

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

Symbol	Parameter		Rating		Unit
			N-Channel	P-Channel	
V_{DSS}	Drain-Source Voltage		20	-20	V
V_{GSS}	Gate-Source Voltage		± 12	± 12	
I_D^*	Continuous Drain Current	$V_{GS} = \pm 4.5\text{V}$	3	-2	A
I_{DM}^*	300 μs Pulsed Drain Current		12	-8	
I_S^*	Diode Continuous Forward Current		1	-1	A
T_J	Maximum Junction Temperature		150		$^\circ\text{C}$
T_{STG}	Storage Temperature Range		-55 to 150		
P_D^*	Power Dissipation	$T_A = 25^\circ\text{C}$	0.83		W
		$T_A = 100^\circ\text{C}$	0.3		
$R_{\theta JA}^*$	Thermal Resistance-Junction to Ambient		150		$^\circ\text{C}/\text{W}$

Note : *Surface Mounted on 1in² pad area, $t \leq 10\text{sec}$.

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

Symbol	Parameter	Test Conditions	APM2701AC			Unit	
			Min.	Typ.	Max.		
Static Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_{DS} = 250\mu\text{A}$	N-Ch	20	-	-	V
		$V_{GS} = 0\text{V}, I_{DS} = -250\mu\text{A}$	P-Ch	-20	-	-	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 16\text{V}, V_{GS} = 0\text{V}$ $T_J = 85^\circ\text{C}$	N-Ch	-	-	1	μA
			P-Ch	-	-	30	
		$V_{DS} = -16\text{V}, V_{GS} = 0\text{V}$ $T_J = 85^\circ\text{C}$	N-Ch	-	-	-1	
			P-Ch	-	-	-30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{DS} = 250\mu\text{A}$	N-Ch	0.5	0.7	1	V
		$V_{DS} = V_{GS}, I_{DS} = -250\mu\text{A}$	P-Ch	-0.5	-0.7	-1	
I_{GSS}	Gate Leakage Current	$V_{GS} = \pm 10\text{V}, V_{DS} = 0\text{V}$	N-Ch	-	-	± 10	μA
			P-Ch	-	-	± 10	
$R_{DS(ON)}^a$	Drain-Source On-State Resistance	$V_{GS} = 4.5\text{V}, I_{DS} = 3\text{A}$	N-Ch	-	50	65	m Ω
		$V_{GS} = -4.5\text{V}, I_{DS} = -2\text{A}$	P-Ch	-	90	120	
		$V_{GS} = 2.5\text{V}, I_{DS} = 1.7\text{A}$	N-Ch	-	65	90	
		$V_{GS} = -2.5\text{V}, I_{DS} = -1\text{A}$	P-Ch	-	130	180	

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

Symbol	Parameter	Test Conditions	APM2701AC			Unit	
			Min.	Typ.	Max.		
Diode Characteristics							
V_{SD}^a	Diode Forward Voltage	$I_{SD}=0.5A, V_{GS}=0V$	N-Ch	-	0.7	1.3	V
		$I_{SD}=-0.5A, V_{GS}=0V$	P-Ch	-	-0.7	-1.3	
t_{rr}	Reverse Recovery Time	N-Channel $I_{SD}=3A,$ $dI_{SD}/dt=100A/\mu s$	N-Ch	-	11	-	ns
			P-Ch	-	12	-	
Q_{rr}	Reverse Recovery Charge	P-Channel $I_{SD}=-2A,$ $dI_{SD}/dt=100A/\mu s$	N-Ch	-	4	-	nC
			P-Ch	-	4	-	
Dynamic Characteristics^b							
C_{iss}	Input Capacitance	N-Channel $V_{GS}=0V,$ $V_{DS}=10V,$ Frequency=1.0MHz	N-Ch	-	300	-	pF
			P-Ch	-	375	-	
C_{oss}	Output Capacitance	P-Channel $V_{GS}=0V,$ $V_{DS}=-10V,$ Frequency=1.0MHz	N-Ch	-	70	-	pF
			P-Ch	-	70	-	
C_{riss}	Reverse Transfer Capacitance	N-Channel $V_{GS}=0V,$ $V_{DS}=-10V,$ Frequency=1.0MHz	N-Ch	-	50	-	pF
			P-Ch	-	50	-	
$t_{d(ON)}$	Turn-on Delay Time	N-Channel $V_{DD}=10V, R_L=10\Omega,$ $I_{DS}=1A, V_{GEN}=4.5V,$ $R_G=6\Omega$	N-Ch	-	4	8	ns
			P-Ch	-	6	12	
T_r	Turn-on Rise Time	P-Channel $V_{DD}=-10V, R_L=10\Omega,$ $I_{DS}=-1A, V_{GEN}=-4.5V,$ $R_G=6\Omega$	N-Ch	-	14	26	ns
			P-Ch	-	14	26	
$t_{d(OFF)}$	Turn-off Delay Time	N-Channel $V_{DD}=10V, R_L=10\Omega,$ $I_{DS}=1A, V_{GEN}=4.5V,$ $R_G=6\Omega$	N-Ch	-	21	39	ns
			P-Ch	-	27	50	
T_f	Turn-off Fall Time	P-Channel $V_{DD}=-10V, R_L=10\Omega,$ $I_{DS}=-1A, V_{GEN}=-4.5V,$ $R_G=6\Omega$	N-Ch	-	5	10	ns
			P-Ch	-	5	10	
Gate Charge Characteristics^b							
Q_g	Total Gate Charge	N-Channel $V_{DS}=10V, V_{GS}=4.5V,$ $I_{DS}=3A$	N-Ch	-	4.1	6	nC
			P-Ch	-	4.2	6	
Q_{gs}	Gate-Source Charge	P-Channel $V_{DS}=-10V, V_{GS}=-4.5V,$ $I_{DS}=-2A$	N-Ch	-	0.4	-	nC
			P-Ch	-	0.6	-	
Q_{gd}	Gate-Drain Charge	N-Channel $V_{DS}=10V, V_{GS}=4.5V,$ $I_{DS}=3A$	N-Ch	-	1.7	-	nC
			P-Ch	-	1.3	-	

