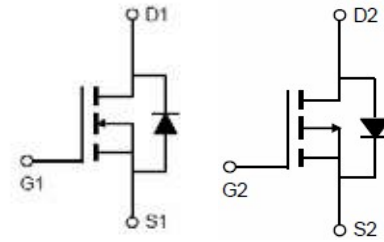


N and P-Channel Power MOSFET
Description

The AP3003 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. This device is suitable for use as a Battery protection or in other Switching application.


General Features
● N-Channel

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

$$R_{DS(ON)} < 24m\Omega @ V_{GS}=10V$$

$$R_{DS(ON)} < 28m\Omega @ V_{GS}=4.5V$$

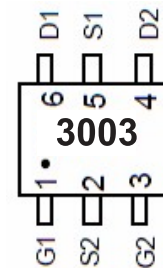
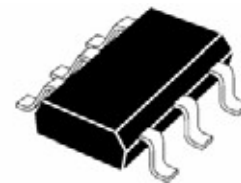
● P-Channel

$$V_{DS} = -30V, I_D = -3.7A$$

$$R_{DS(ON)} < 65 m\Omega @ V_{GS}=-10V$$

$$R_{DS(ON)} < 85 m\Omega @ V_{GS}=-4.5V$$

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Halogen-free

**N-channel P-channel
Schematic diagram**

Marking and pin Assignment

TSOT23-6L top view
Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
3003	AP3003S6	TSOT23-6L	Ø180mm	8mm	3000units

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	4.2	-3.7	A
	$T_A=70^\circ\text{C}$		3	-2.1	
Pulsed Drain Current ^(Note 1)		I_{DM}	20	-15	A
Maximum Power Dissipation	$T_A=25^\circ\text{C}$	P_D	1.2		W
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 To 150	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient ^(Note2)	$R_{\theta JA}$	N-Ch	104	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient ^(Note2)	$R_{\theta JA}$	P-Ch	104	$^\circ\text{C/W}$

Nand P-Channel Power MOSFET
N-CH Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	30	33	-	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
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	0.7	-	1.3	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =4.2A	-	19	24	mΩ
		V _{GS} =4.5V, I _D =2A	-	24	28	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =3.1A	-	4	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{Iss}	V _{DS} =15V, V _{GS} =0V, F=1.0MHz	-	210	-	PF
Output Capacitance	C _{Oss}		-	35	-	PF
Reverse Transfer Capacitance	C _{rss}		-	23	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =15V, R _L =3Ω V _{GS} =10V, R _{GEN} =6Ω	-	4.5	-	nS
Turn-on Rise Time	t _r		-	1.5	-	nS
Turn-Off Delay Time	t _{d(off)}		-	18.5	-	nS
Turn-Off Fall Time	t _f		-	15.5	-	nS
Total Gate Charge	Q _g	V _{DS} =15V, I _D =3.5A, V _{GS} =10V	-	5	-	nC
Gate-Source Charge	Q _{gs}		-	0.55	-	nC
Gate-Drain Charge	Q _{gd}		-	1	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =3.5A	-	0.8	1.2	V
Diode Forward Current (Note 2)	I _S		-	-	3.5	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Nand P-Channel Power MOSFET

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-30	-33	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 12V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.7	-	-1.3	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-3.7A$	-	50	65	m Ω
		$V_{GS}=-4.5V, I_D=-2A$		60	85	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-10V, I_D=-2.7A$		2	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{ISS}	$V_{DS}=-15V, V_{GS}=0V,$ $F=1.0MHz$	-	199	-	PF
Output Capacitance	C_{OSS}		-	47	-	PF
Reverse Transfer Capacitance	C_{RSS}		-	28	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-15V, R_L=15\Omega$ $V_{GS}=-10V, R_{GEN}=6\Omega$	-	8	-	nS
Turn-on Rise Time	t_r		-	5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	12	-	nS
Turn-Off Fall Time	t_f		-	4	-	nS
Total Gate Charge	Q_g	$V_{DS}=-15V, I_D=-2.7A, V_{GS}=-10V$	-	5	-	nC
Gate-Source Charge	Q_{gs}		-	0.7	-	nC
Gate-Drain Charge	Q_{gd}		-	1.1	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=-2.7A$	-	-	-1.2	V

