

## DUAL N-Channel Enhancement Mode Power MOSFET

### Description

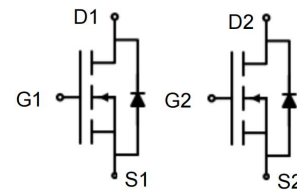
The G60N04D52 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge. It can be used in a wide variety of applications.

### General Features

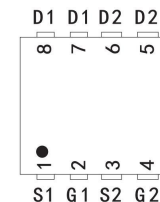
- $V_{DS}$  40V
- $I_D$  (at  $V_{GS} = 10V$ ) 60A
- $R_{DS(ON)}$  (at  $V_{GS} = 10V$ ) < 9m $\Omega$
- $R_{DS(ON)}$  (at  $V_{GS} = 4.5V$ ) < 12m $\Omega$
- 100% Avalanche Tested
- RoHS Compliant

### Application

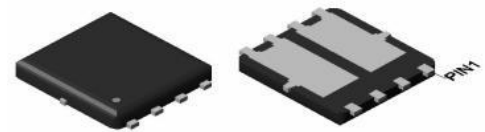
- Power switch
- DC/DC converters



Schematic diagram



pin assignment



DFN5X6-8L Dual

### Ordering Information

Device	Package	Marking	Packaging
G60N04D52	DFN5X6-8L Dual	G60N04	5000pcs/Tube

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	40	V
Continuous Drain Current	$I_D$	60	A
Pulsed Drain Current (note1)	$I_{DM}$	240	A
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Power Dissipation	$P_D$	65	W
Single pulse avalanche energy (note2)	$E_{AS}$	73	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 To 150	$^\circ\text{C}$

### Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Ambient	$R_{thJA}$	60	$^\circ\text{C/W}$
Maximum Junction-to-Case	$R_{thJC}$	1.9	$^\circ\text{C/W}$

Specifications $T_J = 25^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
<b>Static Parameters</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	40	--	--	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40V, V_{GS} = 0V$	--	--	1	$\mu A$
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 20V$	--	--	$\pm 100$	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.0	1.7	2.5	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 20A$	--	7.2	9.0	m $\Omega$
		$V_{GS} = 4.5V, I_D = 10A$	--	9.0	12	
Forward Transconductance	$g_{FS}$	$V_{GS} = 5V, I_D = 20A$	--	15	--	S
<b>Dynamic Parameters</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0V,$ $V_{DS} = 20V,$ $f = 1.0\text{MHz}$	--	1982	--	pF
Output Capacitance	$C_{oss}$		--	183	--	
Reverse Transfer Capacitance	$C_{rss}$		--	170	--	
Total Gate Charge	$Q_g$	$V_{DD} = 20V,$ $I_D = 20A,$ $V_{GS} = 10V$	--	29	--	nC
Gate-Source Charge	$Q_{gs}$		--	4.5	--	
Gate-Drain Charge	$Q_{gd}$		--	6.5	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 20V,$ $I_D = 20A,$ $R_G = 3\Omega$	--	17	--	ns
Turn-on Rise Time	$t_r$		--	6.5	--	
Turn-off Delay Time	$t_{d(off)}$		--	30	--	
Turn-off Fall Time	$t_f$		--	17	--	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$	$T_C = 25^\circ\text{C}$	--	--	60	A
Body Diode Voltage	$V_{SD}$	$T_J = 25^\circ\text{C}, I_{SD} = 20A, V_{GS} = 0V$	--	--	1.2	V
Reverse Recovery Charge	$Q_{rr}$	$I_F = 20A, V_{GS} = 0V$ $di/dt=100A/us$	--	29	--	nC
Reverse Recovery Time	$T_{rr}$		--	26	--	ns

### Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition :  $T_J=25^\circ\text{C}$  ,  $V_{DD}=40V, V_{GS}=10V, L=0.5\text{mH}, R_G=25\Omega$   
The table shows the minimum avalanche energy, which is 225mJ when the device is tested until failure
3. Identical low side and high side switch with identical  $R_G$