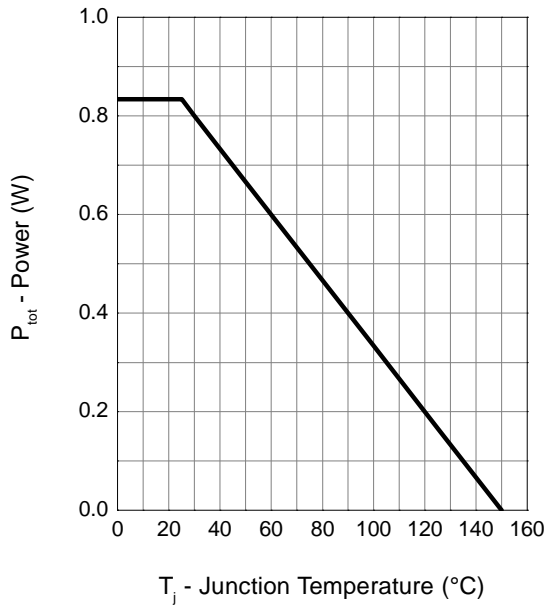
Note a : Pulse test ; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

Note b : Guaranteed by design, not subject to production testing.

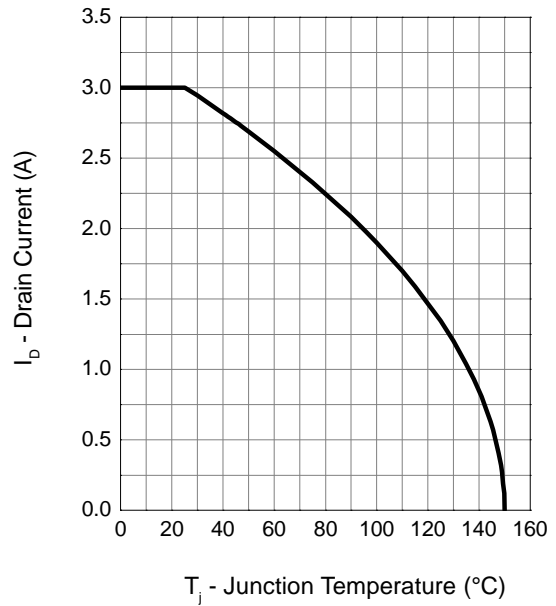
Typical Operating Characteristics

N-Channel

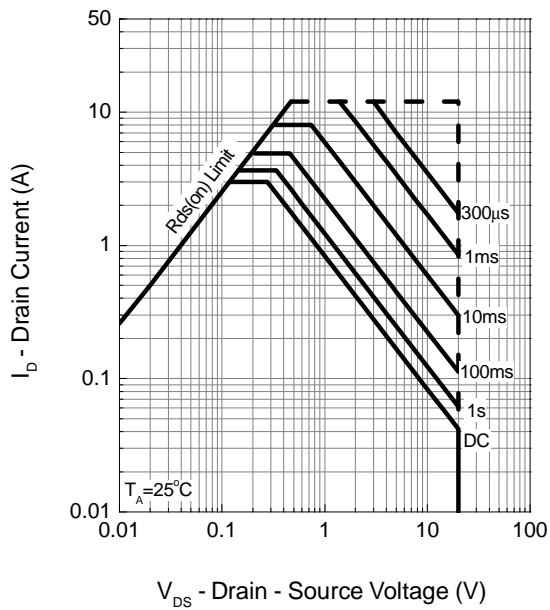
Power Dissipation