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

AP3003

Nand P-Channel Power MOSFET

N- Channel Typical Electrical and Thermal Characteristics

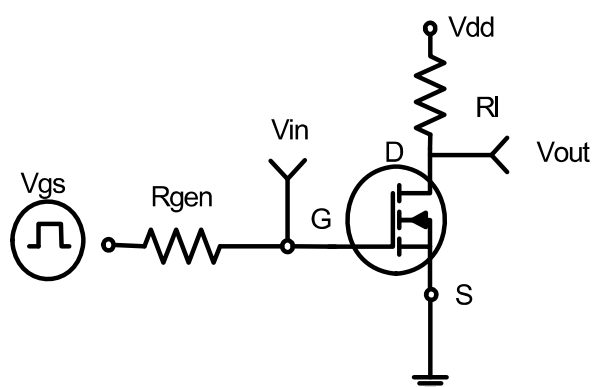


Figure 1: Switching Test Circuit

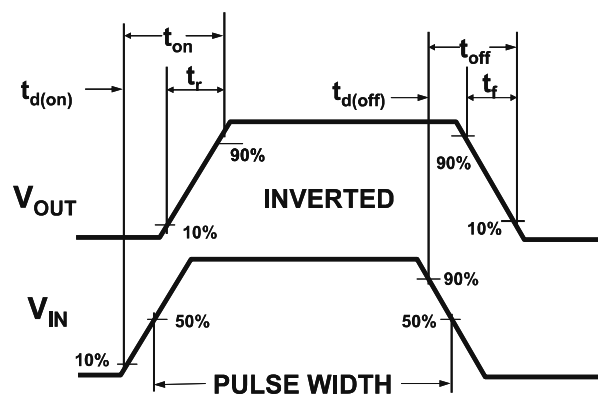


