

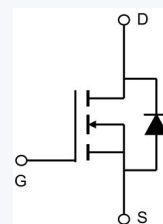
DATASHEET

Features

- $V_{DS} = 400\text{ V}$, $I_D = 10\text{ A}$
- $R_{DS(ON_TYP)} = 0.47\ \Omega$ ($V_{GS} = 10\text{ V}$)
- Low $R_{DS(ON)}$
- Low Gate Charge
- 100% Avalanche Tested

Applications

- LED Power Supplies
- Switch-Mode Power Supplies
- Motor Driving



Device Symbol

N-channel enhancement-mode power MOSFET built on VDMOS technology, combining low $R_{DS(ON)}$ with low gate charge. Available in TO-252, TO-220 and TO-220F packages.

Pin Configuration

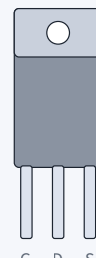
Terminal	Description
G	Gate
D	Drain (tab)
S	Source



TO-252



TO-220



TO-220F

Ordering Information

Orderable Part Number	Package	Marking
SYN740D	TO-252	SYN740D
SYN740T	TO-220	SYN740T
SYN740F	TO-220F	SYN740F

Absolute Maximum Ratings (@ $T_C = 25\text{ }^{\circ}\text{C}$, unless otherwise specified.)

Parameter	Symbol	Ratings	Units
Drain – Source Voltage	V_{DS}	400	V
Gate – Source Voltage	V_{GS}	± 30	V
Drain Current — Continuous (@ $T_C = 25\text{ }^{\circ}\text{C}$)	I_D	10	A
Drain Current — Pulsed ⁽¹⁾	I_{DM}	40	A
Total Power Dissipation (@ $T_C = 25\text{ }^{\circ}\text{C}$)	P_D	98	W
Single Pulse Avalanche Energy ⁽²⁾	E_{AS}	517	mJ
Operating Junction Temperature Range	T_J	$-55 \sim 150$	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	$-55 \sim 150$	$^{\circ}\text{C}$

Thermal Characteristics

Parameter	Symbol	TO-252	TO-220	TO-220F	Units
Junction to Ambient	$R_{\theta JA}$	62	56	56	$^{\circ}\text{C/W}$
Junction to Case	$R_{\theta JC}$		1.28		$^{\circ}\text{C/W}$

Electrical Characteristics (@ $T_C = 25^\circ\text{C}$, unless otherwise specified.)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
Drain–Source Breakdown Voltage	V_{DSS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	400	457	—	V
Zero-Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}$	—	—	1	μA
Gate–Source Leakage Current	I_{GSS}	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.5	3.57	4.5	V
Drain–Source On-Resistance ⁽³⁾	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 5\text{ A}$	—	0.47	0.53	Ω

Dynamic Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$	—	801	—	pF
Output Capacitance	C_{oss}		—	118.5	—	
Reverse Transfer Capacitance	C_{rss}		—	5.06	—	

Switching Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10\text{ V}, V_{DD} = 200\text{ V}, R_G = 25\text{ }\Omega, I_D = 10\text{ A}$	—	15.44	—	ns
Rise Time	t_r		—	38.6	—	
Turn-Off Delay Time	$t_{d(off)}$		—	35.12	—	
Fall Time	t_f		—	28.16	—	

Gate Charge Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Total Gate Charge	Q_g	$V_{DS} = 320\text{ V}, I_D = 10\text{ A}, V_{GS} = 10\text{ V}$	—	16.18	—	nC
Gate–Source Charge	Q_{gs}		—	4.77	—	
Gate–Drain Charge	Q_{gd}		—	7.18	—	

Drain–Source Diode Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Diode Forward Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_{SD} = 10\text{ A}$	—	—	1.4	V
Source Current	I_S	$T_C = 25^\circ\text{C}$	—	—	10	A
Reverse Recovery Time	t_{rr}	$I_S = 10\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}$	—	255.6	—	ns
Reverse Recovery Charge	Q_{rr}		—	2.15	—	μC