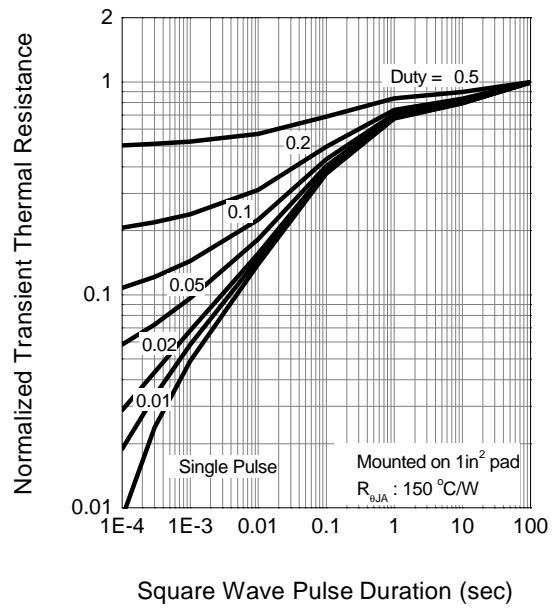
Drain Current



Safe Operation Area

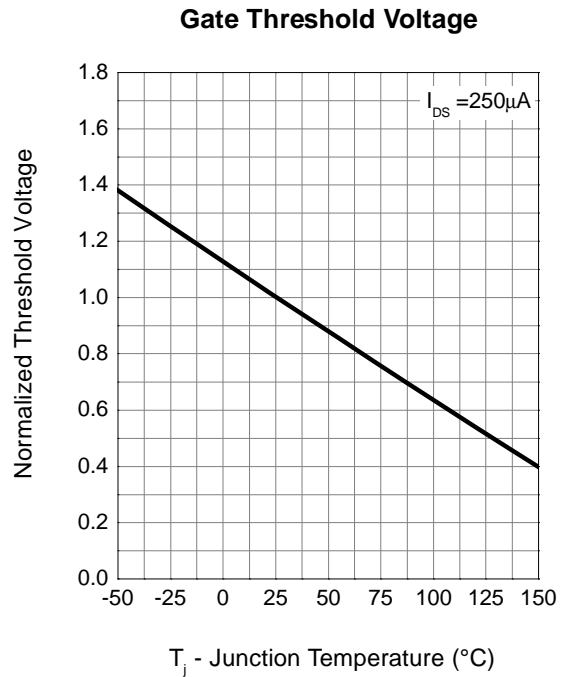
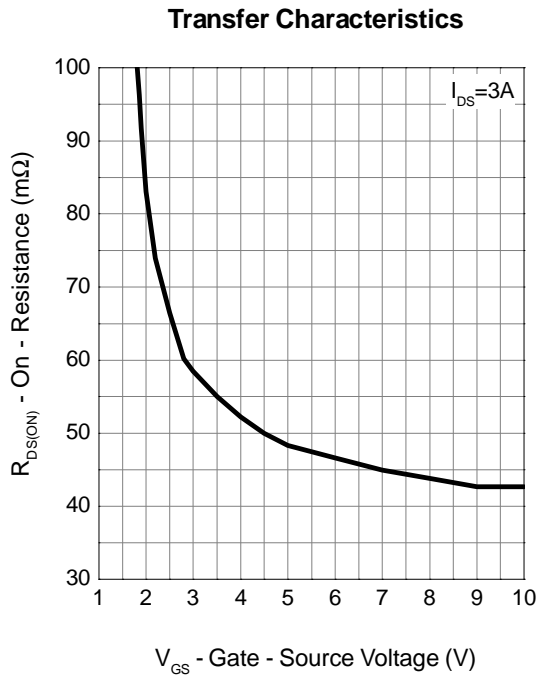
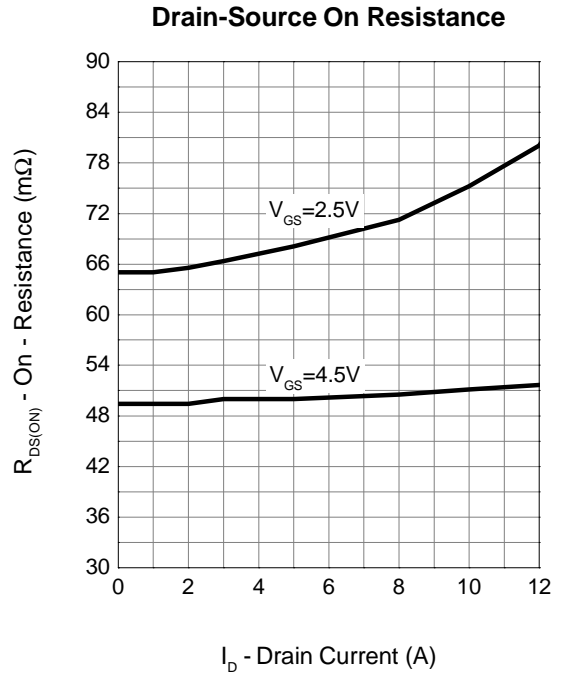
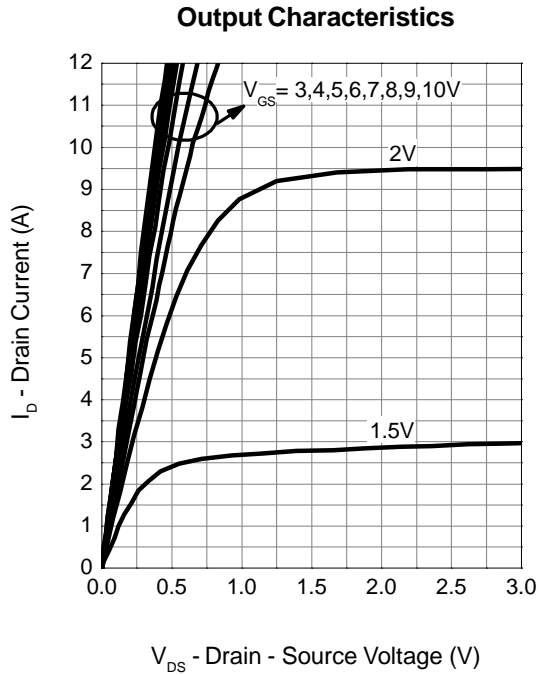


Thermal Transient Impedance



Typical Operating Characteristics (Cont.)

