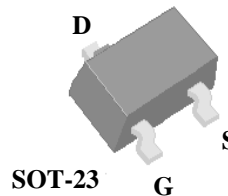




- ▼ Capable of 1.8V Gate Drive
- ▼ ESD Diode Protected
- ▼ Suit for USB Type-C Application
- ▼ RoHS Compliant & Halogen-Free

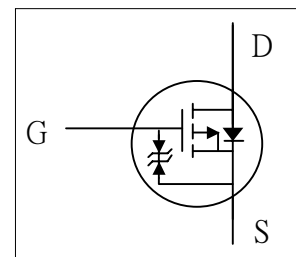


$BV_{DSS}$	-20V
$R_{DS(ON)}$	28m $\Omega$
$I_D$	-4.5A
HBM ESD	8KV

### Description

AP2P028E series are from Advanced Power innovated design and silicon process technology to achieve the lowest possible on-resistance and fast switching performance. It provides the designer with an extreme efficient device for use in a wide range of power applications.

The SOT-23 package is widely preferred for commercial-industrial surface mount applications and suited for low voltage applications such as DC/DC converters.



### Absolute Maximum Ratings @ $T_j=25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 8$	V
$I_D @ T_A=25^\circ\text{C}$	Drain Current <sup>3</sup> , $V_{GS}$ @ 4.5V	-4.5	A
$I_D @ T_A=70^\circ\text{C}$	Drain Current <sup>3</sup> , $V_{GS}$ @ 4.5V	-3.6	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	-20	A
$P_D @ T_A=25^\circ\text{C}$	Total Power Dissipation <sup>3</sup>	0.86	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$

### Thermal Data

Symbol	Parameter	Value	Unit
Rthj-a	Maximum Thermal Resistance, Junction-ambient <sup>3</sup>	145	$^\circ\text{C}/\text{W}$



**Electrical Characteristics @T<sub>j</sub>=25°C(unless otherwise specified)**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-20	-	-	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A	-	-	28	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-3A	-	-	41	mΩ
		V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-2A	-	-	50	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-1mA	-0.3	-	-1	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-4A	-	19	-	S
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V	-	-	-10	uA
I <sub>GSS</sub>	Gate-Source Leakage	V <sub>GS</sub> =±8V, V <sub>DS</sub> =0V	-	-	±30	uA
Q <sub>g</sub>	Total Gate Charge	I <sub>D</sub> =-4A	-	18	28.8	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =-10V	-	2	-	nC
Q <sub>gd</sub>	Gate-Drain ("Miller") Charge	V <sub>GS</sub> =-4.5V	-	3.5	-	nC
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DS</sub> =-10V	-	38	-	ns
t <sub>r</sub>	Rise Time	I <sub>D</sub> =-1A	-	40	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time	R <sub>G</sub> =3.3Ω	-	450	-	ns
t <sub>f</sub>	Fall Time	V <sub>GS</sub> =-5V	-	170	-	ns
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V	-	1620	2600	pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> =-10V	-	160	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	f=1.0MHz	-	125	-	pF

**Source-Drain Diode**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V <sub>SD</sub>	Forward On Voltage <sup>2</sup>	I <sub>S</sub> =-2A, V <sub>GS</sub> =0V	-	-	-1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> =-4A, V <sub>GS</sub> =0V,	-	210	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=100A/μs	-	500	-	nC

**Notes:**

- 1.Pulse width limited by Max. junction temperature.
- 2.Pulse test
- 3.Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board, t ≤ 10s ; 360°C/W when mounted on min. copper pad.

