

■ Description

The 40N05 uses advanced trench technology and design to provide excellent RDS(ON) with low gate charge. It can be used in a wide variety of applications.

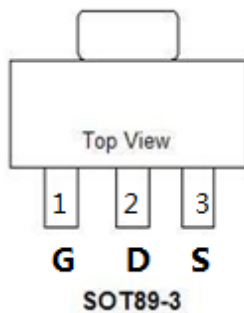
■ Application

- Load switching
- Hard switched and high frequency circuits
- DC-DC Convertor
- Others

■ Features

- BVDS ≥ 43V
- High density cell for Ultra low on-resistance
 $R_{DS(ON)} < 30m\Omega @ V_{GS}=10V$
 $R_{DS(ON)} < 40m\Omega @ V_{GS}=4.5V$
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation and tiny solution size
- 175°C operating temperature

■ Packages and Pin Assignments



Num	Description
1	Gate
2	Drain
3	Source

■ Description:

It utilizes the latest trench processing techniques to achieve extremely low on resistance, fast switching speed and high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in Automotive applications and a wide variety of other applications.

■ Absolute max Rating:

	Parameter	Max.	Units
ID @ TC = 25°C	Continuous Drain Current, VGS @ 10V	12	A
ID @ TC = 100°C	Continuous Drain Current, VGS @ 10V	12	
IDM	Pulsed Drain Current ^①	10	
PD @TC = 25°C	Power Dissipation	2	W
VGS	Gate-to-Source Voltage	± 20	V
EAS	Single Pulse Avalanche Energy ^②	22	mJ
IAR	Avalanche Current @ L=0.3mH	5	A
TJ TSTG	Operating Junction and Storage Temperature Range	-55 to + 175	°C

■ Thermal Resistance

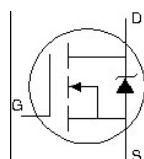
Symbol	Characterizes	Value	Unit
R θ JC	Junction-to-case	7.5	°C/W
R θ JA	Junction-to-ambient	40	°C/W
	Junction-to-Ambient (PCB mounted, steady-state)	60	°C/W

■ Electrical Characterizes @TA=25°C unless otherwise specified

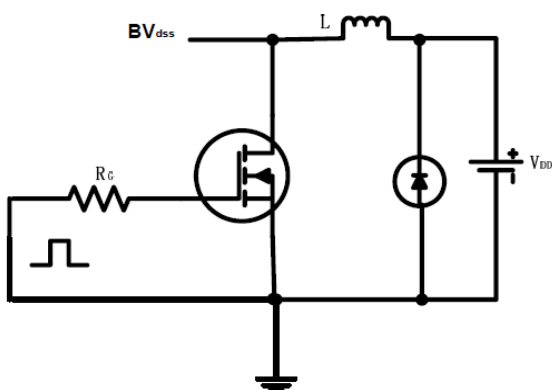
	Parameter	Min.	Typ.	Max	Units	Conditions
BVDSS	Drain-to-Source breakdown voltage	40	—	—	V	VGS = 0V, ID = 250 μ A
RDS(on)	Static Drain-to-Source on-resistance	—	24	30	m Ω	VGS = 10V, ID = 12A ^③
VGS(th)	Gate threshold voltage	1	—	3	V	VDS = VGS, ID = 250 μ A
IDSS	Drain-to-Source leakage current	—	—	1	μ A	VDS = 40V, VGS = 0V
		—	—	150		VDS = 40V, VGS = 0V, TJ
IGSS	Gate-to-Source forward leakage	—	—	100	nA	VGS = 20V
	Gate-to-Source reverse leakage	—	—	-100		VGS = -20V

Qg	Total gate charge	—	9.5	—	nC	ID = 12A VDS = 20V VGS = 10V ^③
Qgs	Gate-to-Source charge	—	4.5	—		
Qgd	Gate-to-Drain("Miller") charge	—	1.5	—		
td(on)	Turn-on delay time	—	3.5	—	ns	VDD = 20V ID = 12A RG = 1.7 Ω VGS = 10V ^③
tr	Rise time	—	6	—		
td(off)	Turn-Off delay time	—	13.5	—		
tf	Fall time	—	3.5	—		
Ciss	Input capacitance	—	410	—	pF	VGS = 0V VDS = 20V f = 1.0MHz
Coss	Output capacitance	—	95	—		
Crss	Reverse transfer capacitance	—	35	—		

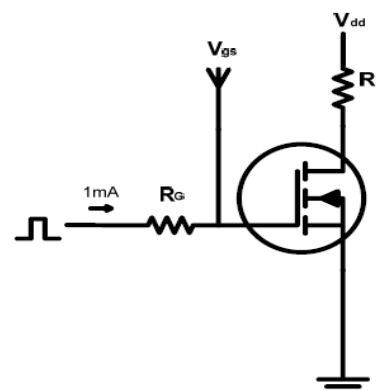
■ Source-Drain Ratings and Characteristics

	Parameter	Min	Typ.	Max	Units	Conditions
IS	Continuous Source Current (Body Diode)	—	—	6	A	MOSFET symbol showing the integral reverse p-n junction diode.  TJ = 25°C, IF = 1A, VDD = 20V di/dt = 100A/μs ^③
VSD	Diode Forward Voltage	—	0.75	1.0	V	
trr	Reverse Recovery Time	—	23	—	ns	TJ = 25°C, IF = 12A, VDD = 20V di/dt = 100A/μs ^③
Qrr	Reverse Recovery Charge	—	18.5	—	nC	
ton	Forward Turn-on Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