Figure 2: Switching Waveforms

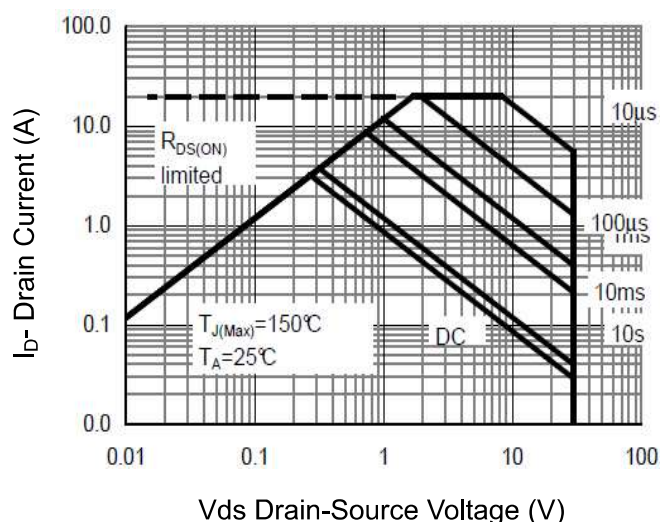


Figure 3 Safe Operation Area

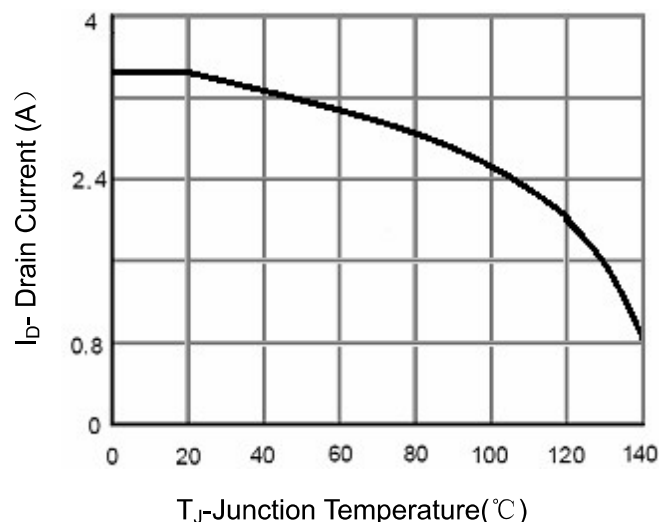


Figure 4 Drain Current

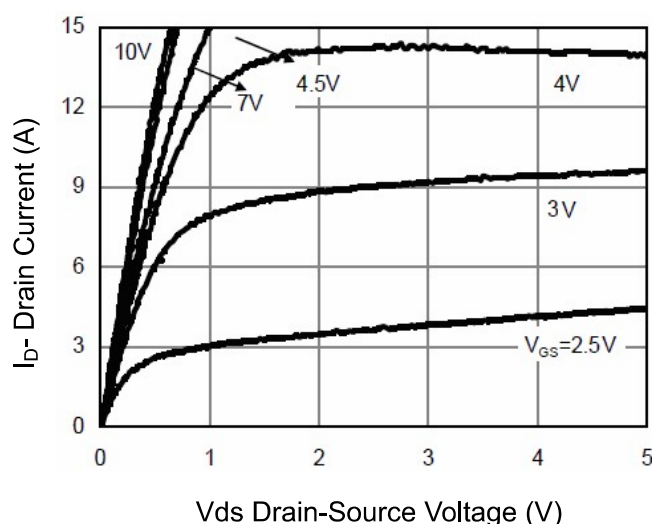


Figure 5 Output Characteristics