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.  
 USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.  
 APEC DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED  
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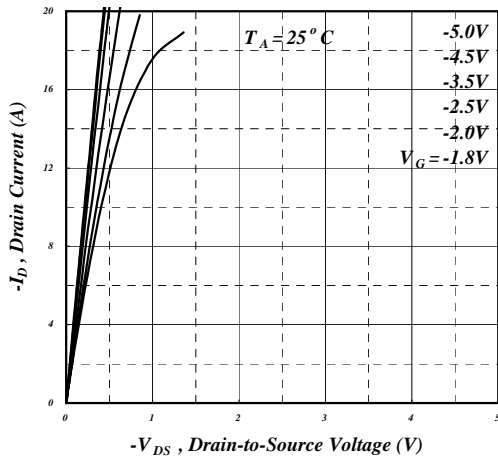


Fig 1. Typical Output Characteristics

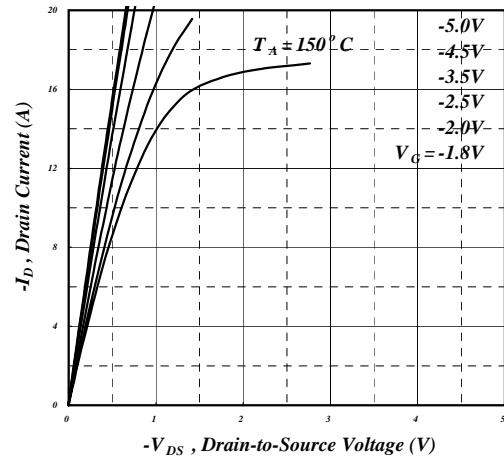


Fig 2. Typical Output Characteristics

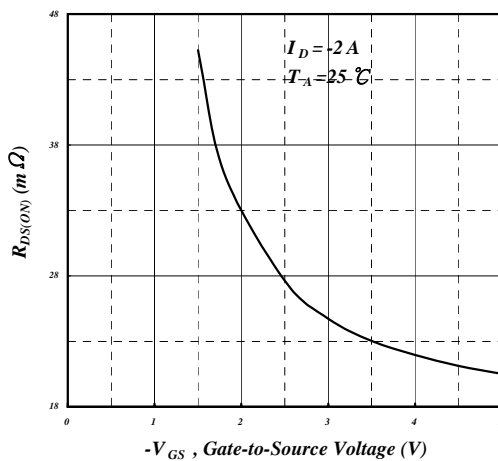


Fig 3. On-Resistance v.s. Gate Voltage

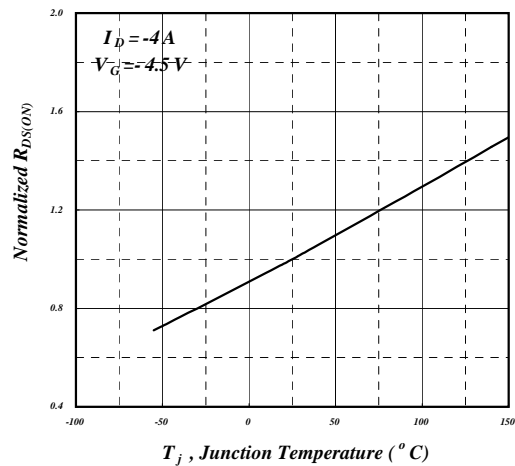


Fig 4. Normalized On-Resistance v.s. Junction Temperature

