -4A		53	68	mΩ
		V _{GS} = -2.5V, I _D = -1A		75	96	
Dynamic characteristics						
Input Capacitance	C _{iss}	V _{DS} = -15V, V _{GS} = 0V, f = 1MHz		882		pF
Output Capacitance	C _{oss}			104		
Reverse Transfer Capacitance	C _{rss}			65		
Switching characteristics						
Turn-on delay time	t _{d(on)}	V _{DD} = -15V, I _D = -1.0A, V _{GS} = -10V, R _G = 2.5Ω		7		ns
Turn-on rise time	t _r			3		
Turn-off delay time	t _{d(off)}			20		
Turn-off fall time	t _f			12		
Total Gate Charge	Q _g	V _{DS} = -15V, I _D = -4.2A, V _{GS} = -10V		8.5		nC
Gate-Source Charge	Q _{gs}			1.8		
Gate-Drain Charge	Q _{gd}			2.7		
Source-Drain Diode characteristics						
Diode Forward voltage ⁽²⁾	V _{DS}	V _{GS} = 0V, I _S = -4.2A			1.2	V
Diode Forward current ⁽³⁾	I _S		-	-	-4.2	A

Notes:

1. Repetitive Rating: pulse width limited by maximum junction temperature
2. Pulse Test: pulse width ≤ 300μs, duty cycle ≤ 2%
3. Surface Mounted on FR4 Board, t ≤ 10 sec