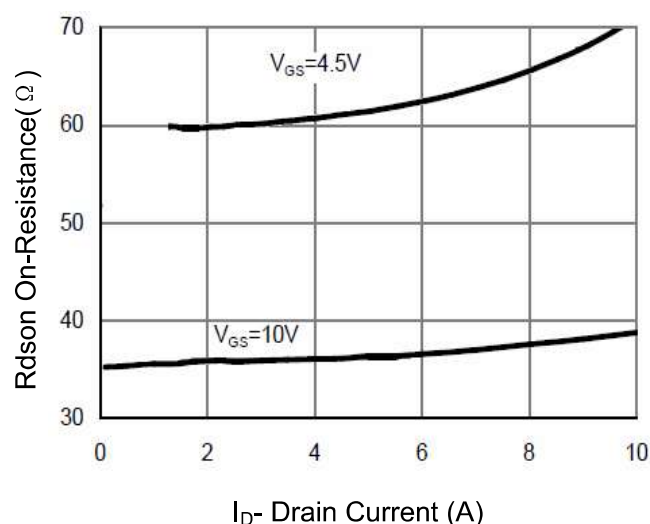
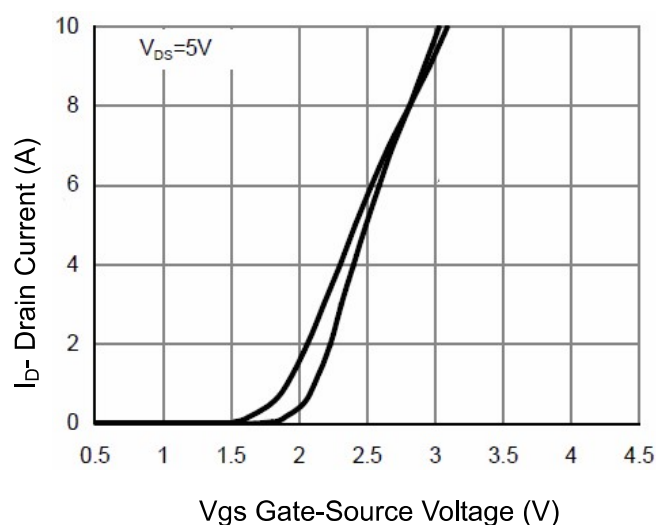
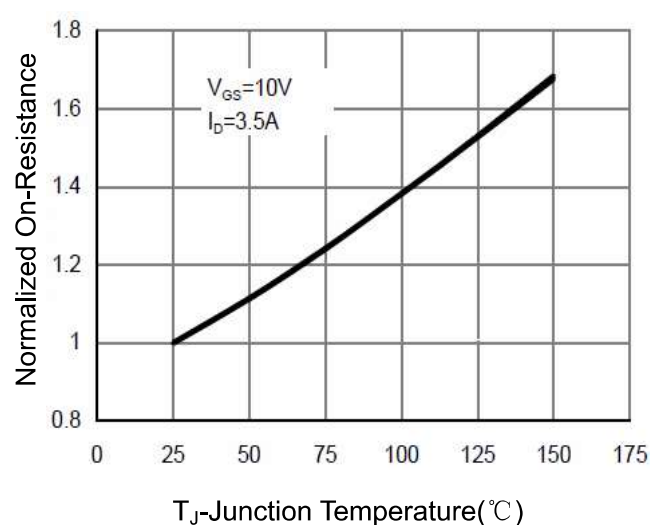
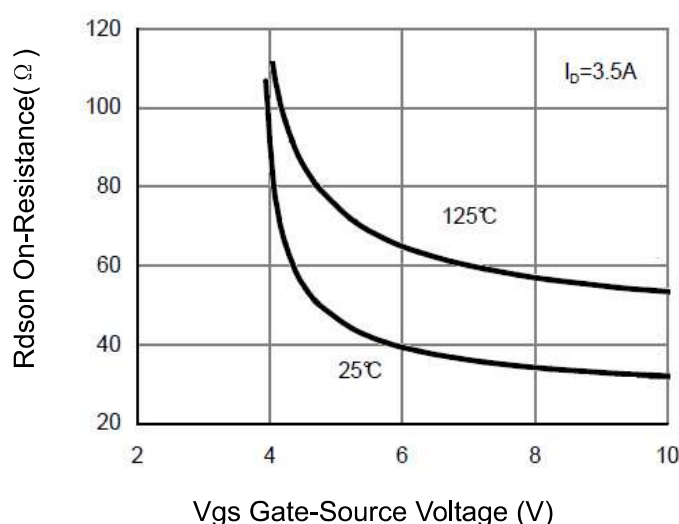
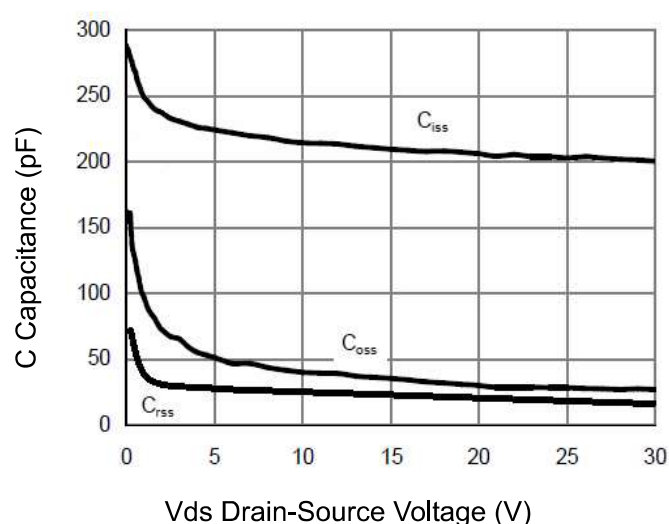
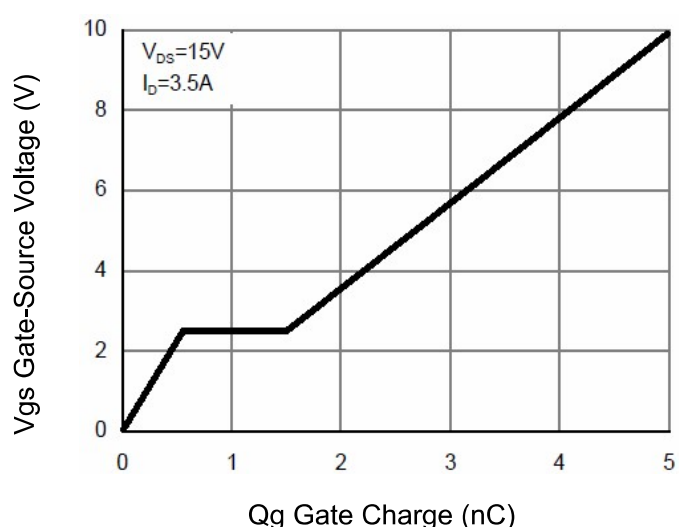
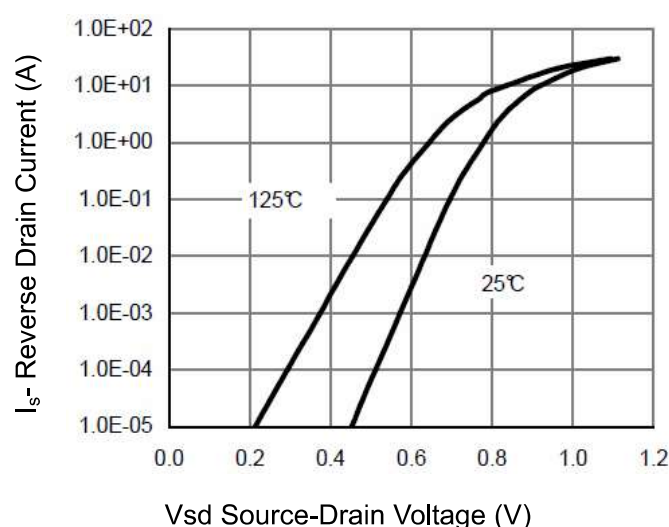