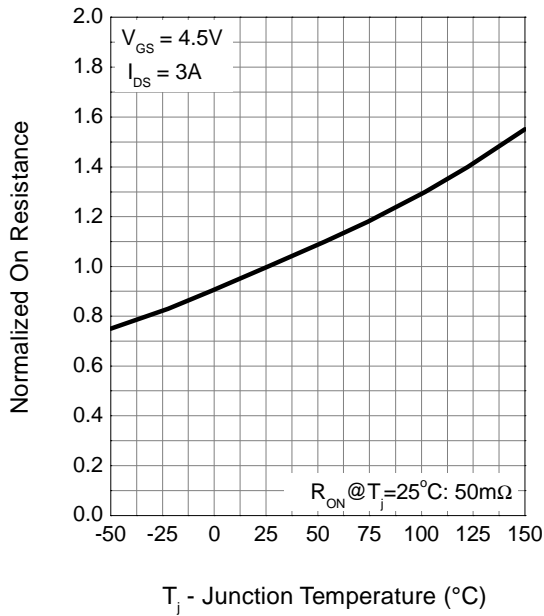
N-Channel



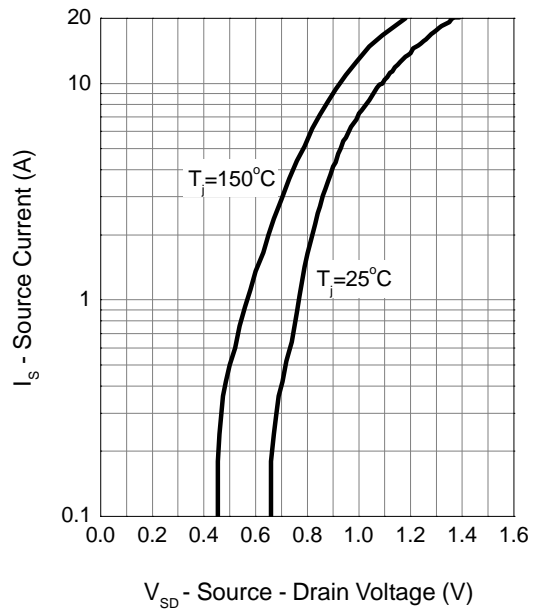
Typical Operating Characteristics (Cont.)

N-Channel

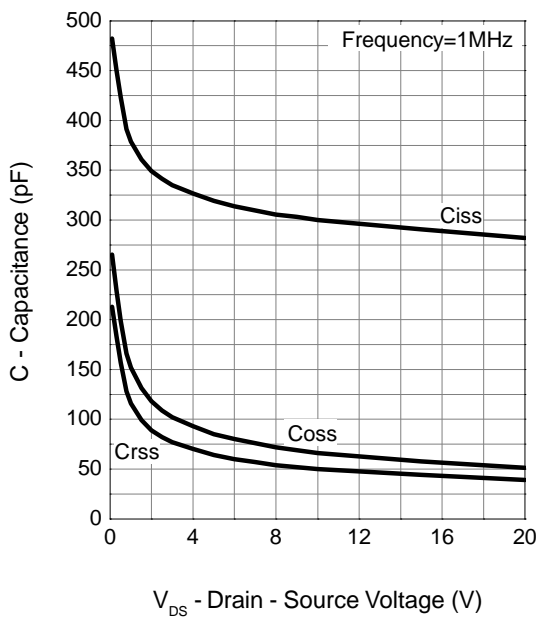
Drain-Source On Resistance



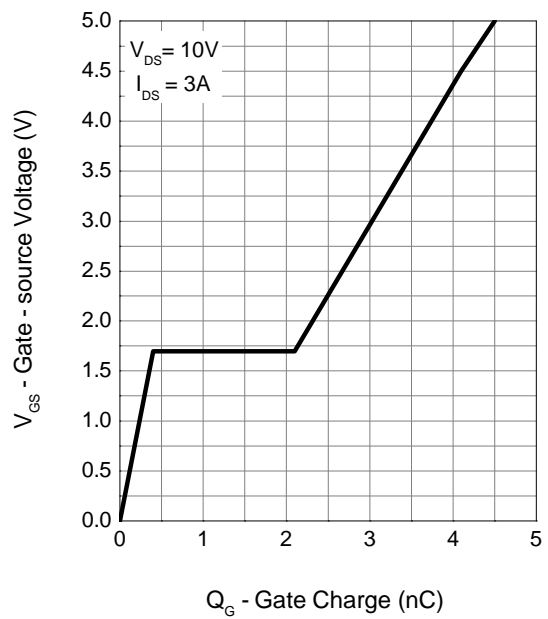
Source-Drain Diode Forward



Capacitance



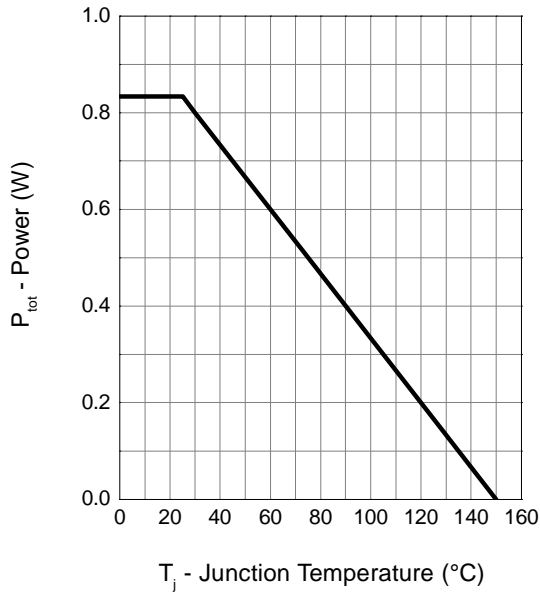
Gate Charge



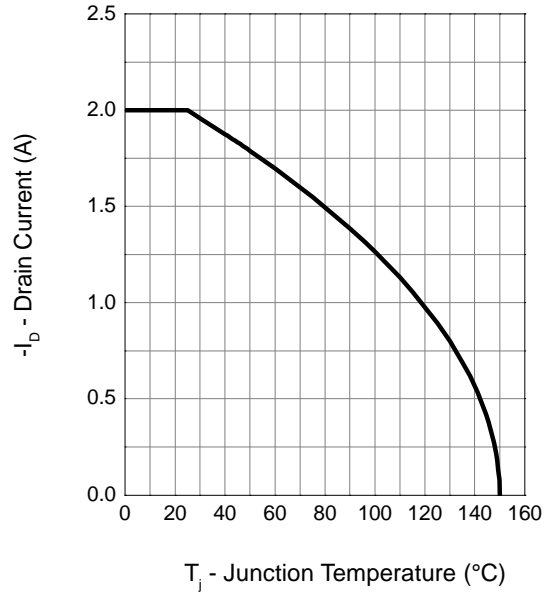
Typical Operating Characteristics (Cont.)