N-Channel

Test Circuit

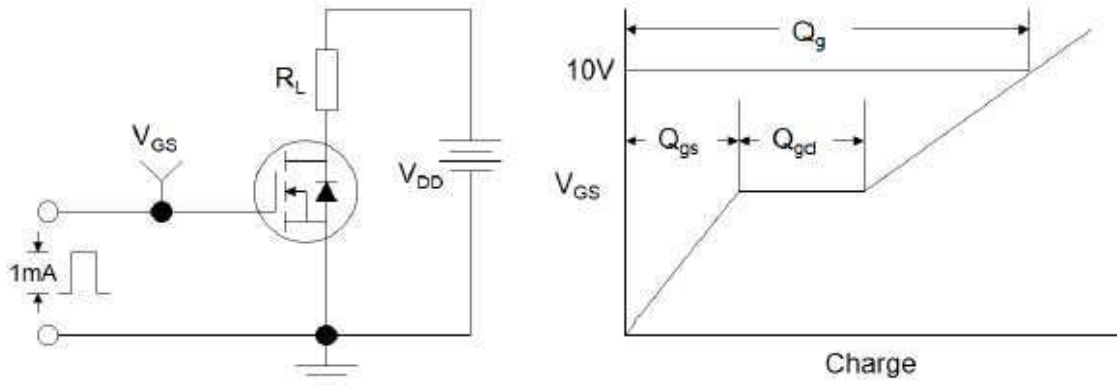


Figure1:Gate Charge Test Circuit & Waveform

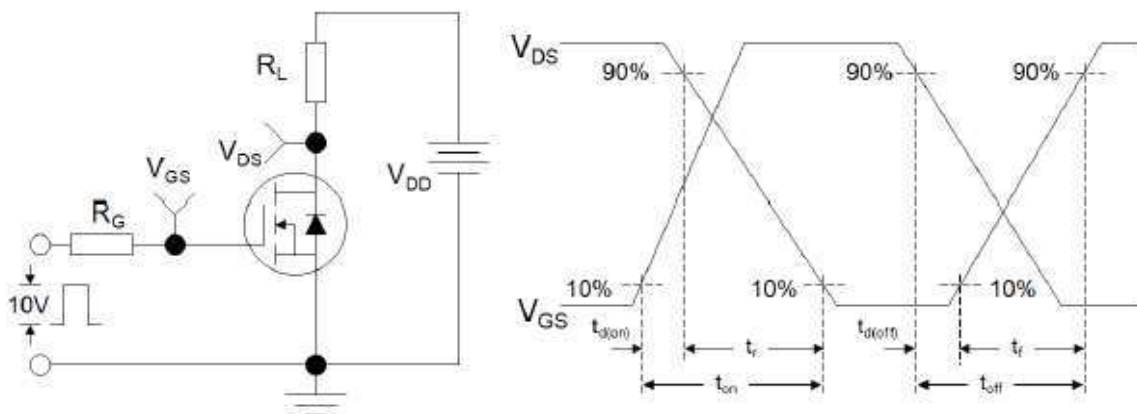


Figure 2: Resistive Switching Test Circuit & Waveforms

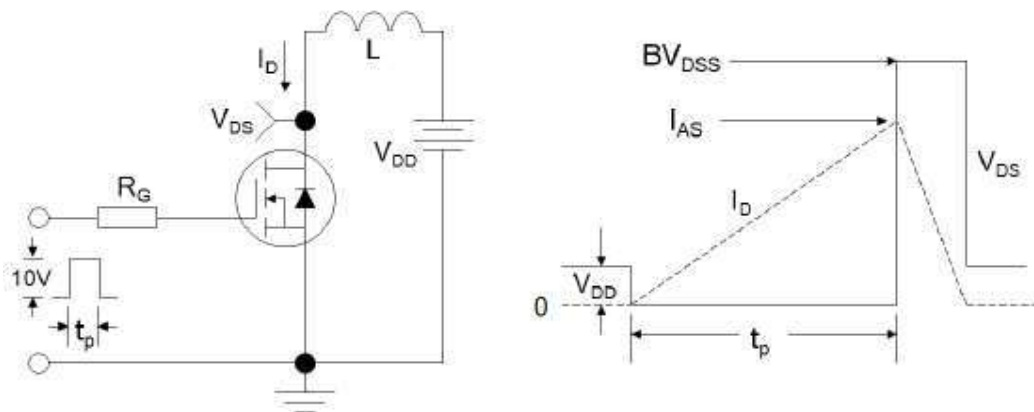


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

N-Channel

Figure 1: Output Characteristics

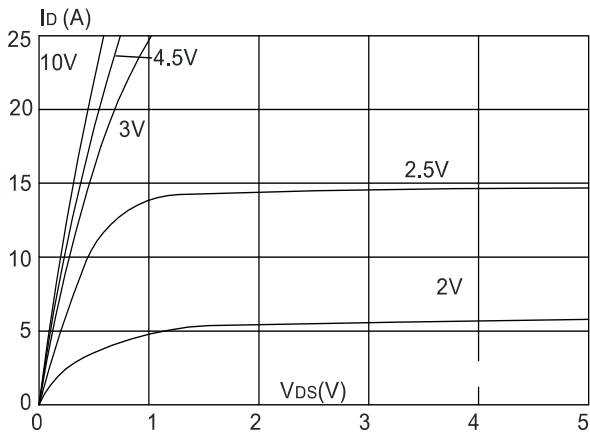