Figure 6 Drain-Source On-Resistance

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Nand P-Channel Power MOSFET

Figure 7 Transfer Characteristics

Figure 8 Drain-Source On-Resistance

Figure 9 Rdson vs Vgs

Figure 10 Capacitance vs Vds

Figure 11 Gate Charge

Figure 12 Source- Drain Diode Forward

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Nand P-Channel Power MOSFET

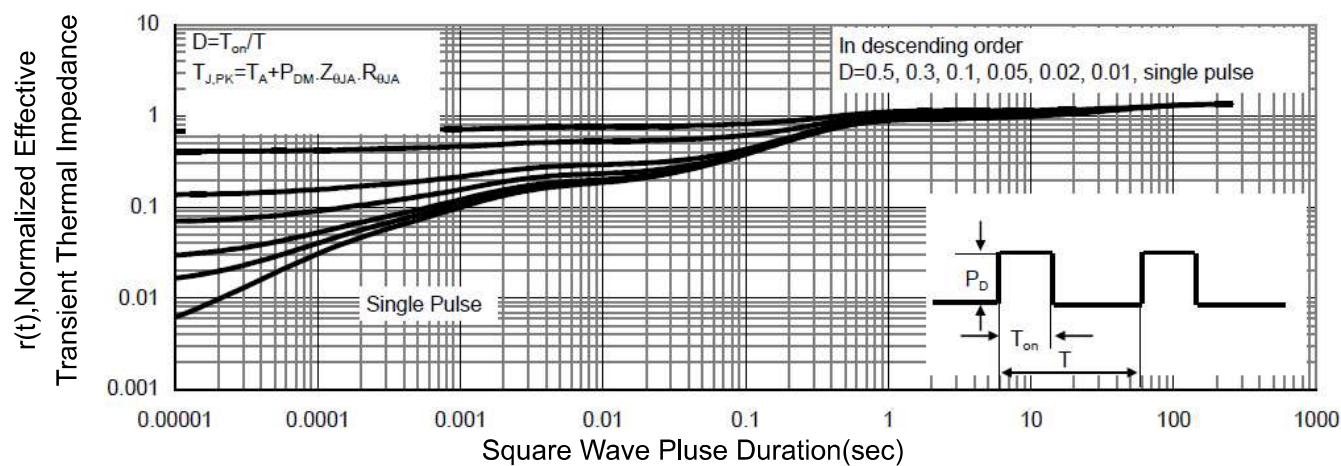