Typical Characteristics

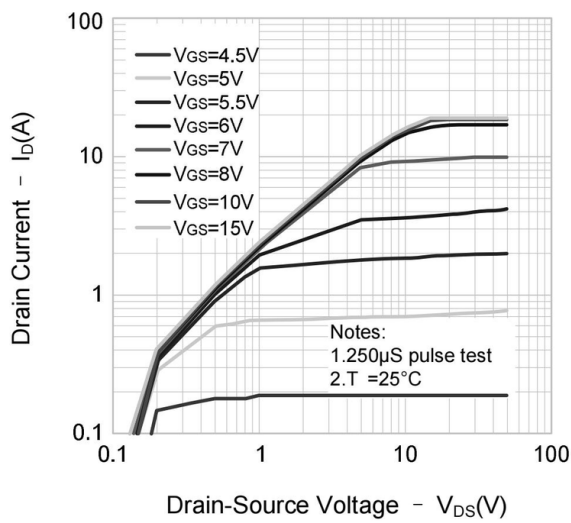


Figure 1: Output Characteristics

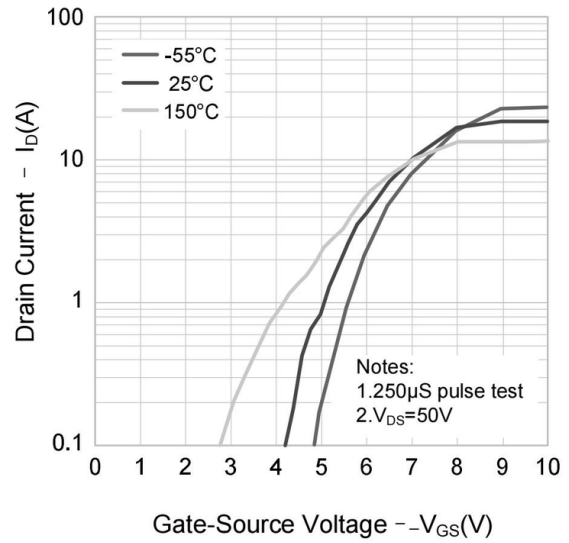


Figure 2: Transfer Characteristics

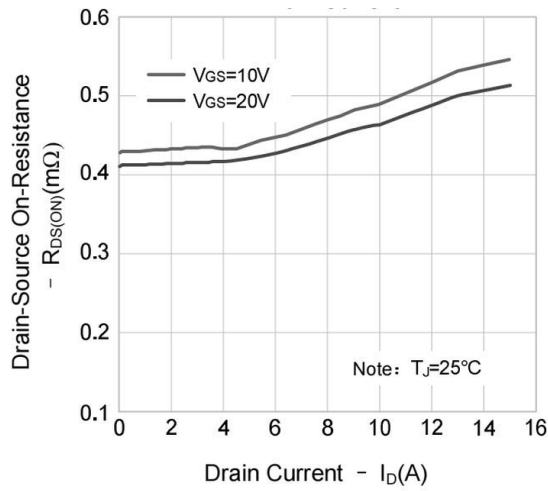


Figure 3: On-Resistance vs Drain Current

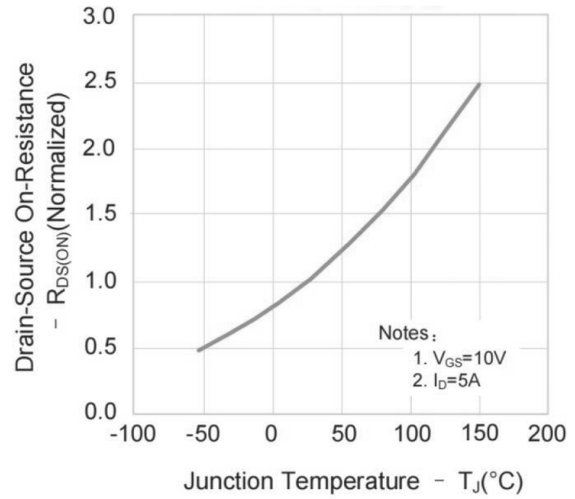


Figure 4: On-Resistance vs Junction Temperature

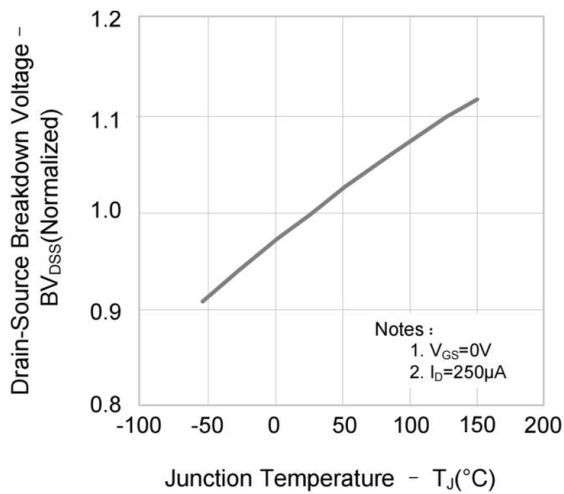


Figure 5: Breakdown Voltage vs Junction Temperature

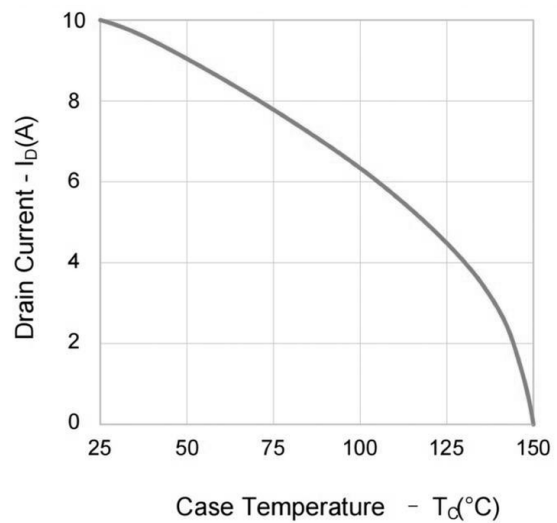


Figure 6: Drain Current Derating

Typical Characteristics (Continued)