Figure 2: Typical Transfer Characteristics

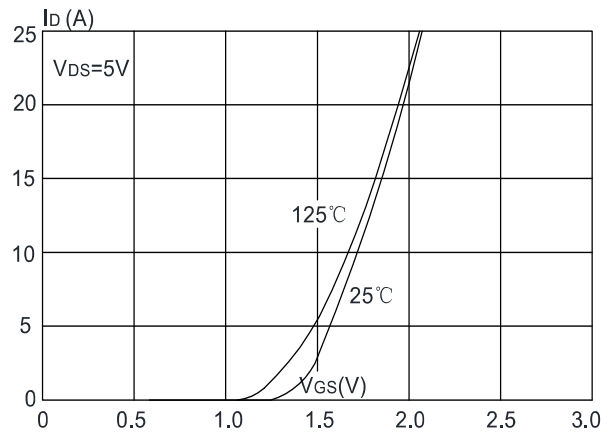


Figure 3: On-resistance vs. Drain Current

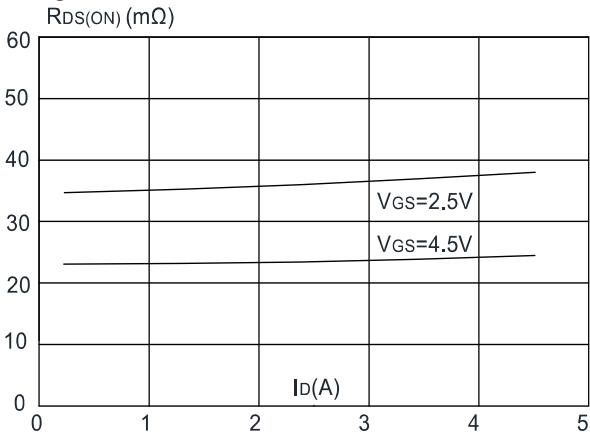


Figure 4: Body Diode Characteristics

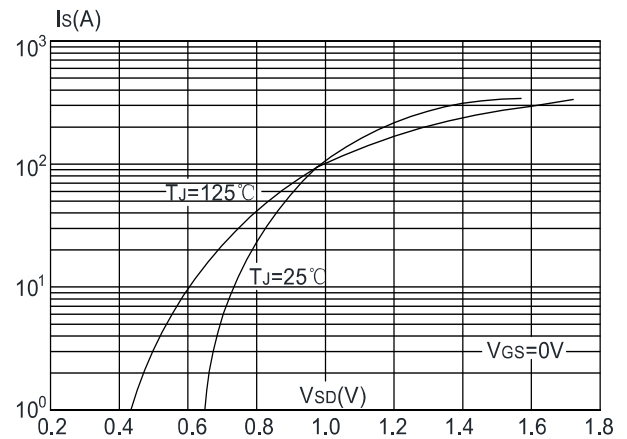


Figure 5: Gate Charge Characteristics

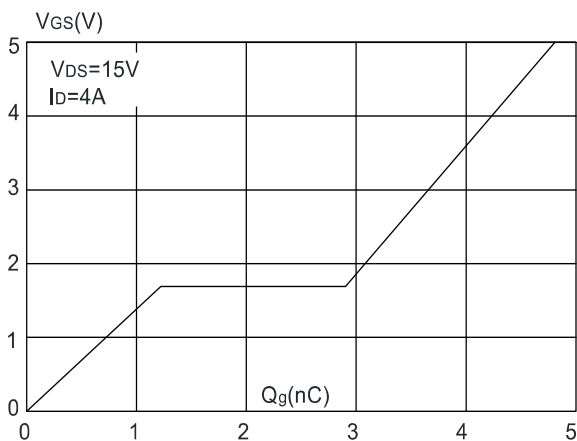
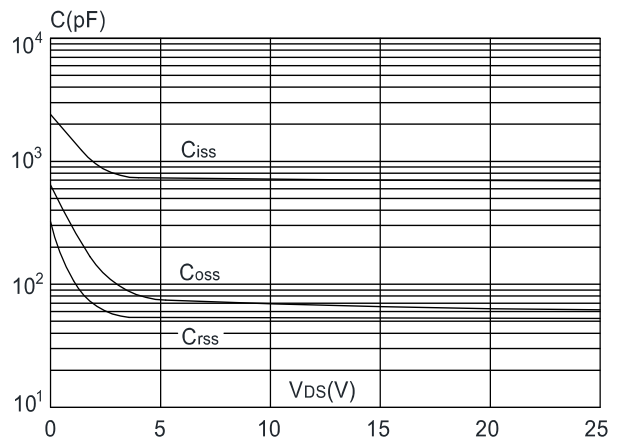