Figure 13 Normalized Maximum Transient Thermal Impedance

Nand P-Channel Power MOSFET

P- Channel Typical Electrical and Thermal Characteristics

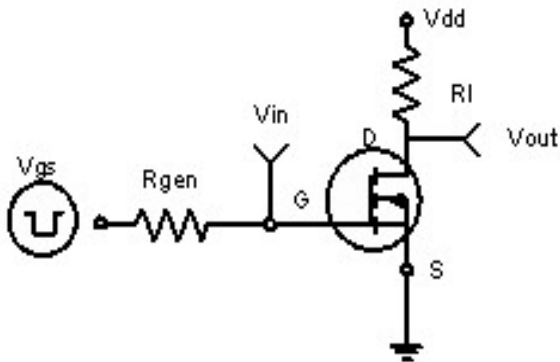


Figure 1:Switching Test Circuit

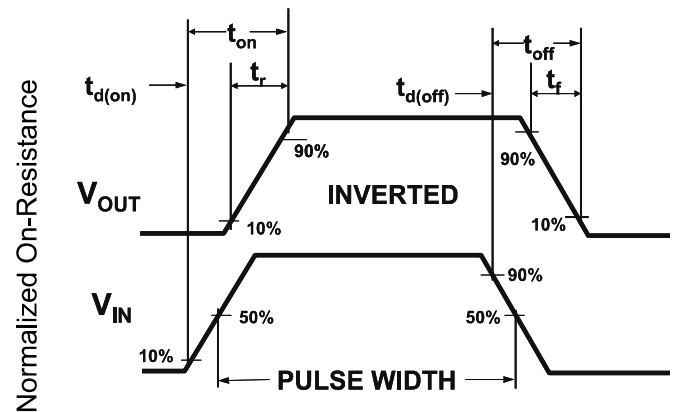


Figure 2:Switching Waveforms

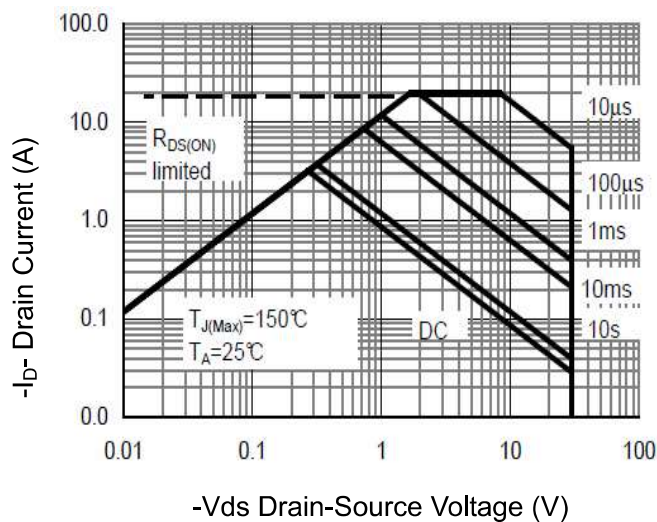


Figure 3 Safe Operation Area

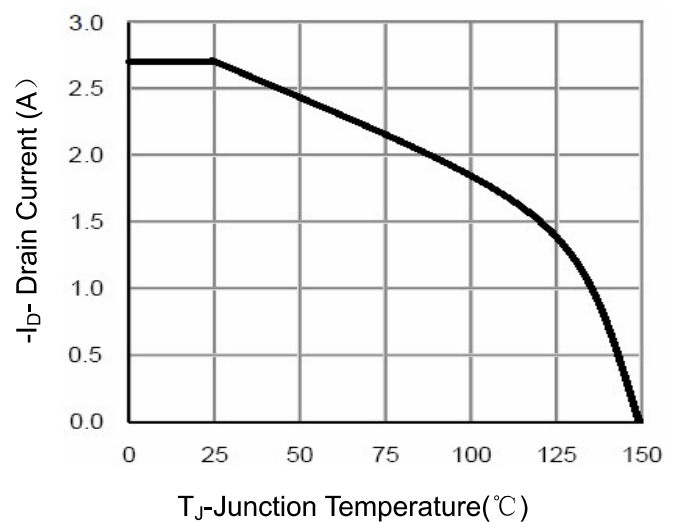