P-Channel

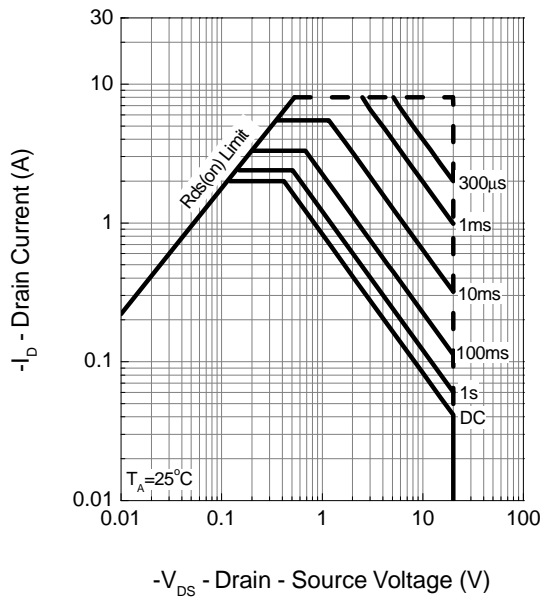
Power Dissipation



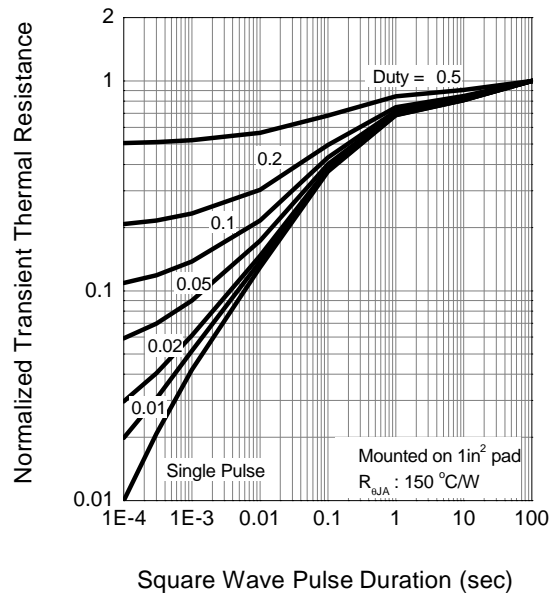
Drain Current



Safe Operation Area



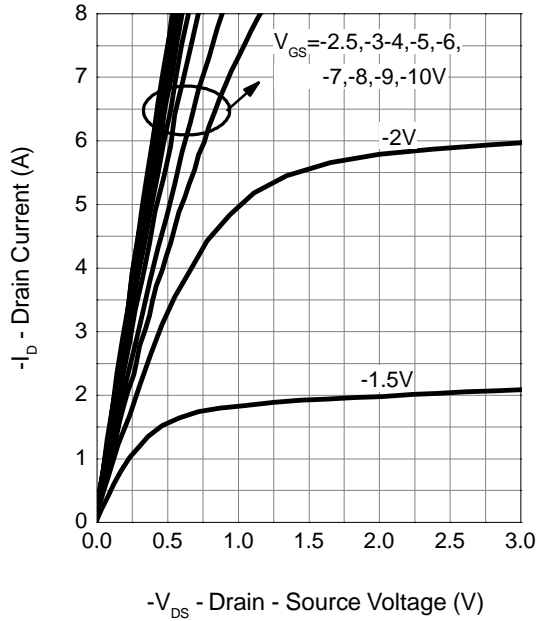
Thermal Transient Impedance



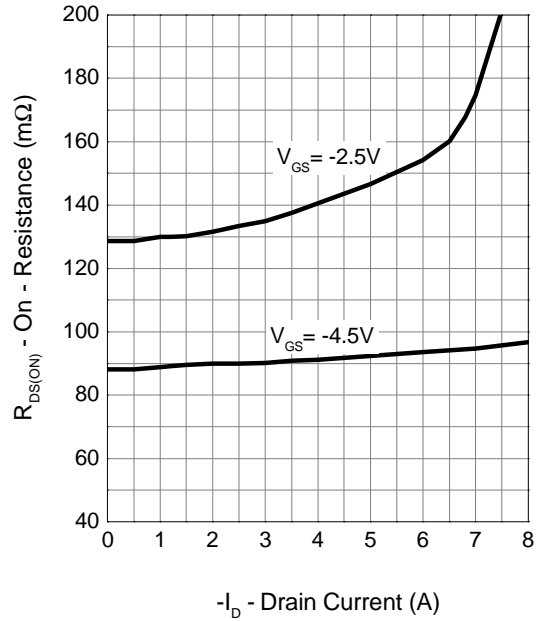
Typical Operating Characteristics (Cont.)