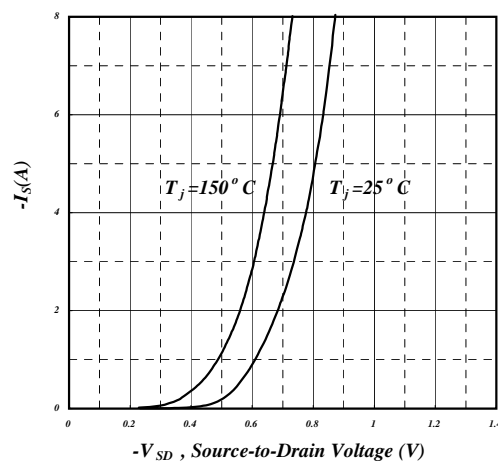


Fig 5. Forward Characteristic of Reverse Diode

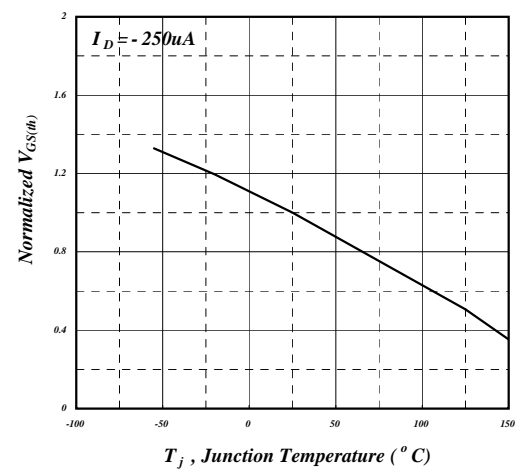


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

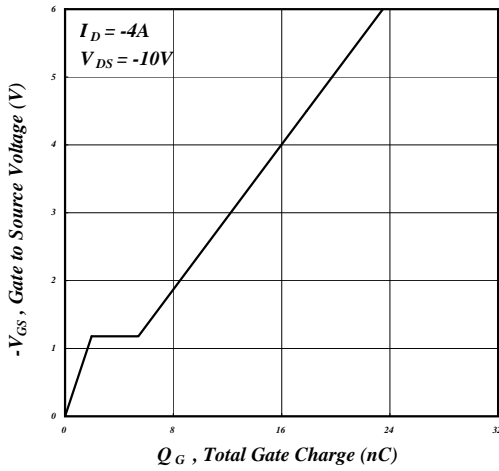


Fig 7. Gate Charge Characteristics

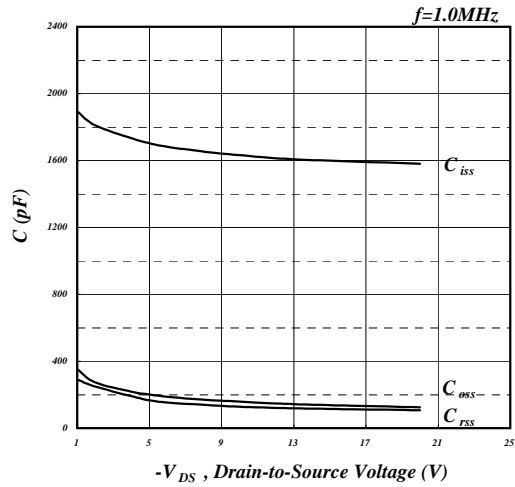


Fig 8. Typical Capacitance Characteristics

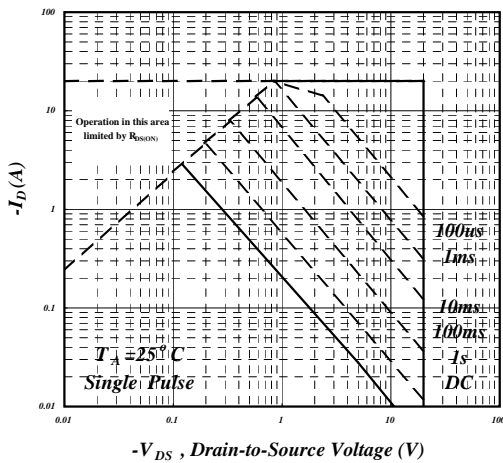


Fig 9. Maximum Safe Operating Area

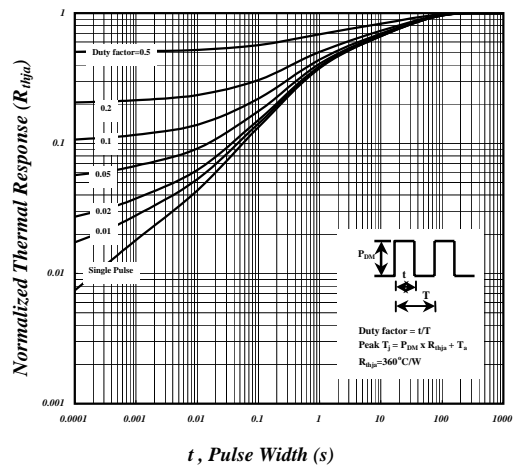


Fig 10. Effective Transient Thermal Impedance