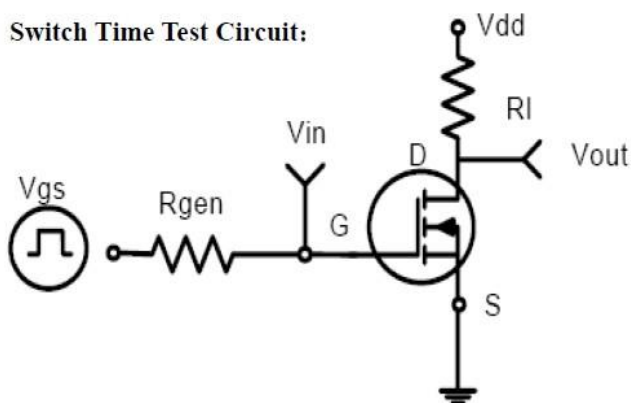
EAS test circuits:



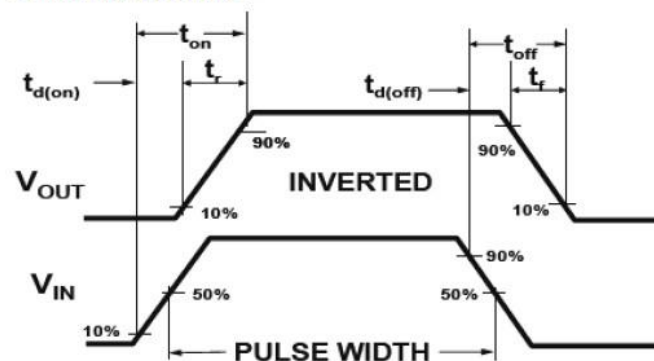
Gate charge test circuit:



Switch Time Test Circuit:



Switch Waveforms:



Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by T_{Jmax} , starting $T_J = 25^\circ C$, $L = 0.3mH$, $R_G = 50\Omega$, $I_{AS} = 82A$, $V_{GS} = 10V$.
Part not recommended for use above this value.
- ③ Pulse width $< 1.0ms$; duty cycle $< 2\%$.

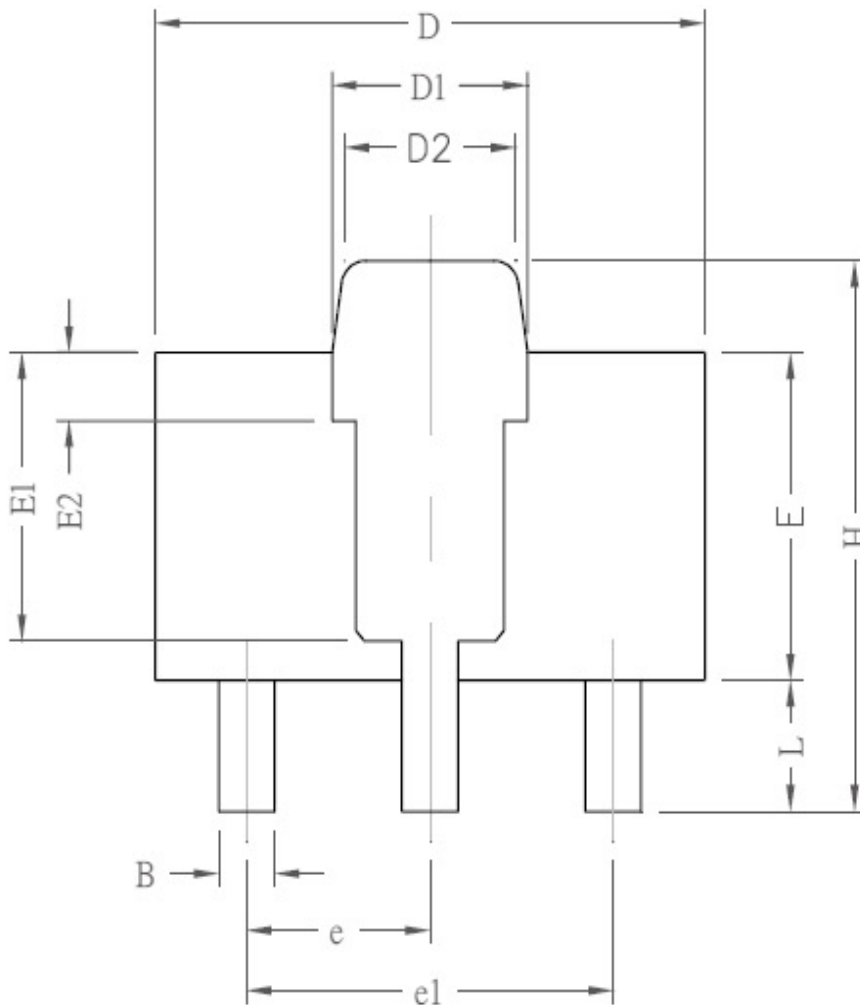
Ordering Information

Part Number	VDS _{MAX} (V)	Package	Marking	Qty (pcs)
SP40N05	40	SOT89-3	SP40N05 MNY①W②X③	1000pcs

- ① Year(13-99)
- ② Week(01-53)

■ Package Information

SOT89-3 Package



REF.	DIMENSIONS	
	Millimeters	
	Min.	Max.
A	1.40	1.60
B	0.40	0.52
C	0.35	0.41
D	4.40	4.60
D1	1.50	1.70
D2	1.30	1.50
E	2.40	2.60
E1	2.20 REF.	
E2	0.52 REF.	
e	1.50 REF.	
e1	3.00 REF.	
F	5°TYP.	
H	4.05	4.25
L	0.89	1.20