P-Channel

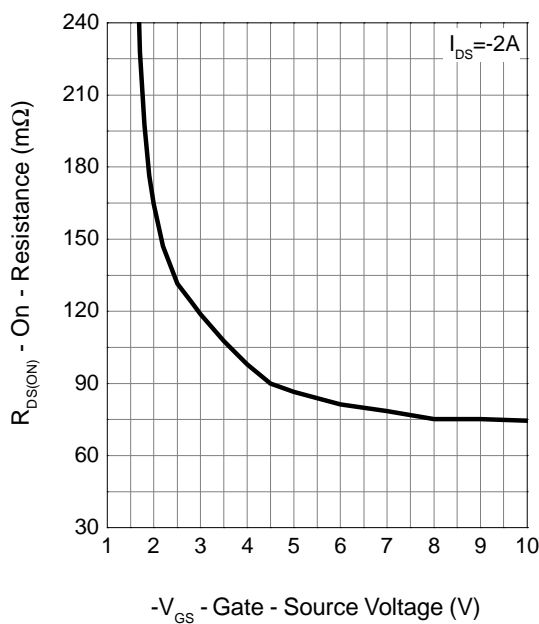
Output Characteristics



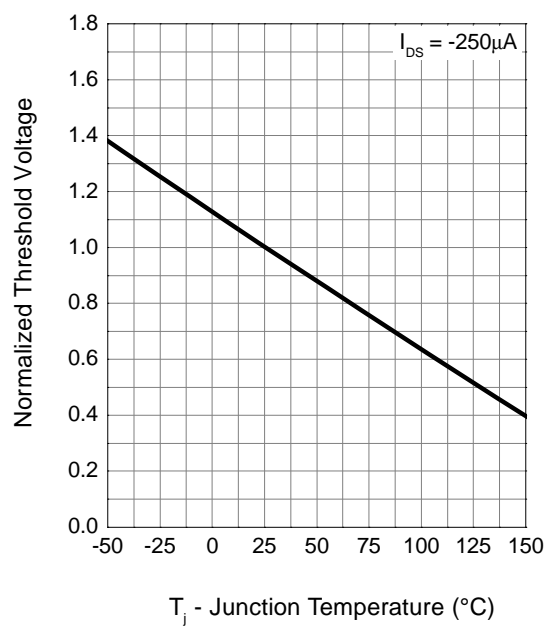
Drain-Source On Resistance



Transfer Characteristics



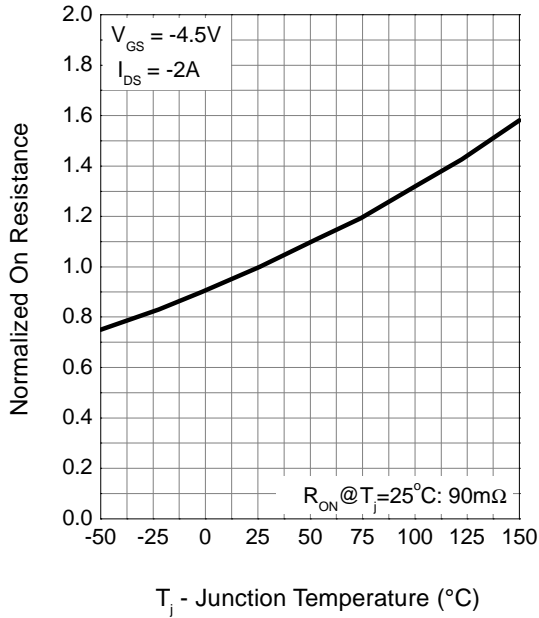
Gate Threshold Voltage



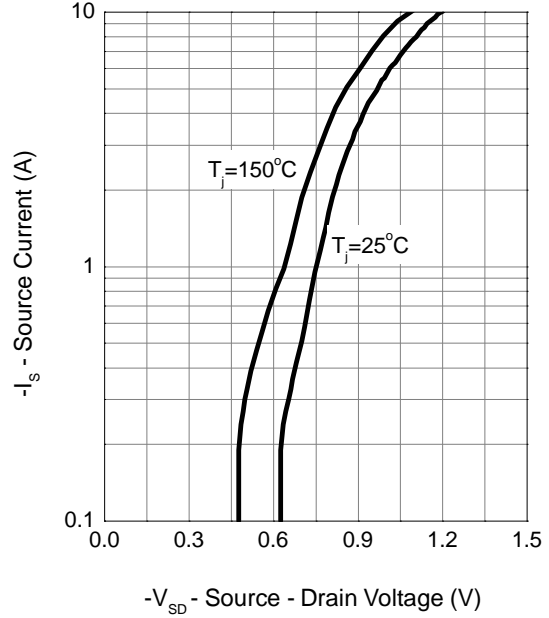
Typical Operating Characteristics (Cont.)