Figure 4 Drain Current

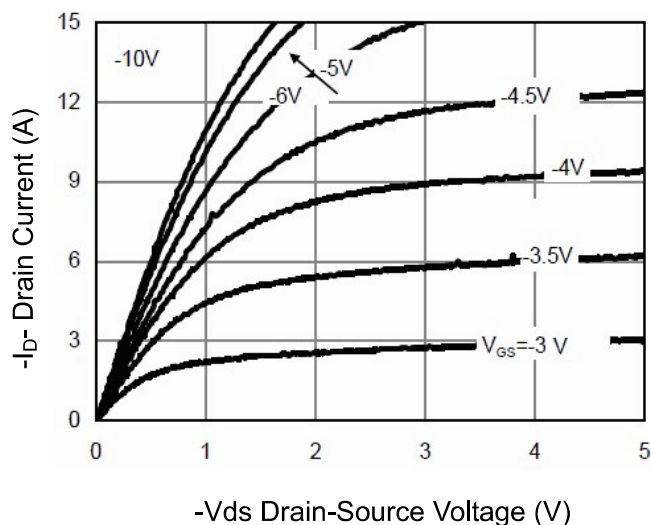


Figure 5 Output Characteristics

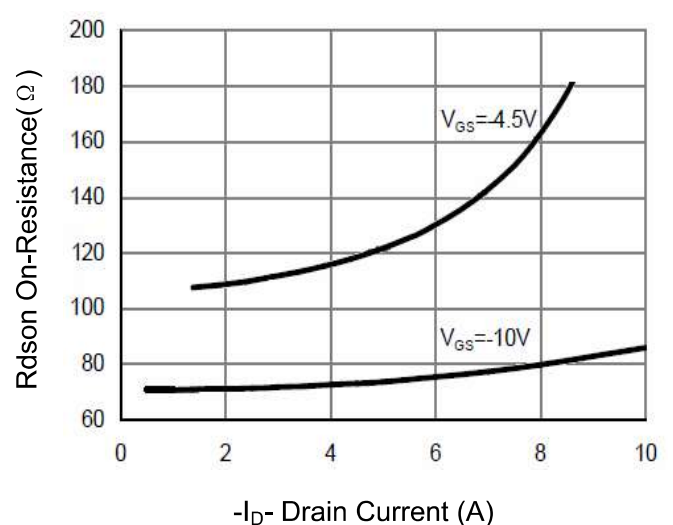
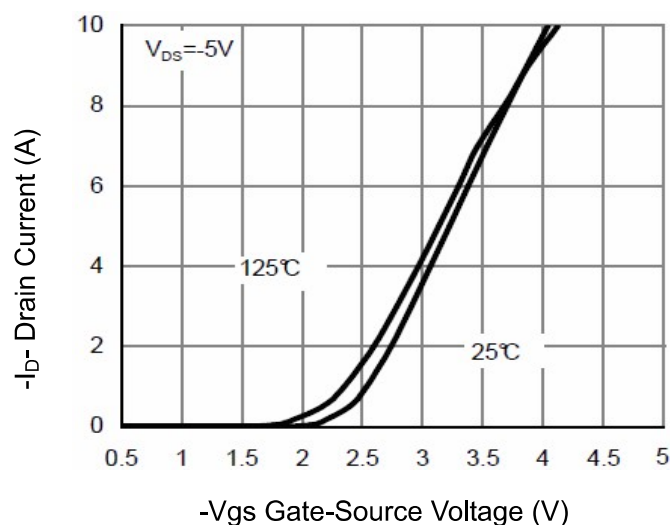
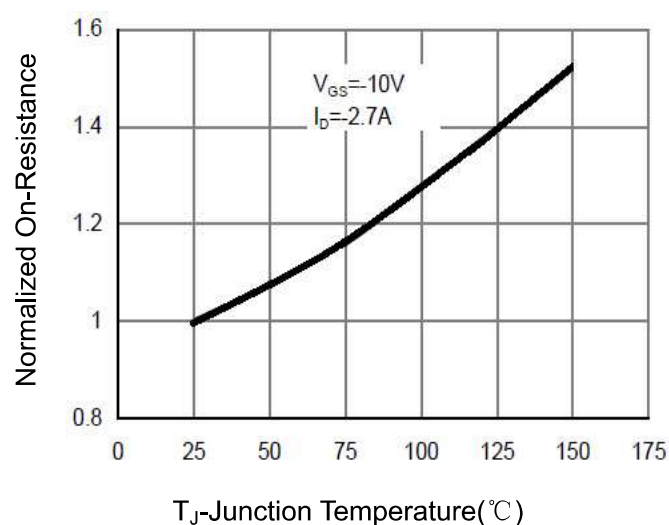
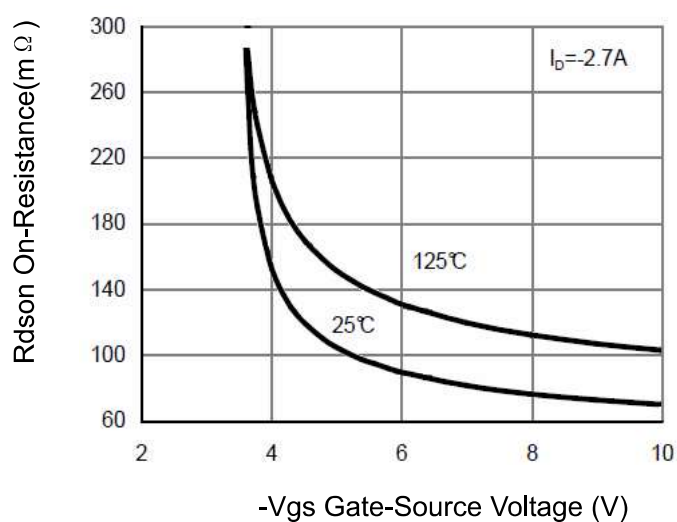
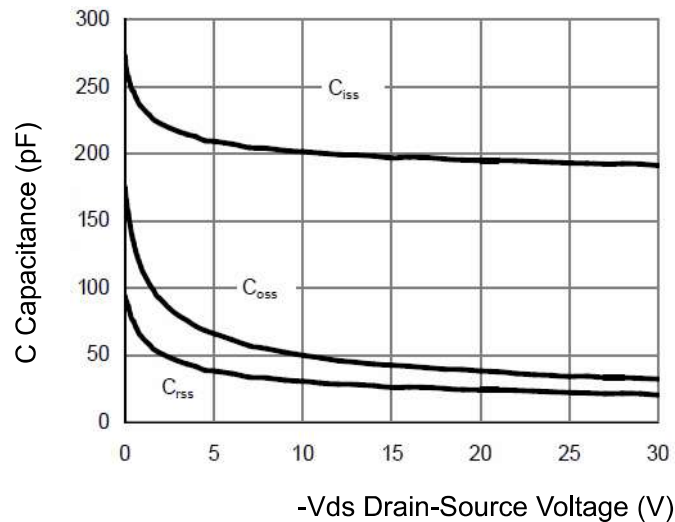
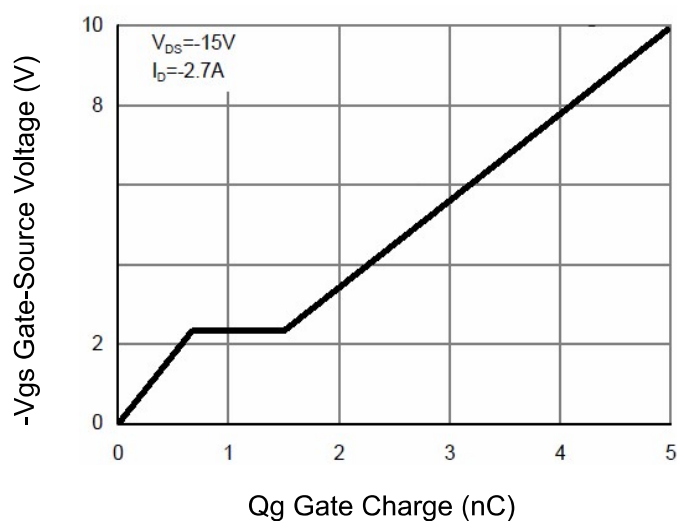
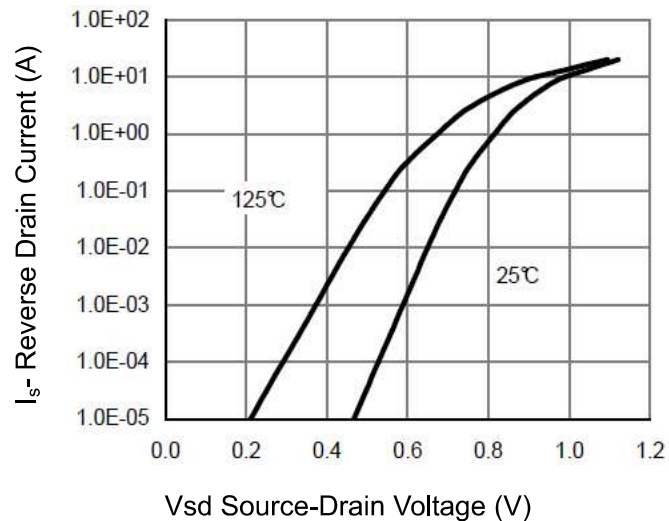


