

## 100V N-Channel Enhancement Mode MOSFET

### Description

The AP40N10P uses advanced **APM-SGT<sub>11</sub>** technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 10V. This device is suitable for use as a Battery protection or in other Switching application.

### General Features

$V_{DS} = 100V$   $I_D = 40A$

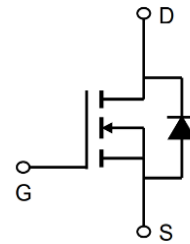
$R_{DS(ON)} < 25m\Omega$  @  $V_{GS}=10V$  (Type: **18mΩ**)

### Application

DC/DC Converter

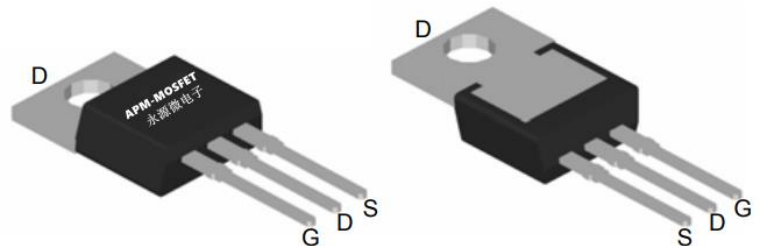
LED Backlighting

Power Management Switches



Top View

Bottom View



### Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP40N10P	TO-220-3L	AP40N10P XXX YYYY	1000

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

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	100	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D@T_C=25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V$	38	A
$I_D@T_C=100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V$	18	A
IDM	Pulsed Drain Current	100	A
EAS	Single Pulse Avalanche Energy	160	mJ
IAS	Avalanche Current	53.4	A
$P_D@T_C=25^\circ\text{C}$	Total Power Dissipation <sup>4</sup>	27	W
TSTG	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	4.65	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case	62	$^\circ\text{C/W}$

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### Electrical Characteristics (T<sub>c</sub>=25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
BVDSS	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	100	108	-	V
IDSS	Drain-Source Leakage Current	V <sub>DS</sub> = 80V, V <sub>GS</sub> = 0V	-	-	1	μA
IGSS	Gate to Body Leakage Current	V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V	-	-	±100	nA
VGS(th)	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.0	2.8	4.0	V
RDS(on)	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 15A	-	18	25	mΩ
		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 10A	-	28	38	mΩ
g <sub>fs</sub>	Forward Threshold Voltage	V <sub>DS</sub> = 10V, I <sub>D</sub> = 20A	-	22	-	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> = V <sub>GS</sub> = 0V, f = 1.0MHz	-	1.62	-	Ω
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 50V, V <sub>GS</sub> = 0V, f = 1.0MHz	-	822	-	pF
C <sub>oss</sub>	Output Capacitance		-	310	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	23.5	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 50V, I <sub>D</sub> = 20A, V <sub>GS</sub> = 10V	-	22.7	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	6.2	-	
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	5.3	-	
td(on)	Turn-On Delay Time	V <sub>DS</sub> = 50V, I <sub>D</sub> = 20A, R <sub>G</sub> = 3Ω, V <sub>GS</sub> = 10V	-	15	-	ns
t <sub>r</sub>	Turn-On Rise Time		-	3.2	-	
td(off)	Turn-Off Delay Time		-	30	-	
t <sub>f</sub>	Turn-Off Fall Time		-	7.6	-	
I <sub>s</sub>	Continuous Source Current		-	-	25	A
VSD	Diode Forward Voltage	I <sub>S</sub> = 20A, V <sub>GS</sub> = 0V	-	0.88	1.0	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = 20A, dI <sub>SD</sub> /dt = 100A/μs	-	45	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	59	-	nC

#### Notes:

- 1、 The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3、 The EAS data shows Max. rating . The test condition is V<sub>DD</sub> = 50V, V<sub>GS</sub> = 10V, L = 0.5mH, I<sub>AS</sub> = 8A
- 4、 The power dissipation is limited by 150°C junction temperature
- 5、 The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.