P-Channel

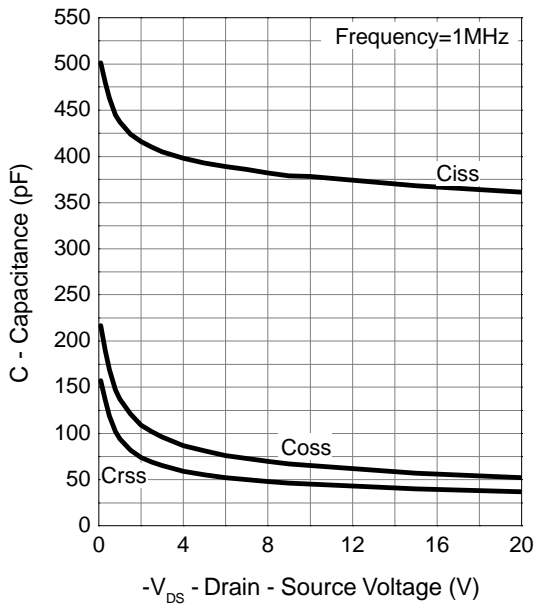
Drain-Source On Resistance



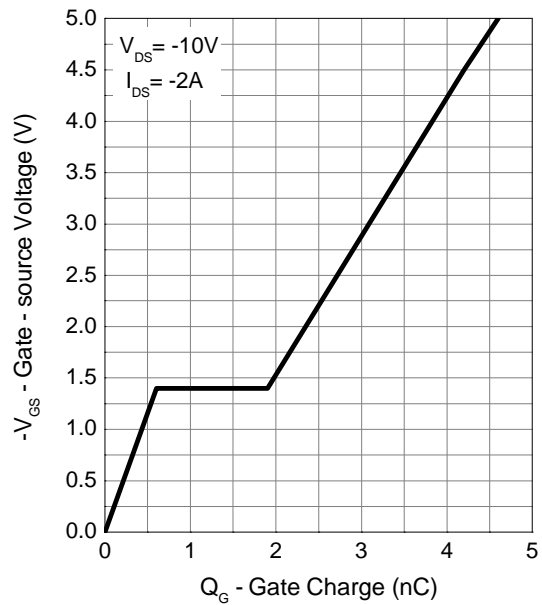
Source-Drain Diode Forward



Capacitance

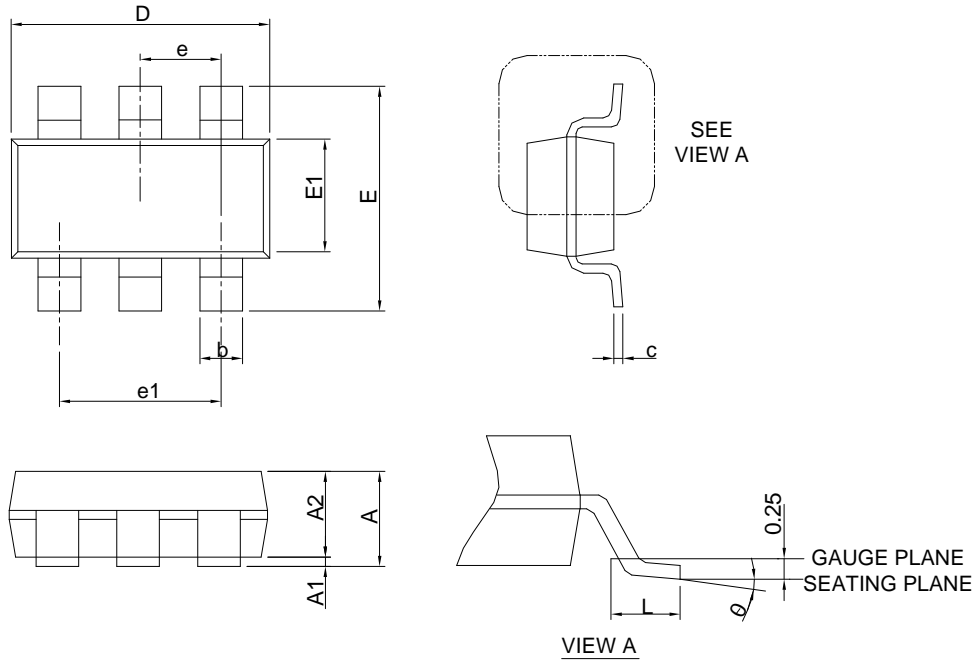


Gate Charge



Package Information

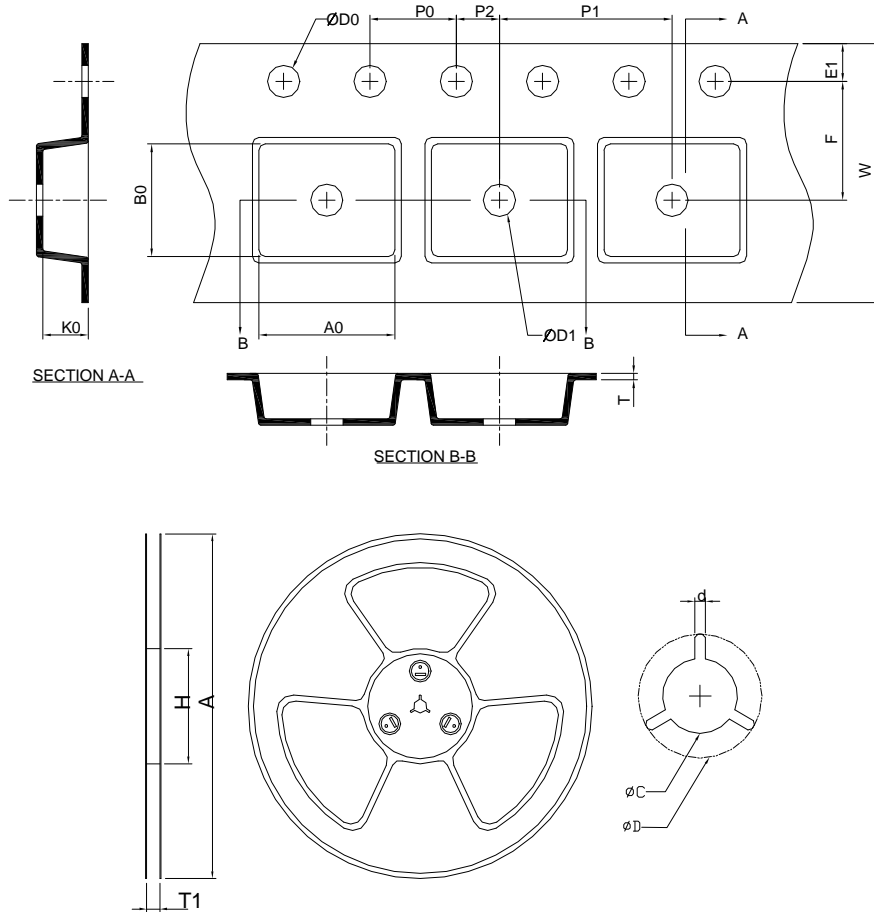
SOT-23-6



SYMBOL	SOT-23-6			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		1.45		0.057
A1	0.00	0.15	0.000	0.006
A2	0.90	1.30	0.035	0.051
b	0.30	0.50	0.012	0.020
c	0.08	0.22	0.003	0.009
D	2.70	3.10	0.106	0.122
E	2.60	3.00	0.102	0.118
E1	1.40	1.80	0.055	0.071
e	0.95 BSC		0.037 BSC	
e1	1.90 BSC		0.075 BSC	
L	0.30	0.60	0.012	0.024
θ	0°	8°	0°	8°

Note : 1. Follow JEDEC TO-178 AB.
 2. Dimension D and E1 do not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 10 mil per side.