Figure 6 Drain-Source On-Resistance

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Figure 7 Transfer Characteristics

Figure 8 Drain-Source On-Resistance

Figure 9 Rdson vs Vgs

Figure 10 Capacitance vs Vds

Figure 11 Gate Charge

Figure 12 Source- Drain Diode Forward

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Nand P-Channel Power MOSFET

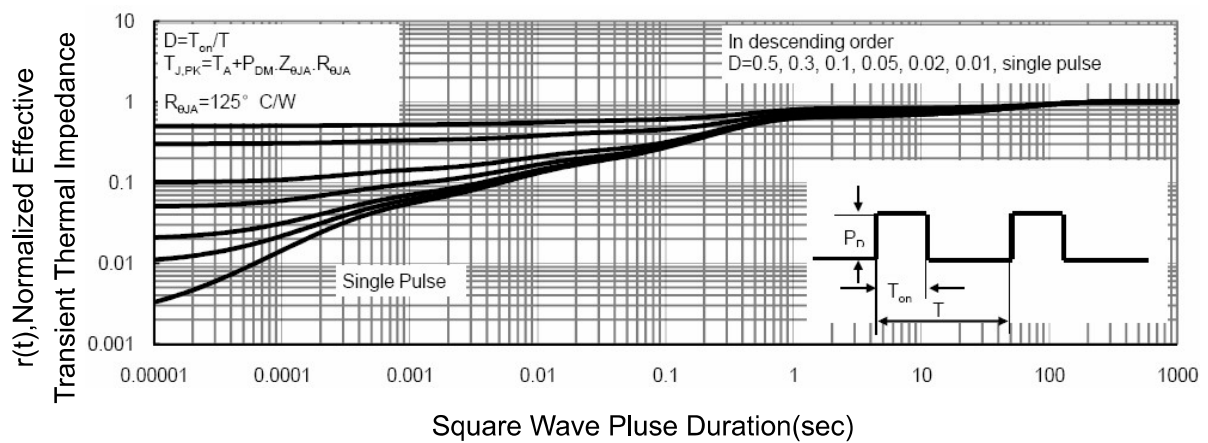
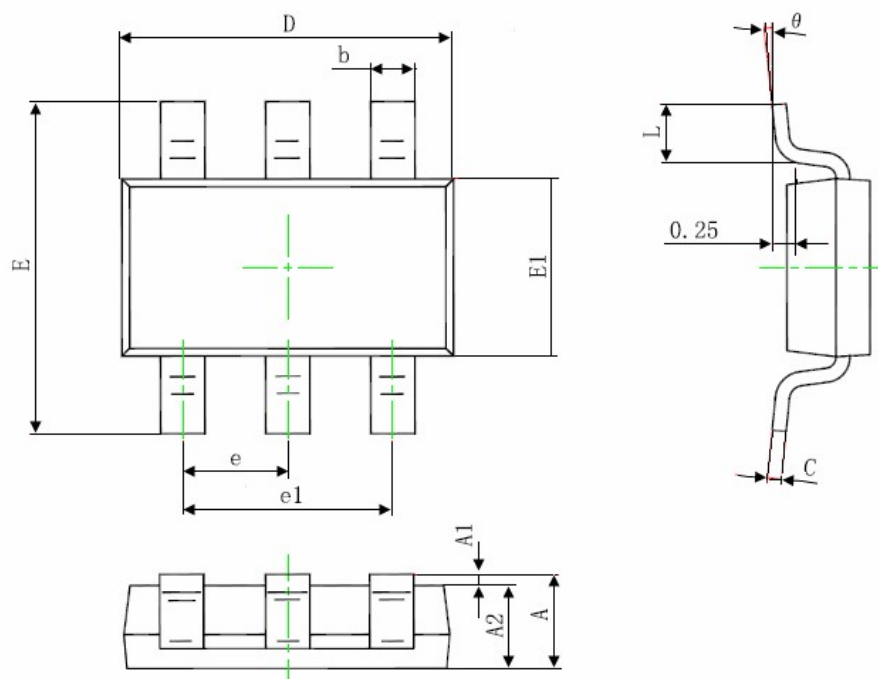


Figure 13 Normalized Maximum Transient Thermal Impedance

AP3003
Nand P-Channel Power MOSFET
TSOT23-6L Package Information


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	---	0.900	---	0.035
A1	0.000	0.100	0.000	0.004
A2	0.700	0.800	0.028	0.031
b	0.350	0.500	0.014	0.020
c	0.080	0.200	0.003	0.008
D	2.820	3.020	0.111	0.119
E1	1.600	1.700	0.063	0.067
E	2.650	2.950	0.104	0.116
e	0.95 (BSC)		0.037(BSC)	
e1	1.90 (BSC)		0.075(BSC)	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°