### Typical Characteristics

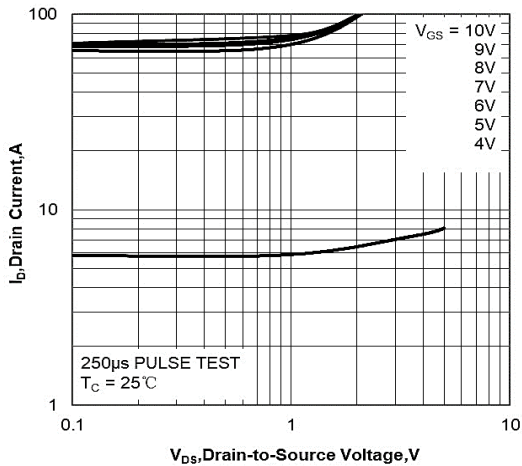


Figure 1. Output Characteristics

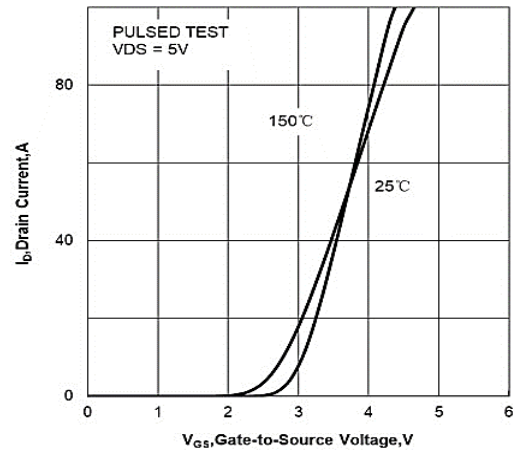


Figure 2. Transfer Characteristics

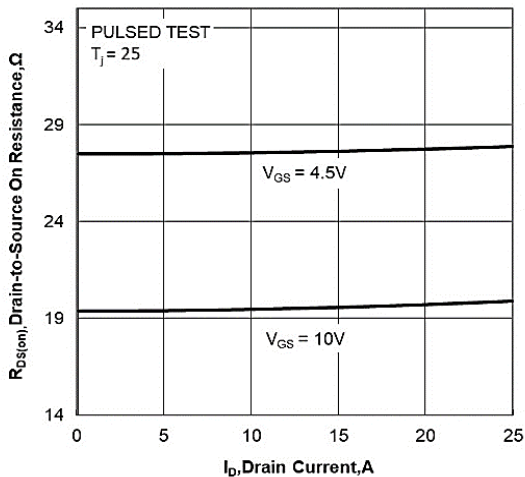


Figure 3. Drain-to-Source On Resistance vs Drain Current

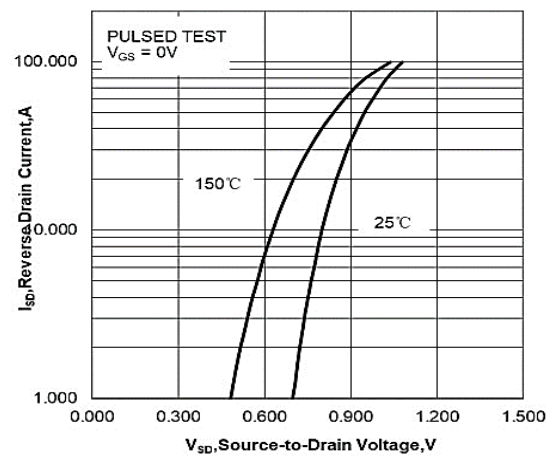


Figure 4. Body Diode Forward Voltage vs Source Current and Temperature

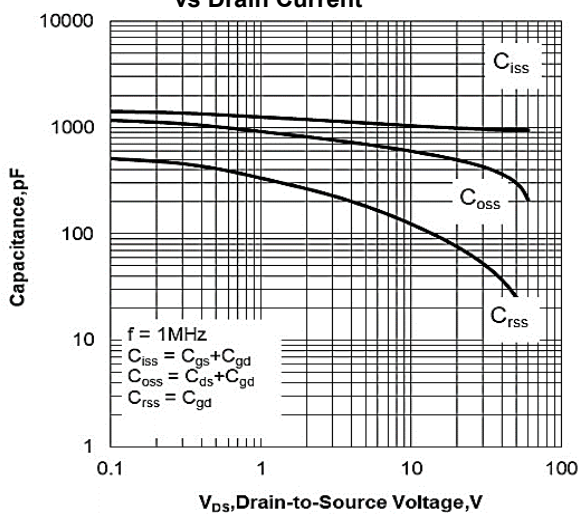


Figure 5. Capacitance Characteristics

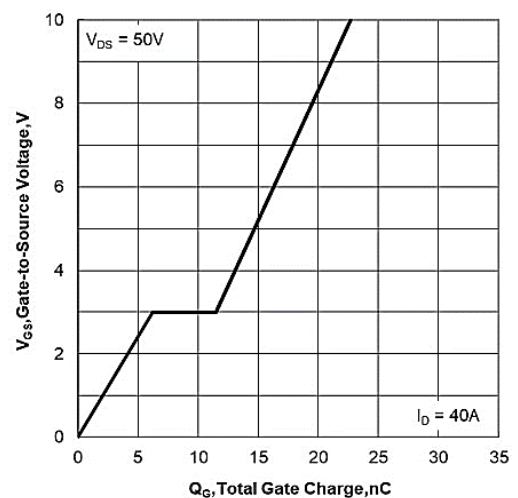


Figure 6. Gate Charge Characteristics



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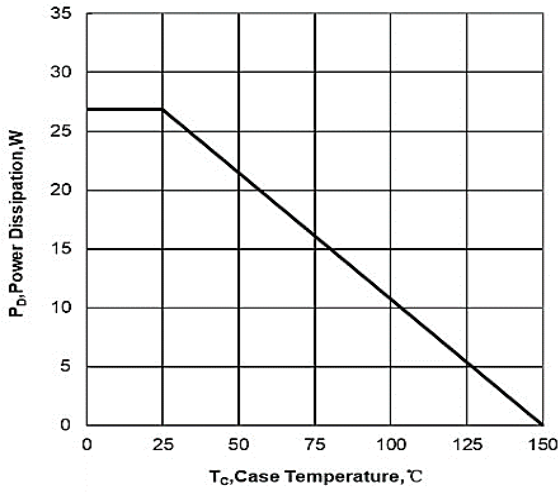