### Gate Charge Test Circuit



### Switch Time Test Circuit

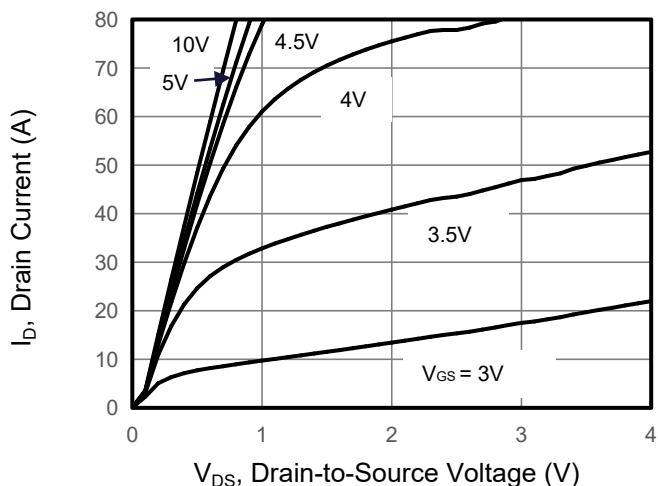


### EAS Test Circuit

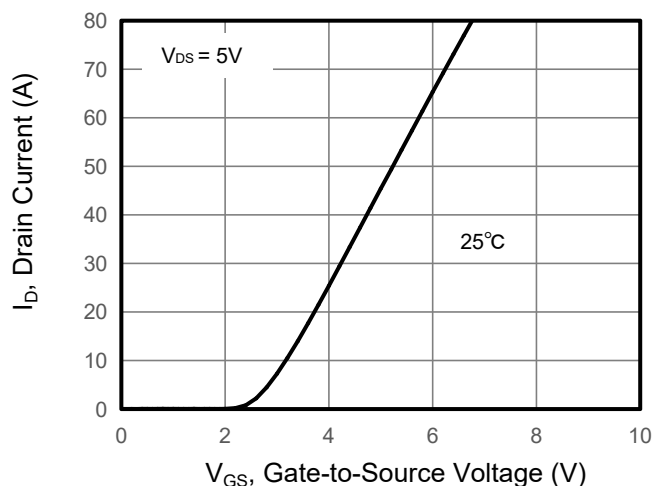


Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

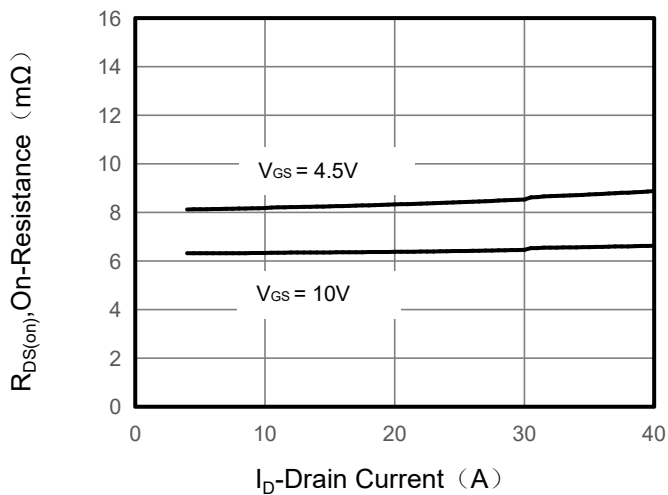
**Figure 1. Output Characteristics**



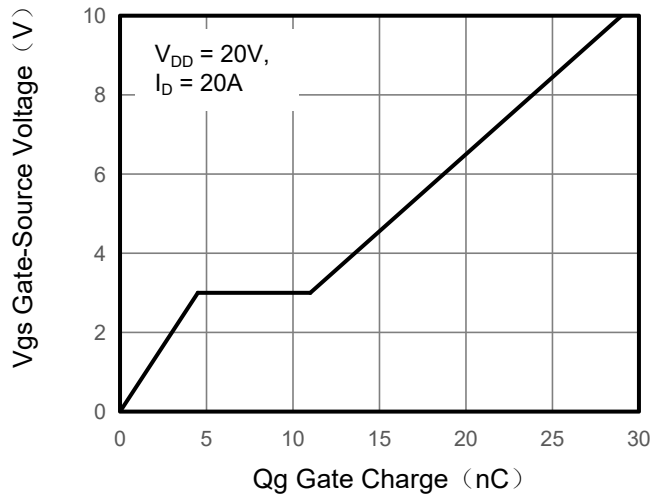