Figure 6: Capacitance Characteristics



N-Channel

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

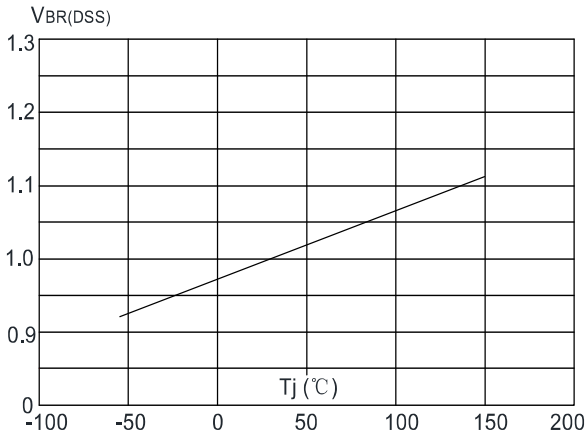


Figure 8: Normalized on Resistance vs. Junction Temperature

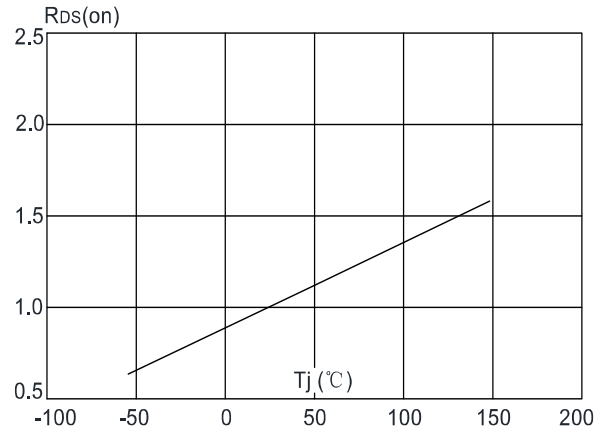


Figure 9: Maximum Safe Operating Area

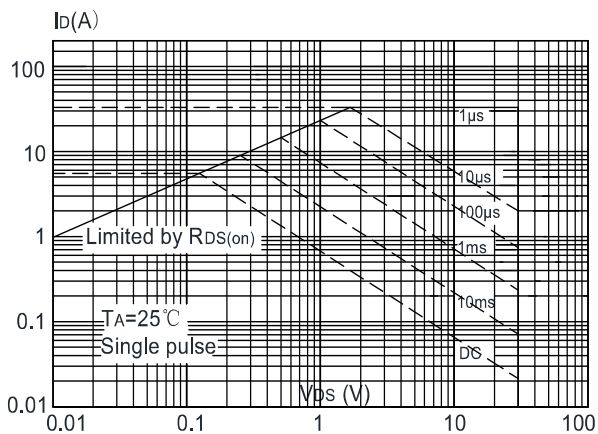


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

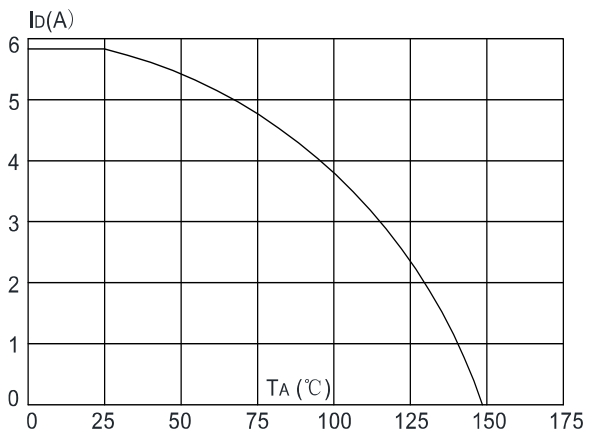
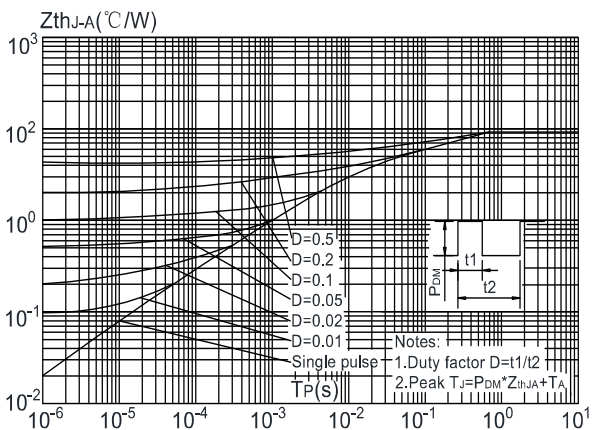


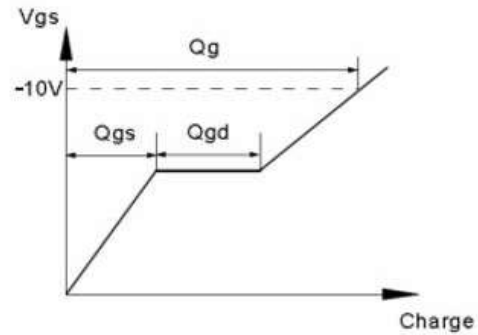
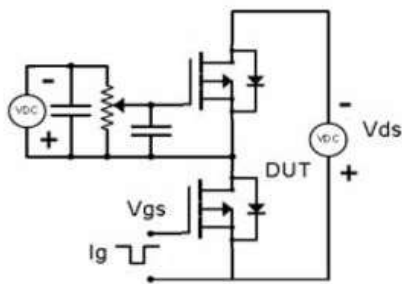
Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



