



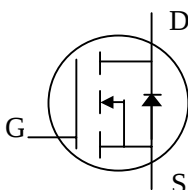
N-channel Enhancement-mode Power MOSFET

Simple Drive Requirement

Good Thermal Performance

Low On-resistance

RoHS-compliant, halogen-free

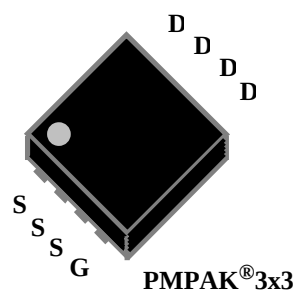


BV_{DS}	30V
$R_{DS(ON)}$	18m Ω
I_D	11.5A

Description

Advanced Power MOSFETs from APEC provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The PMPAK[®]3x3 package is specially designed for DC-DC converter applications, with a small foot print that offers a backside heat sink and a low package profile.



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D at $T_A=25^\circ\text{C}$	Continuous Drain Current ³	11.5	A
I_D at $T_A=70^\circ\text{C}$	Continuous Drain Current ³	9.4	A
I_{DM}	Pulsed Drain Current ¹	40	A
P_D at $T_A=25^\circ\text{C}$	Total Power Dissipation	3.57	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	Units
Rthj-c	Maximum Thermal Resistance, Junction-case ³	6	$^\circ\text{C/W}$
Rthj-a	Maximum Thermal Resistance, Junction-ambient ³	35	$^\circ\text{C/W}$

Ordering Information

AP9402GYT-HF-3TR

RoHS-compliant halogen-free PMPAK[®]3x3, shipped on tape
and reel (3000pcs/reel)

PMPAK[®] is a registered trademark of Advanced Power Electronics Corp.



Electrical Specifications at $T_j=25^{\circ}\text{C}$ (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	-	-	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V, I_D=10A$	-	14	18	$m\Omega$
		$V_{GS}=4.5V, I_D=8A$	-	25	30	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.5	3	V
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=10A$	-	23	-	S
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=30V, V_{GS}=0V$	-	-	10	μA
I_{GSS}	Gate-Source Leakage	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
Q_g	Total Gate Charge ²	$I_D=10A$	-	6.5	10.4	nC
Q_{gs}	Gate-Source Charge	$V_{DS}=15V$	-	2	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	$V_{GS}=4.5V$	-	3.5	-	nC
$t_{d(on)}$	Turn-on Delay Time ²	$V_{DS}=15V$	-	7	-	ns
t_r	Rise Time	$I_D=1A$	-	6	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=3.3\Omega, V_{GS}=10V$	-	17	-	ns
t_f	Fall Time		-	4	-	ns
C_{iss}	Input Capacitance	$V_{GS}=0V$	-	510	820	pF
C_{oss}	Output Capacitance	$V_{DS}=15V$	-	110	-	pF
C_{rss}	Reverse Transfer Capacitance	$f=1.0\text{MHz}$	-	90	-	pF
R_g	Gate Resistance	$f=1.0\text{MHz}$	-	1.4	2.2	Ω

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward On Voltage ²	$I_S=2.9A, V_{GS}=0V$	-	-	1.2	V
t_{rr}	Reverse Recovery Time ²	$I_S=10A, V_{GS}=0V,$	-	18	-	ns
Q_{rr}	Reverse Recovery Charge	$dI/dt=100A/\mu s$	-	9	-	nC

Notes:

1. Pulse width limited by maximum junction temperature
2. Pulse test
3. Surface mounted on 1 in² copper pad of FR4 board, $t \leq 10\text{sec}$, 85°C at steady state.

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 HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

APEC RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN.