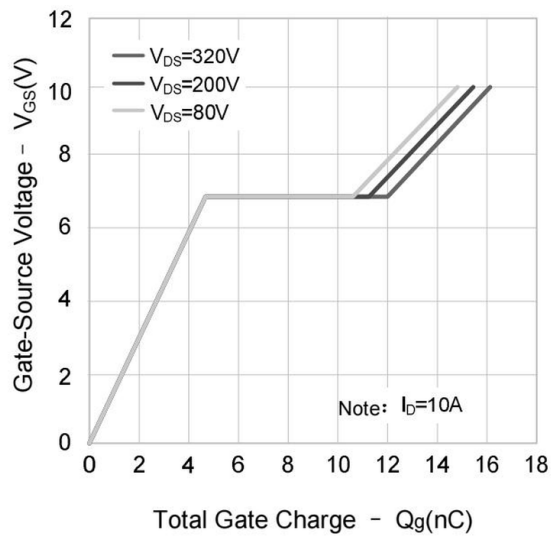


Figure 7: Gate Charge

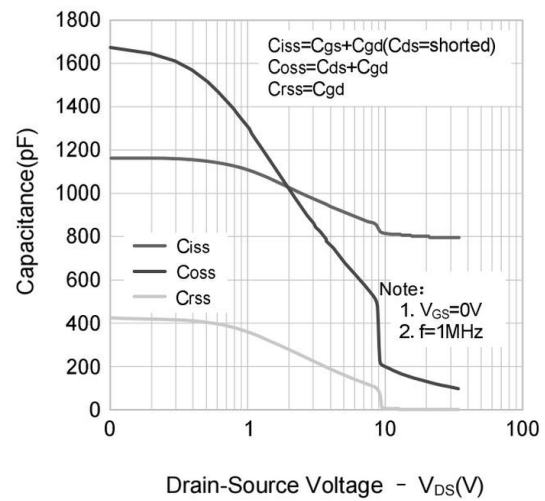


Figure 8: Capacitance vs Drain-Source Voltage

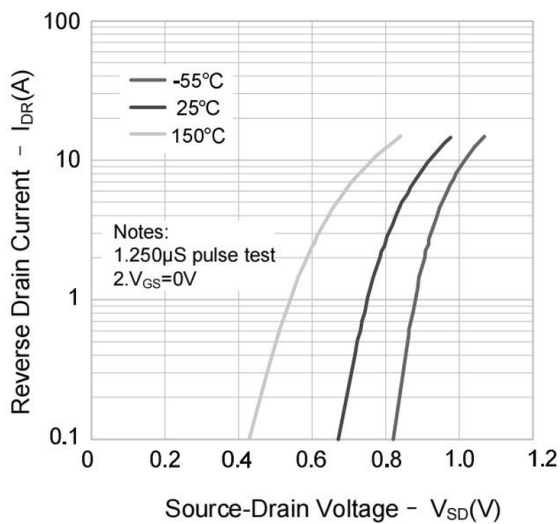


Figure 9: Body Diode Forward Characteristics

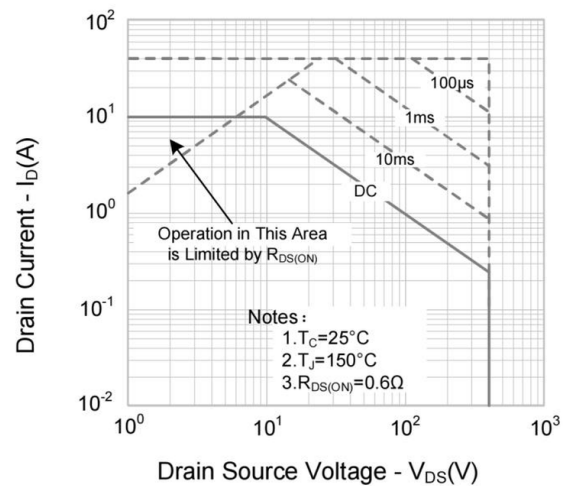
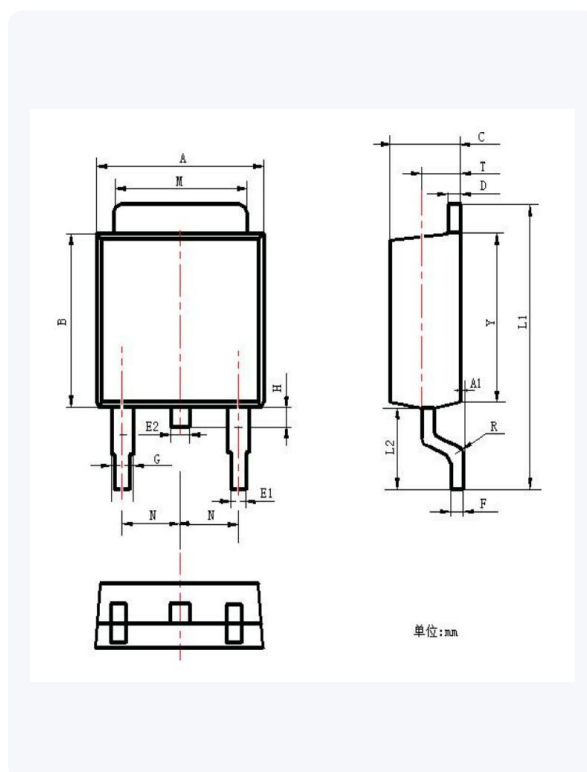


Figure 10: Maximum Safe Operating Area

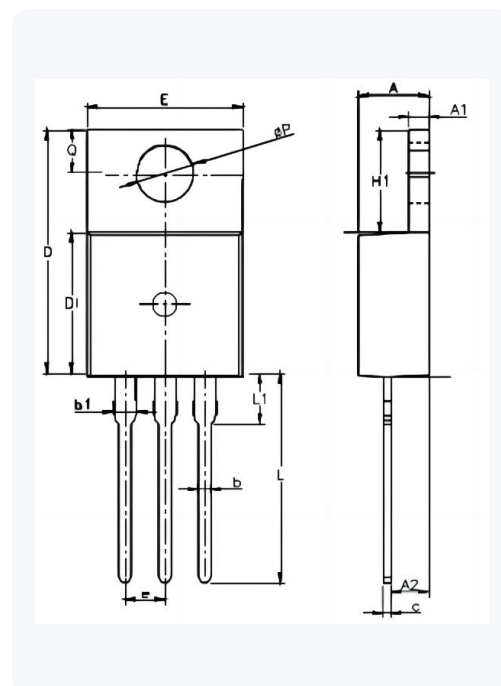
Package Outline Dimensions (TO-252, unit: mm)

Symbol	Min.	Nom.	Max.
A	6.3	6.5	6.9
A1	0	—	0.16
B	5.7	—	6.3
C	2.1	2.3	2.5
D	0.3	0.5	0.7
E1	0.6	0.65	0.9
E2	0.7	—	1
F	0.3	0.5	0.6
G	0.7	0.9	1.2
L1	9.6	10	10.5
L2	2.7	—	3.1
H	0.4	—	1
M	5.1	5.2	5.5
N	2.09	2.2	2.49
R		0.3	
T	1.4	—	1.6
Y	5.1	5.9	6.3



Package Outline Dimensions (TO-220, unit: mm)

Symbol	Min.	Nom.	Max.