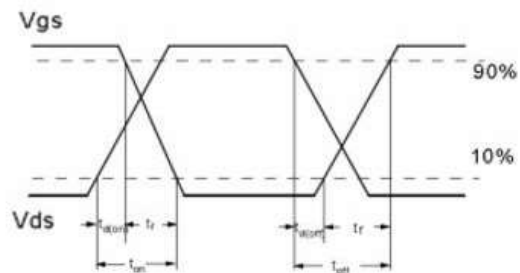
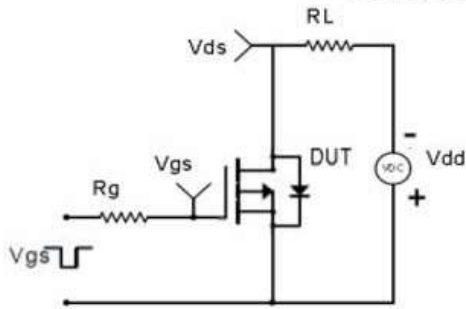
P-Channel

Test Circuit & Waveform

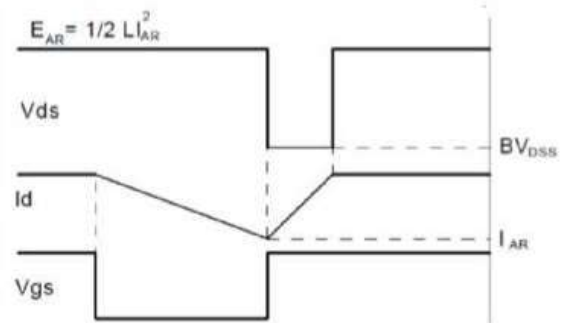
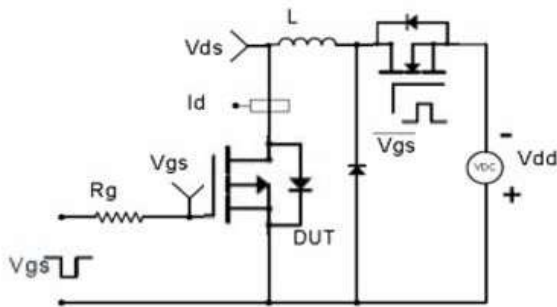
Gate Charge Test Circuit & Waveform



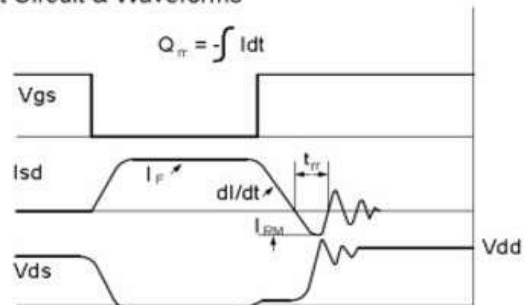
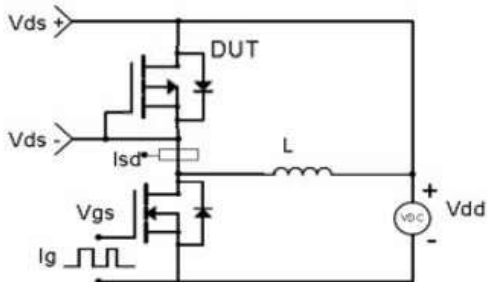
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