**Figure 2. Transfer Characteristics**



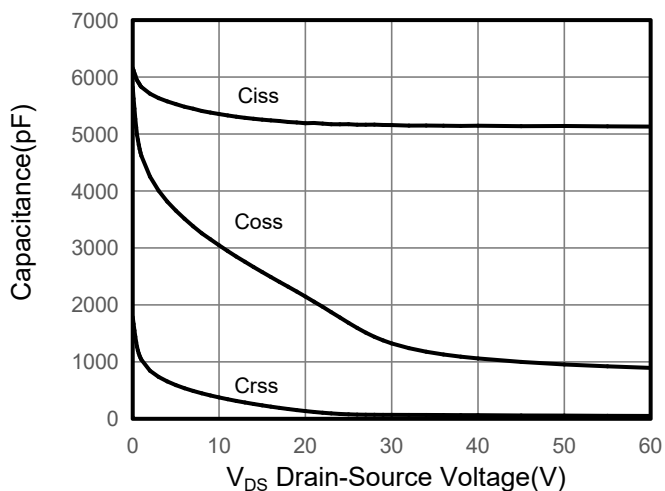
**Figure 3. Drain Source On Resistance**



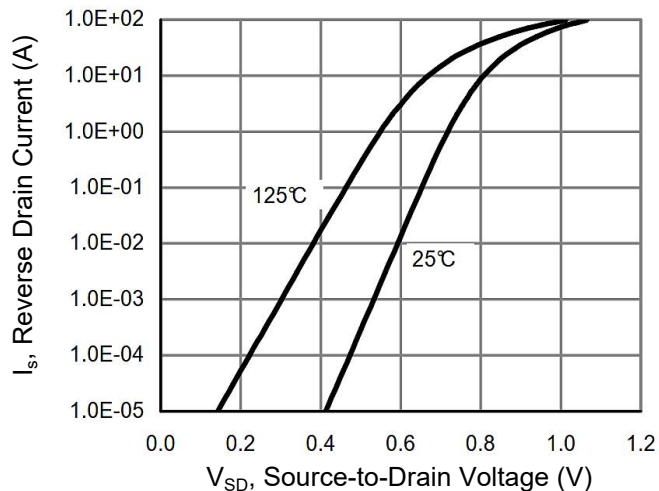
**Figure 4. Gate Charge**



**Figure 5. Capacitance**



**Figure 6. Source-Drain Diode Forward**



Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 7. Drain-Source On-Resistance