A	4.3	4.5	4.7
A1	1	1.3	1.5
A2	1.8	2.4	2.8
b	0.6	0.8	1
b1	1	—	1.6
c	0.3	—	0.7
D	15.1	15.7	16.1
D1	8.1	9.2	10
E	9.6	9.9	10.4
e		2.54 BSC	
H1	6.1	6.5	7
L	12.6	13.08	13.6
L1	—	—	3.95
ΦP	3.4	3.7	3.9
Q	2.6	—	3.2



Package Outline Dimensions (TO-220F, unit: mm)

Symbol	Min.	Nom.	Max.
A	4.42	4.7	5.02
A1	2.3	2.54	2.8
A3	2.5	2.76	3.1
b	0.7	0.8	0.9
b2	—	—	1.47
c	0.35	0.5	0.65
D	15.25	15.87	16.25
D1	15.3	15.75	16.3
D2	9.3	9.8	10.3
E	9.73	10.16	10.36
e		2.54 BSC	
H1	6.4	6.68	7
L	12.48	12.98	13.48
L1	—	—	3.5
øP	3	3.18	3.4

Notes

1. Pulse width limited by maximum junction temperature.
2. E_{AS} condition: starting T_J = 25 °C, L = 30 mH, R_g = 25 Ω.
3. Pulse test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

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