Typical Electrical Characteristics

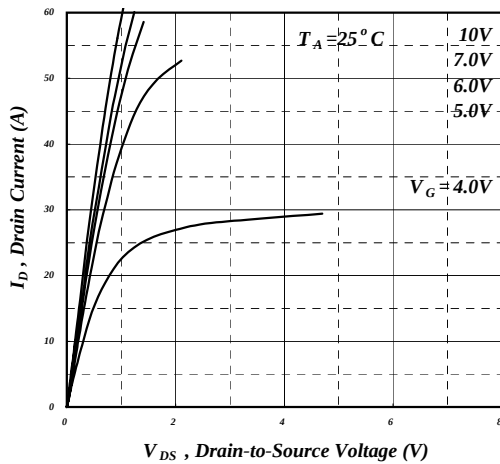


Fig 1. Typical Output Characteristics

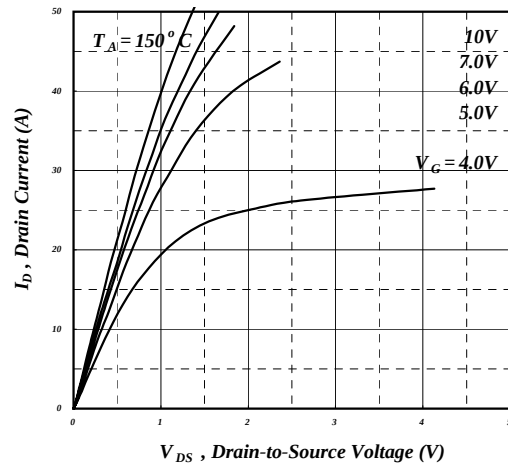


Fig 2. Typical Output Characteristics

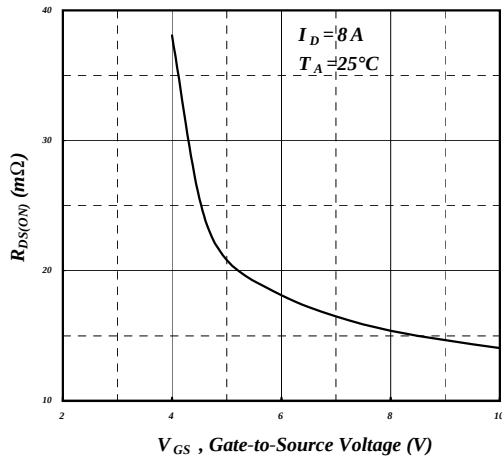


Fig 3. On-Resistance vs. Gate Voltage

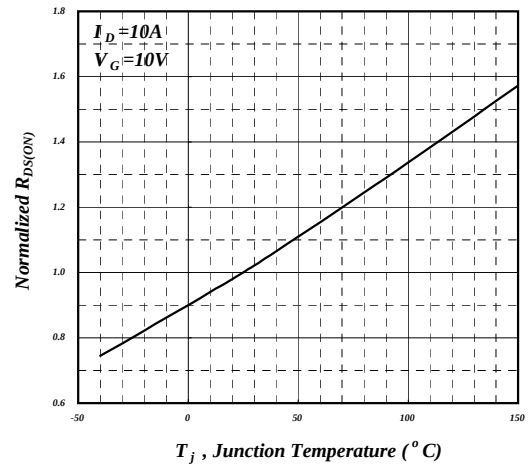


Fig 4. Normalized On-Resistance
vs. Junction Temperature

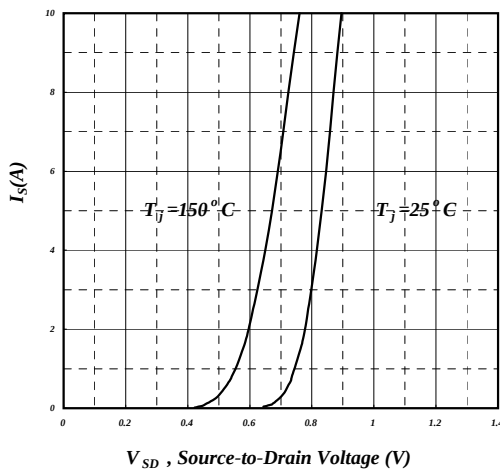


Fig 5. Forward Characteristic of
Reverse Diode

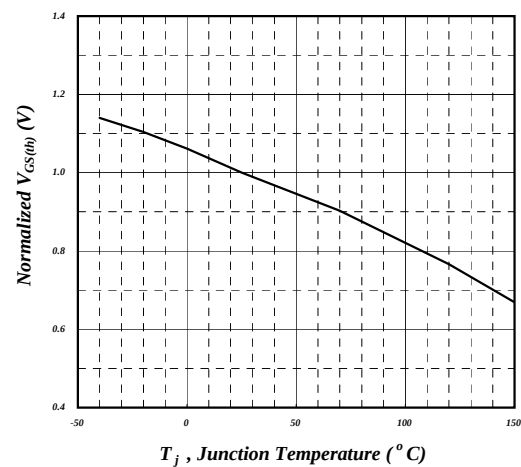


Fig 6. Gate Threshold Voltage vs.
Junction Temperature



Typical Electrical Characteristics (cont.)