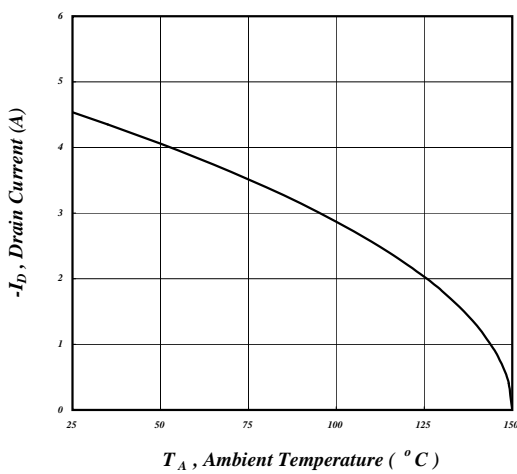


Fig 11. Drain Current v.s. Ambient Temperature

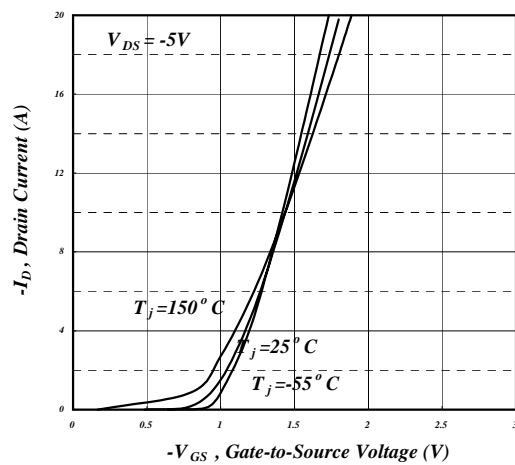


Fig 12. Transfer Characteristics

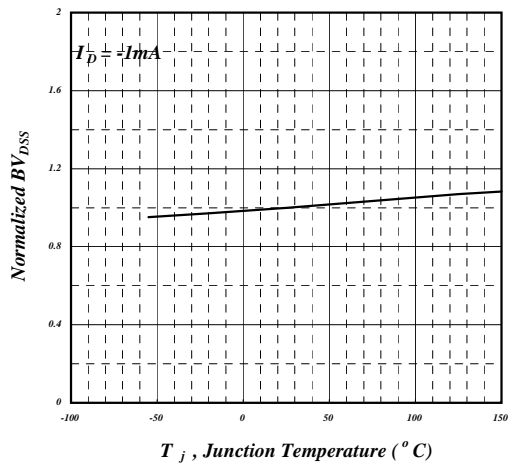


Fig 13. Normalized  $BV_{DSS}$  v.s. Junction Temperature

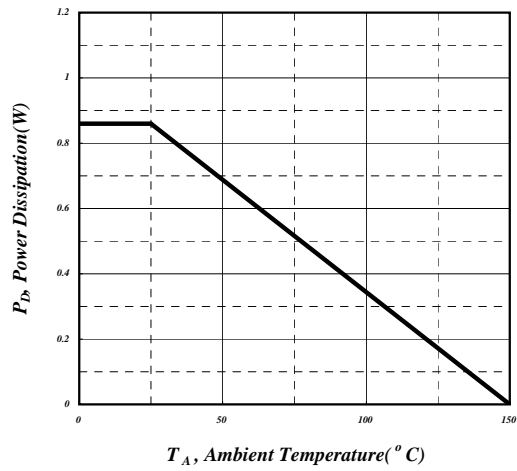


Fig 14. Total Power Dissipation

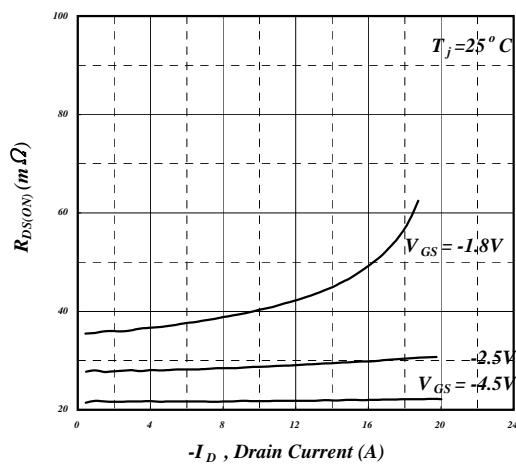


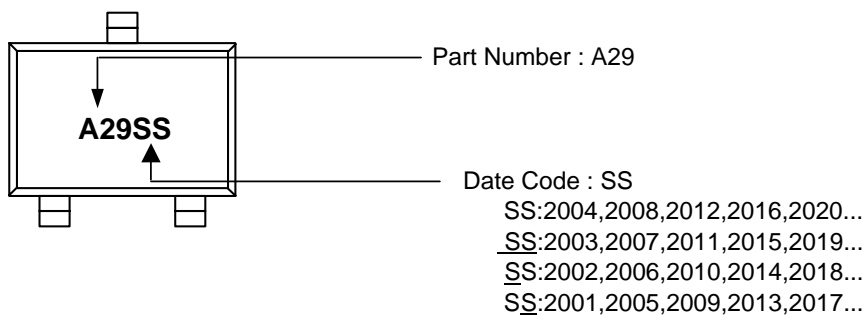
Fig 15. Typ. Drain-Source on State Resistance



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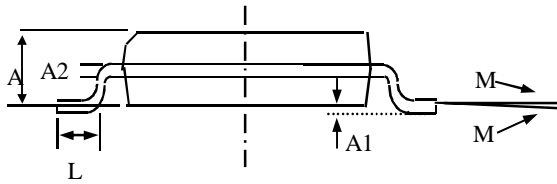