P-Channel

Figure 1: Output Characteristics

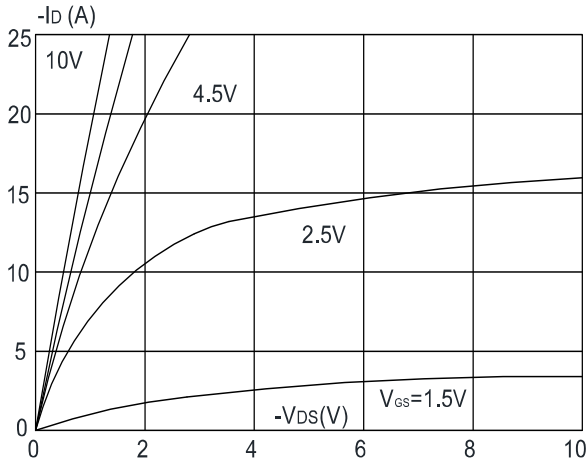


Figure 2: Typical Transfer Characteristics

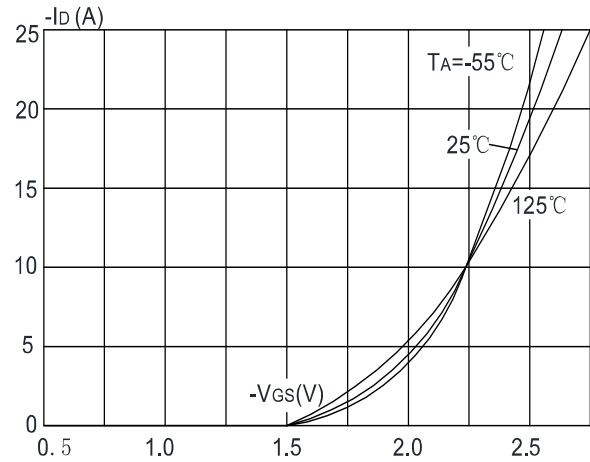


Figure 3: On-resistance vs. Drain Current

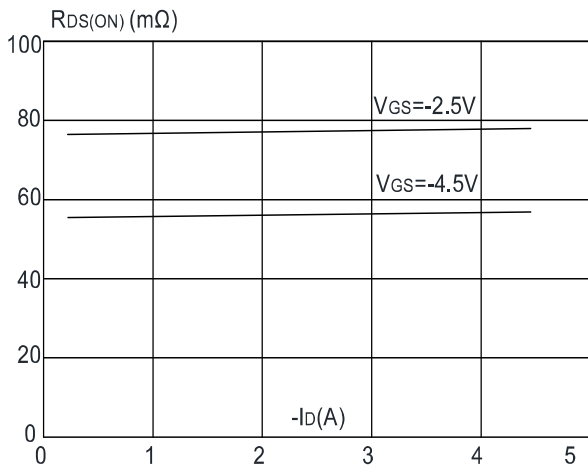


Figure 4: Body Diode Characteristics

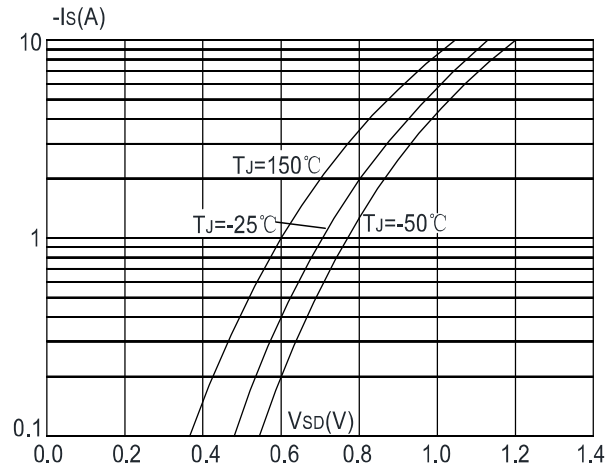


Figure 5: Gate Charge Characteristics

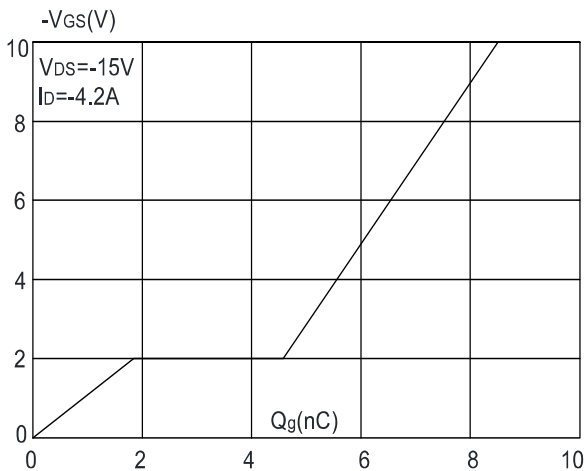
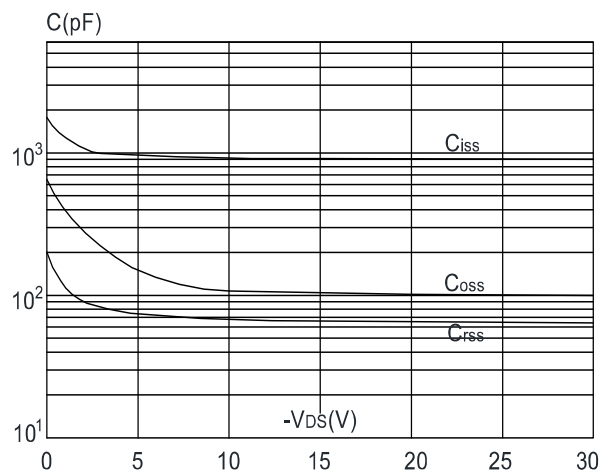