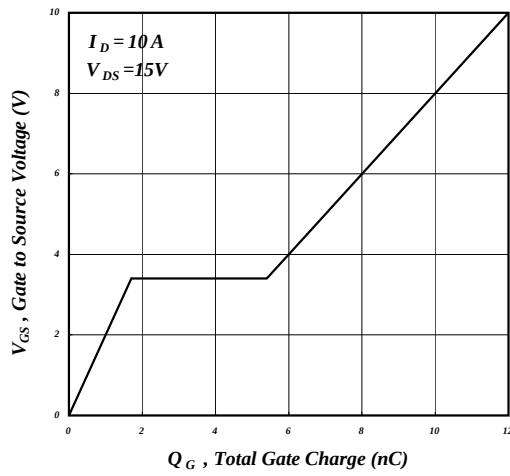


Fig 7. Gate Charge Characteristics

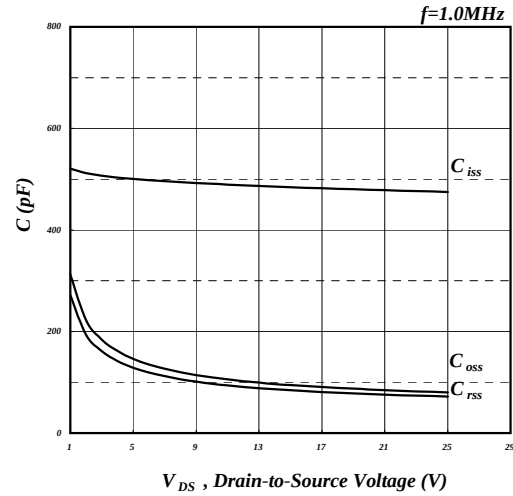


Fig 8. Typical Capacitance Characteristics

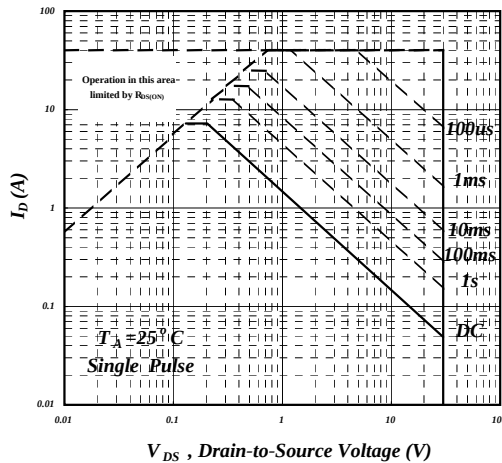


Fig 9. Maximum Safe Operating Area

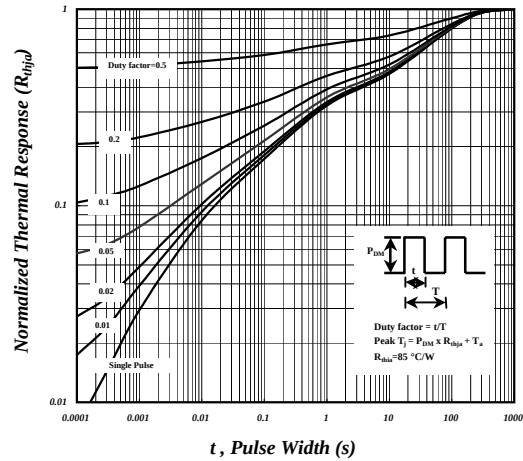


Fig 10. Effective Transient Thermal Impedance

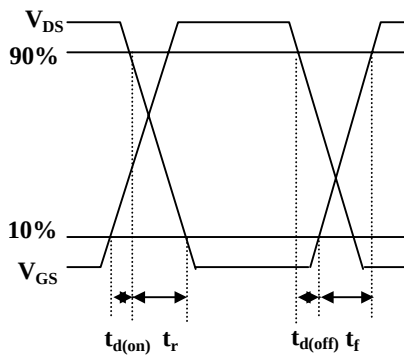


Fig 11. Switching Time Waveforms

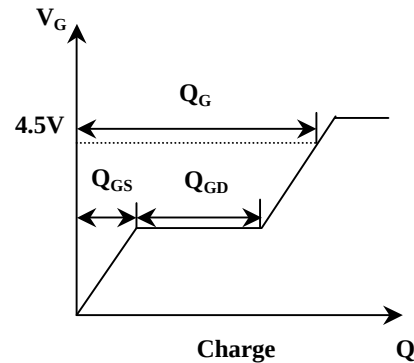
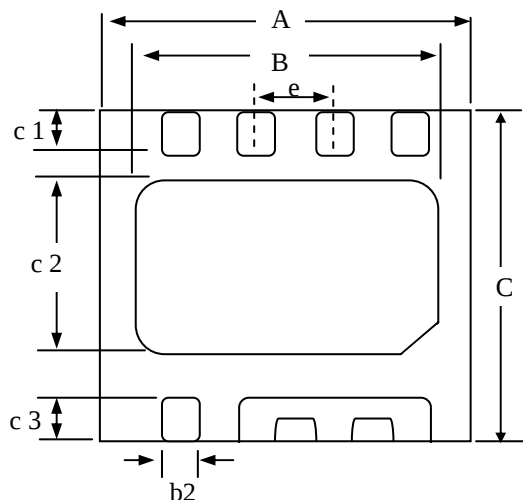


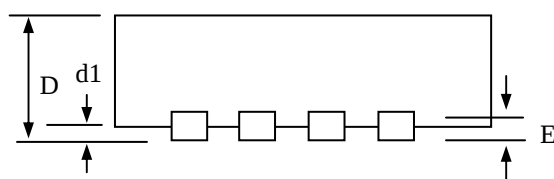
Fig 12. Gate Charge Waveform



Package Dimensions: PMPAK[®]3x3

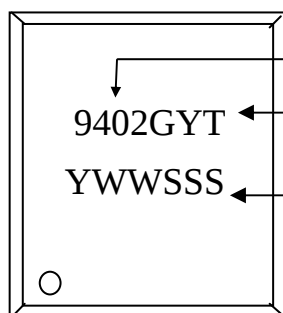


SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	2.95	3.00	3.05
B	2.35	2.40	2.45
e	0.65 (ref.)		
b2	0.30	0.35	0.40
C	2.95	3.00	3.05
c1	0.37	0.42	0.47
c2	1.65	1.70	1.75
c3	0.37	0.42	0.47
D	0.80	0.85	0.95
d1	0.00	-	0.05
E	0.178	0.203	0.228



1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information:



Product: AP9402

9402GYT

Package code:

GYT = RoHS-compliant halogen-free PMPAK[®]3x3

YWWSSS

Date Code (YWWSSS)

Y: Last Digit Of The Year

WW: Work week

SSS: Lot code sequence