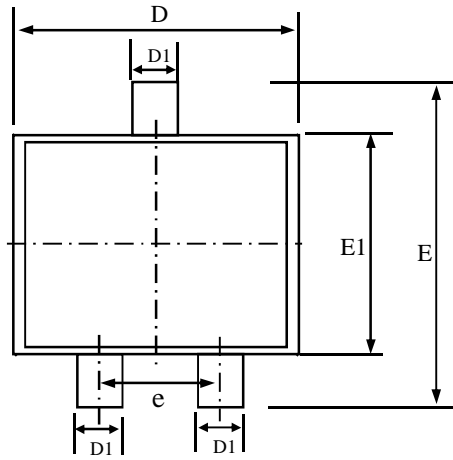
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## MARKING INFORMATION





## Package Outline : SOT-23

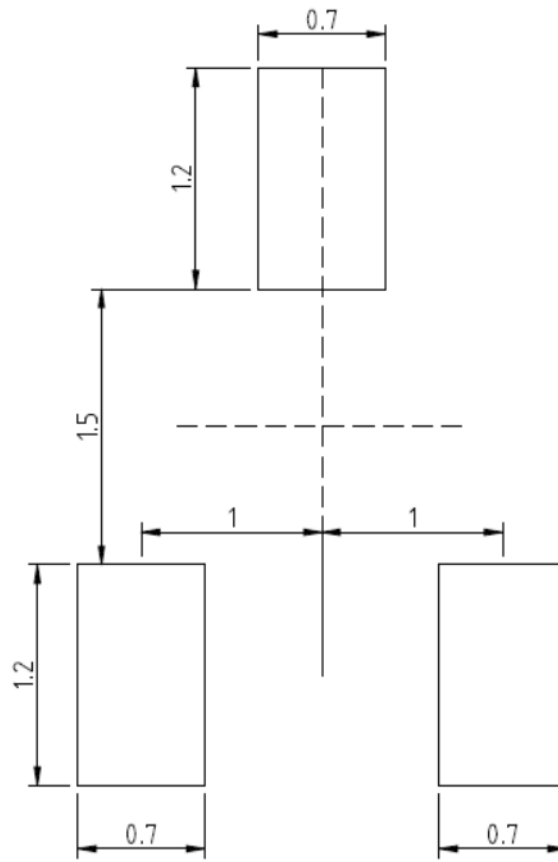


SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	0.90	1.08	1.25
A1	0.00	0.08	0.15
A2	0.08	0.17	0.25
D1	0.30	0.40	0.50
e	1.70	2.00	2.30
D	2.70	2.90	3.10
E	2.40	2.70	3.00
E1	1.40	1.60	1.80
M	0°	5°	10°
L	0.30	0.45	0.60

1. All Dimension Are In Millimeters.
2. Dimension Does Not Include Mold Protrusions.
3. Does not Contain Dam Bar Dimension.



SOT-23 FOOTPRINT :



UNIT: mm