Figure 6: Capacitance Characteristics



P-Channel

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

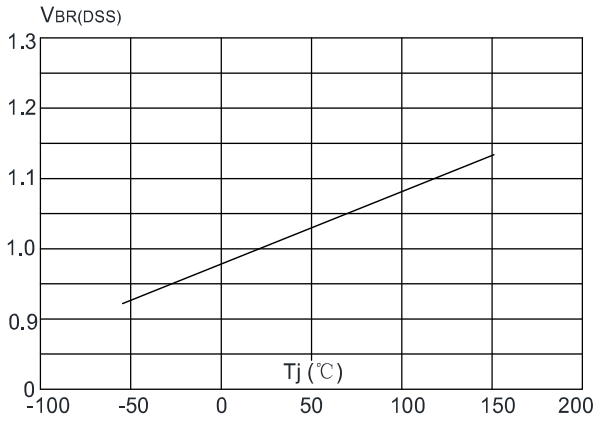


Figure 8: Normalized on Resistance vs. Junction Temperature

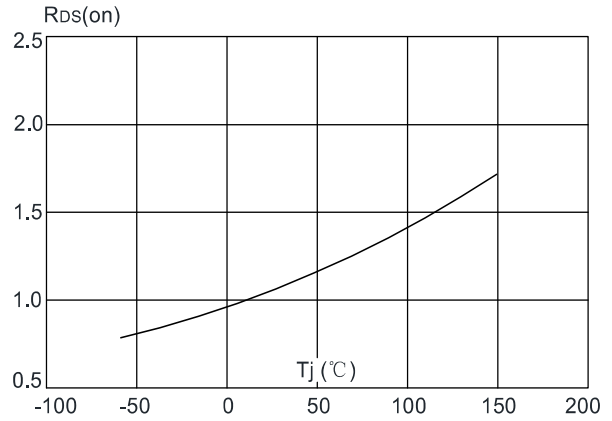


Figure 9: Maximum Safe Operating Area

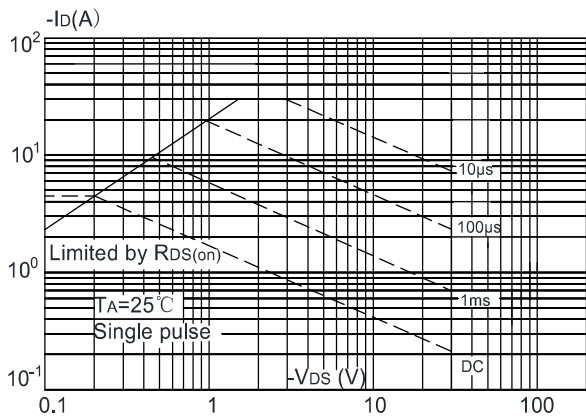


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

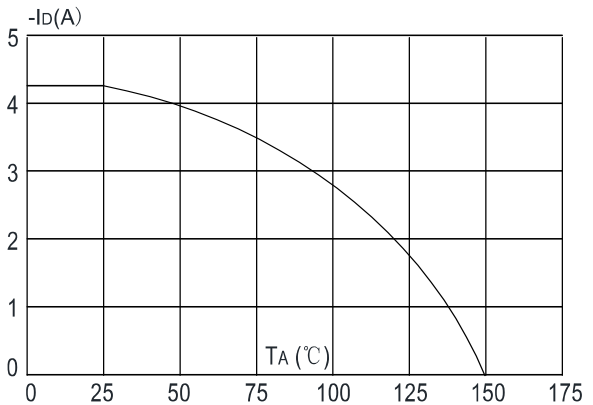
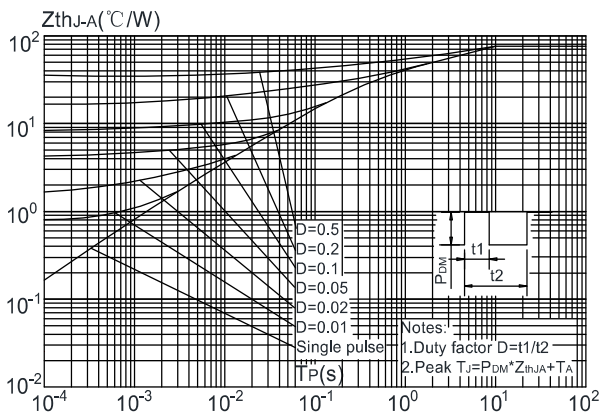
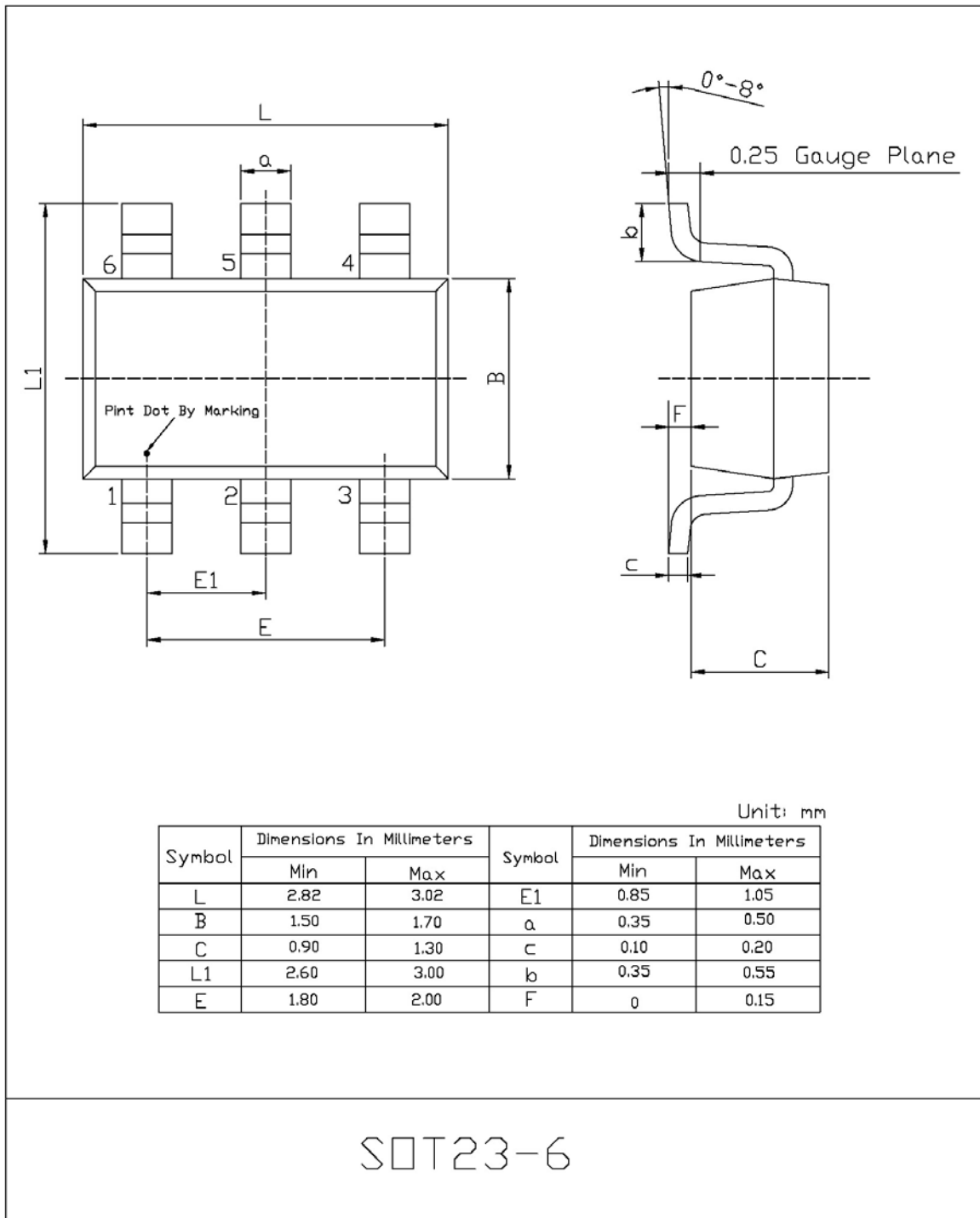


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



SOT23-6 Package Information



Revision History

Revision	Release	Remark
V1.0	2023/03/17	Initial Release

Disclaimer

The information given in this document describes the independent performance of the product, but similar performance is not guaranteed under other working conditions, and cannot be guaranteed when installed with other products or equipment. To achieve the required performance of the product in actual scenarios, the customer should conduct a complete application test to assess the functionality of the product.

Allpower assumes no responsibility for equipment failures result from using products at values that exceed the ratings, operating conditions, or other parameters listed in the product specifications.

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