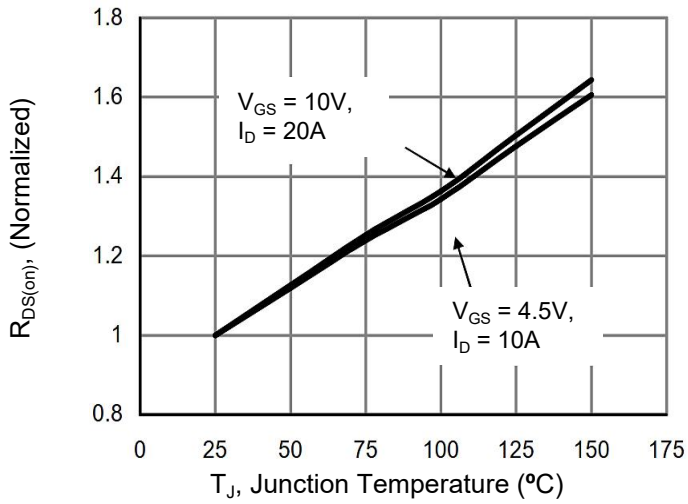


Figure 8. Safe Operation Area

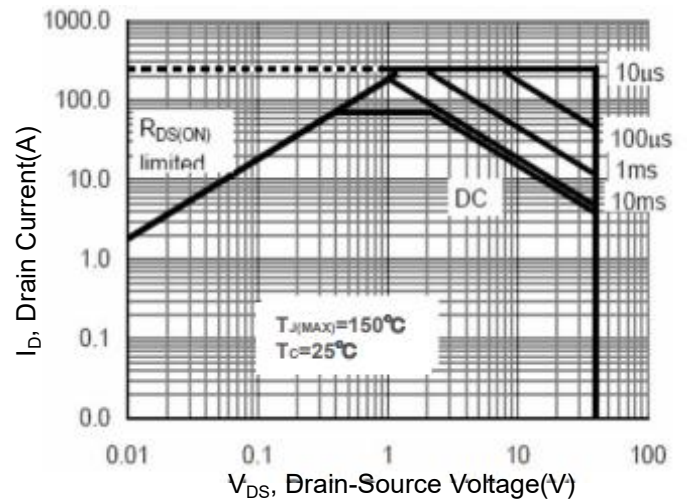
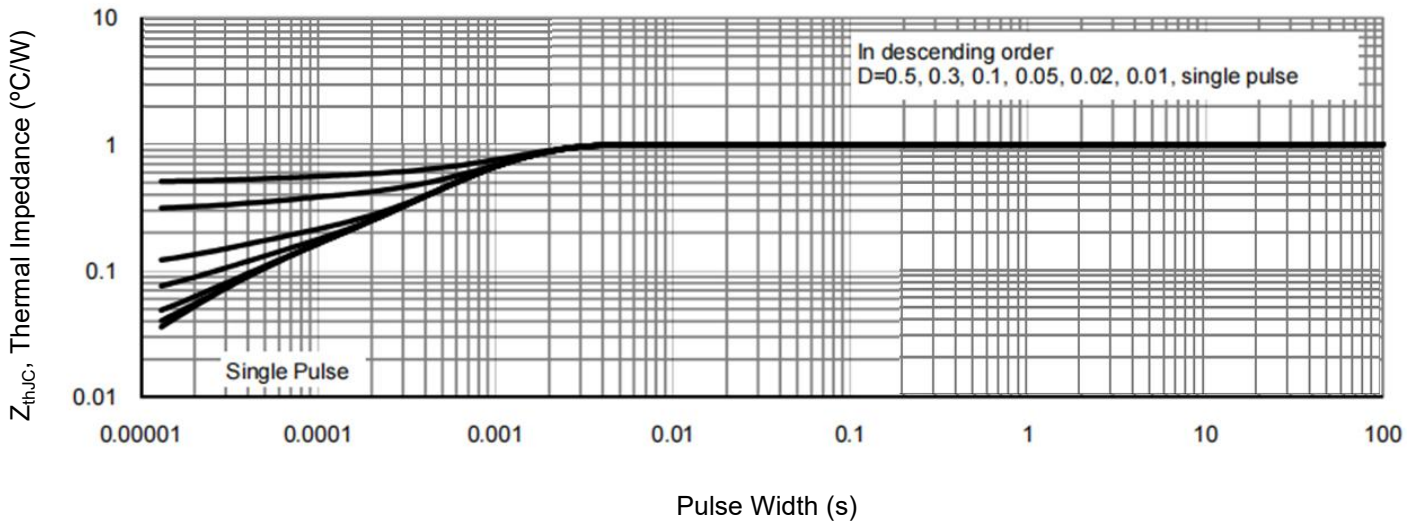
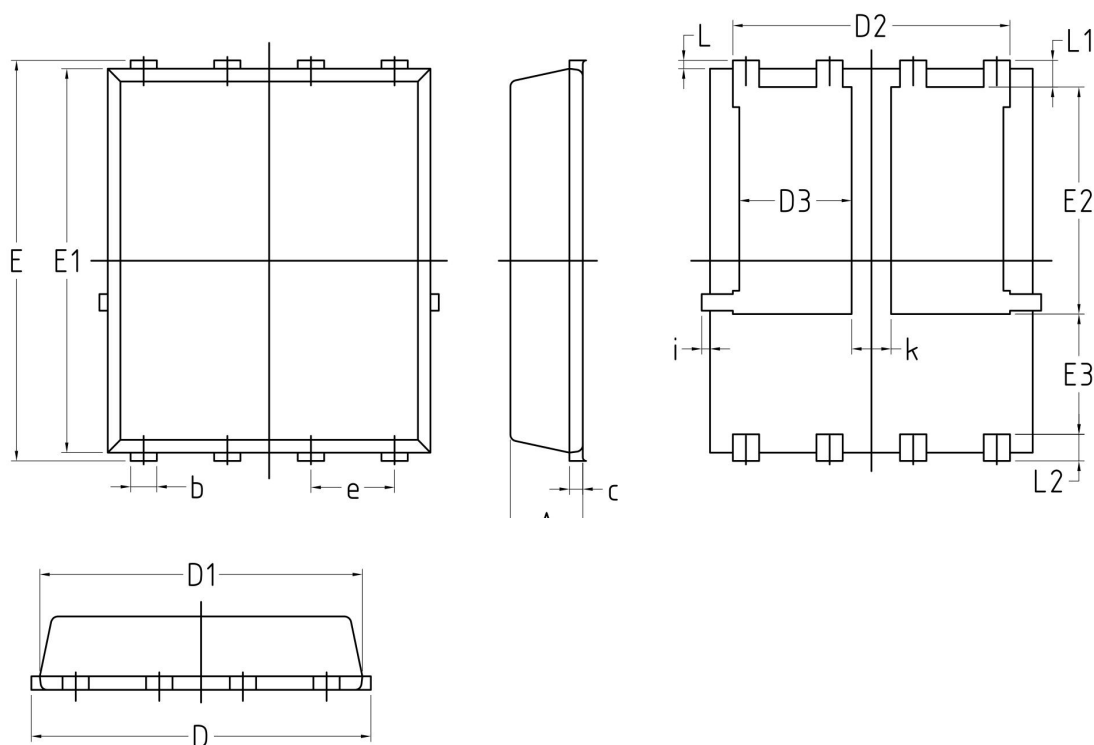


Figure 9. Normalized Maximum Transient Thermal Impedance



## DFN5X6-8L Dual Package Information



S Y M B O L	COMMON			
	MM		INCH	
	MIN.	MAX.	MIN.	MAX.
A	1.03	1.17	0.0406	0.0461
b	0.34	0.48	0.0134	0.0189
c	0.203 BSC		0.0080 BSC	
D	4.80	5.40	0.1890	0.2126
D1	4.80	5.00	0.1890	0.1969
D2	4.11	4.31	0.1620	0.1700
D3	1.60	1.80	0.0629	0.0708
E	5.95	6.15	0.2343	0.2421
E1	5.65	5.85	0.2224	0.2303
E2	3.30	3.50	0.1300	0.1378
E3	1.70	/	0.0630	/
e	1.27 BSC		0.05 BSC	
L	0.05	0.25	0.0019	0.0098
L1	0.38	0.50	0.0150	0.0197
L2	0.38	0.50	0.0150	0.0197
i	/	0.18	/	0.0070
k	0.5	0.7	0.0197	0.0276