Figure 9. Maximum Continuous Drain Current vs Case Temperature

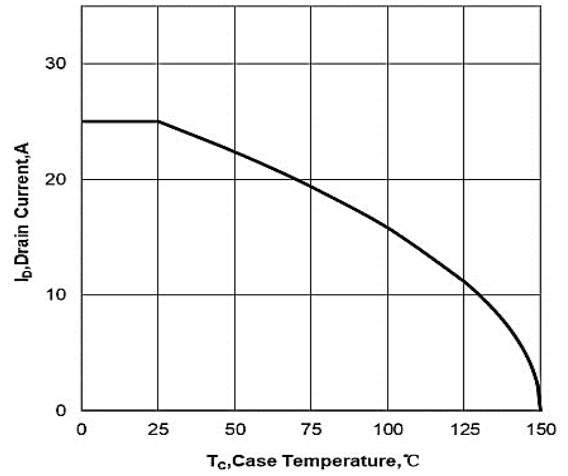


Figure 10. Maximum Power Dissipation vs Case Temperature

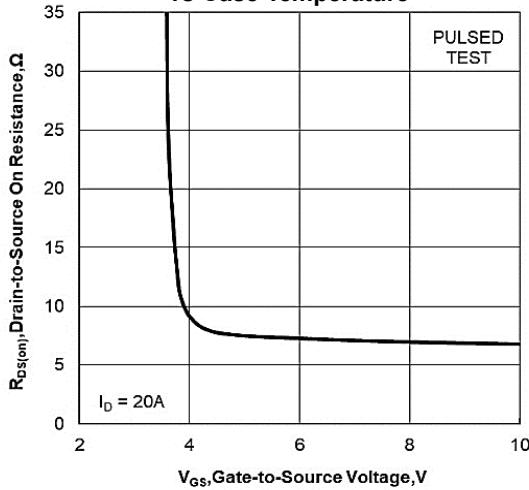


Figure 11. Drain-to-Source On Resistance vs Gate Voltage and Drain Current

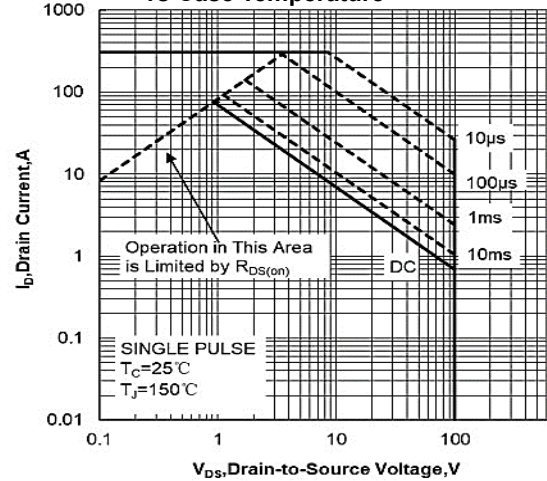


Figure 12. Maximum Safe Operating Area

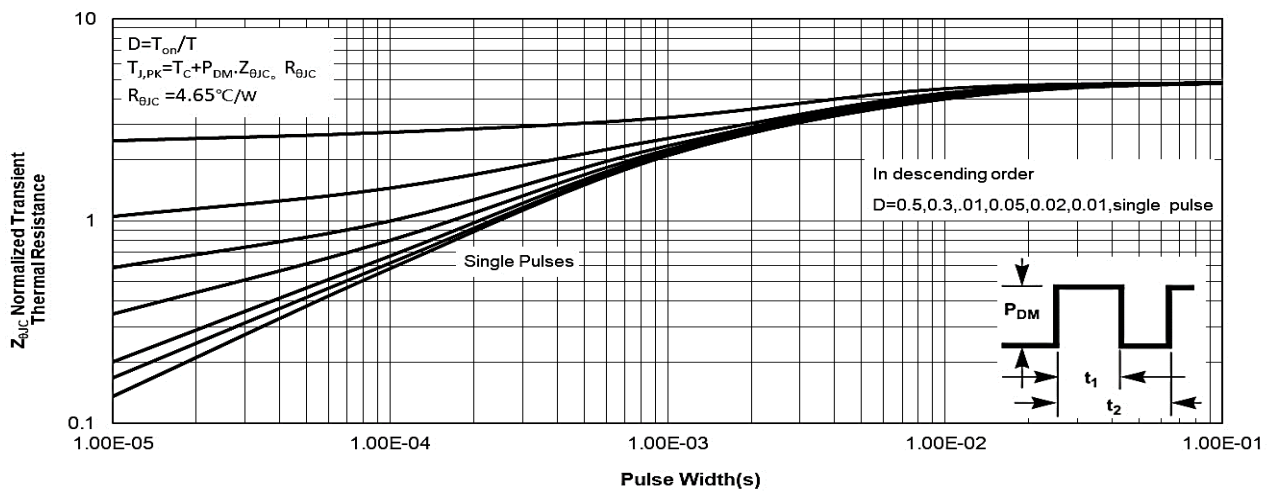
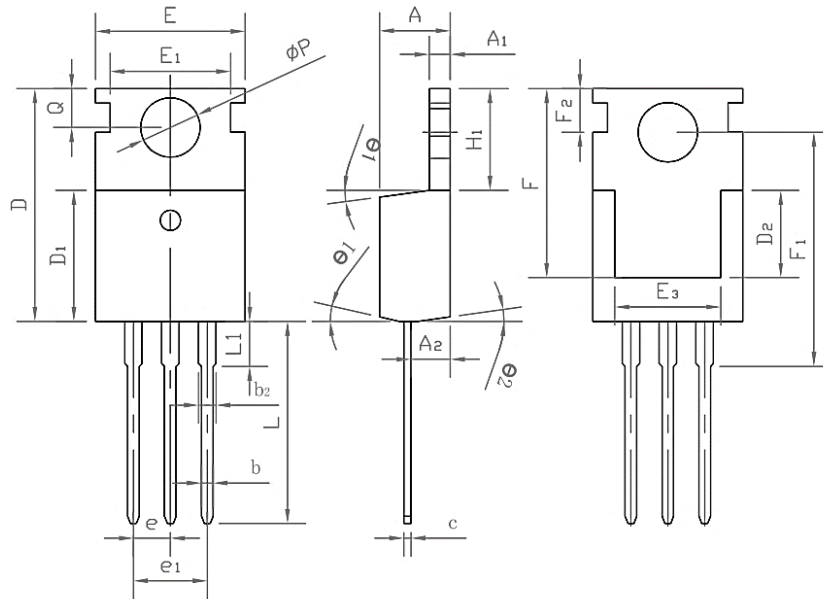


Figure 13. Maximum Effective Transient Thermal Impedance, Junction-to-Case

### Package Mechanical Data-TO-220-3L-SLK



Symbol	Common		
	mm		
	Mim	Nom	Max
A	4.27	4.57	4.87
A1	1.15	1.30	1.45
A2	2.10	2.40	2.70
b	0.70	0.80	1.00
b2	1.17	1.27	1.50
D	0.40	0.50	0.65
D1	8.80	9.10	9.40
D2	5.70	6.70	7.00
E	9.70	10.00	10.30
E1	-	8.70	-
E2	9.63	10.00	10.35
E3	7.00	8.00	8.40
e		0.37	
e1		0.10	
H1	6.00	6.50	6.85
L	12.75	13.50	13.90
L1	-	3.10	3.40
$\Phi p$	3.45	3.60	3.75
Q	2.60	2.80	3.00
$\theta 1$	4°	7°	10°
$\theta 2$	0°	3°	6°
F	13.30	13.50	13.70
F1	15.50	15.90	16.30
F2	2.80	3.00	3.20

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Edition	Date	Change
Rve1.0	2022/2/2	Initial release

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