Carrier Tape & Reel Dimensions



Application	A	H	T1	C	d	D	W	E1	F
SOT-23-6	178.0 ±0.00	50 MIN.	8.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	8.0 ±0.30	1.75 ±0.10	3.5 ±0.05
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0 ±0.10	4.0 ±0.10	2.0 ±0.05	1.5+0.10 -0.00	1.0 MIN.	0.6+0.00 -0.40	3.20 ±0.20	3.10 ±0.20	1.50 ±0.20

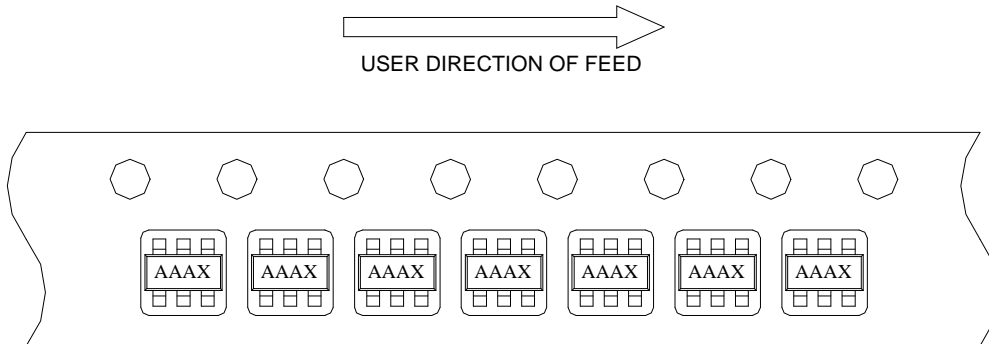
(mm)

Devices Per Unit

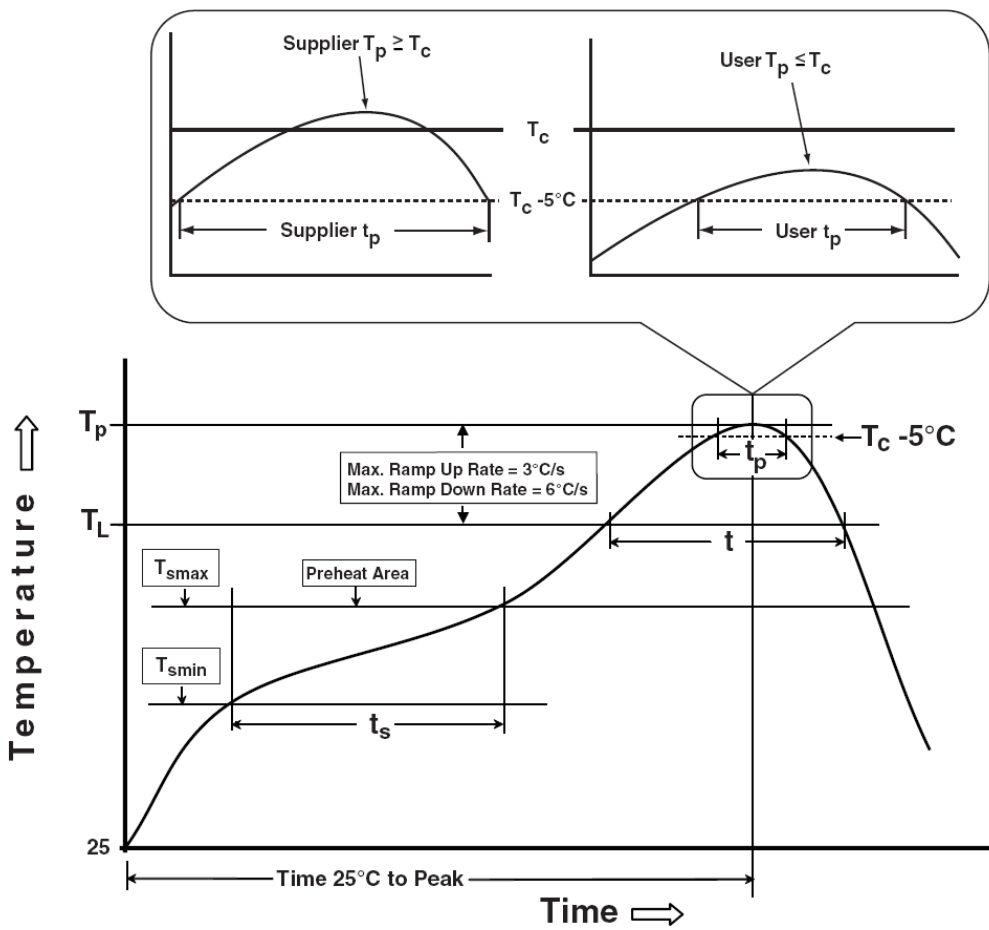
Package Type	Unit	Quantity
SOT-23-6	Tape & Reel	3000

Taping Direction Information

SOT-23-6



Classification Profile



Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{smin})	100 °C	150 °C
Temperature max (T_{smax})	150 °C	200 °C
Time (T_{smin} to T_{smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{smax} to T_p)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L)	183 °C	217 °C
Time at liquidous (t_L)	60-150 seconds	60-150 seconds
Peak package body Temperature (T_p)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_p)** within 5°C of the specified classification temperature (T_c)	20** seconds	30** seconds
Average ramp-down rate (T_p to T_{smax})	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (T_p) is defined as a supplier minimum and a user maximum.		
** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.		

Table 1. SnPb Eutectic Process – Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HOLT	JESD-22, A108	1000 Hrs, Bias @ 125°C
PCT	JESD-22, A102	168 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -65°C~150°C

Customer Service

Anpec Electronics Corp.

Head Office :

No.6, Dusing 1st Road, SBIP,

Hsin-Chu, Taiwan, R.O.C.

Tel : 886-3-5642000

Fax : 886-3-5642050

Taipei Branch :

2F, No. 11, Lane 218, Sec 2 Jhongsing Rd.,

Sindain City, Taipei County 23146, Taiwan

Tel : 886-2-2910-3838

Fax : 886-2-2917-3838