

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
60V	2.8mΩ@10V	180A
	3.2mΩ@4.5V	

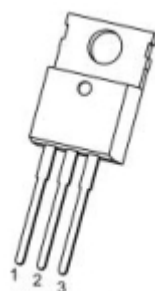
Feature

- Fast Switching
- Low Gate Charge and Rdson
- Advanced Split Gate Trench Technology
- 100% Single Pulse avalanche energy Test

Applications

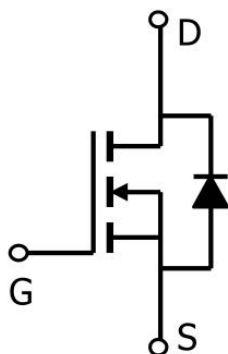
- DC-DC Converters
- Power Management

Package

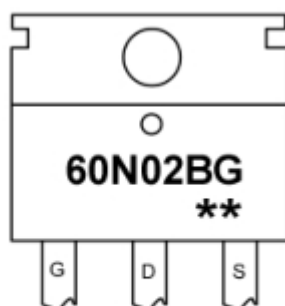


TO-220(G:1 D:2 S:3)

Circuit diagram



Marking



60N02BG =Device Code
****** =Week Code

Absolute maximum ratings

($T_a=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ¹ ($T_c=25^{\circ}\text{C}$)	I_D	180	A
Pulsed Drain Current ²	I_{DM}	720	A
Single Pulse Avalanche Energy ³	E_{AS}	243	mJ
Total Power Dissipation ⁴ ($T_c=25^{\circ}\text{C}$)	P_D	210	W
Thermal Resistance Junction-Case ¹	$R_{\theta JC}$	0.59	$^{\circ}\text{C}/\text{W}$
Storage Temperature Range	T_{STG}	$-55 \sim +150$	$^{\circ}\text{C}$
Operating Junction Temperature Range	T_J	$-55 \sim +150$	$^{\circ}\text{C}$

Electrical characteristics

($T_A=25^{\circ}\text{C}$, unless otherwise noted)

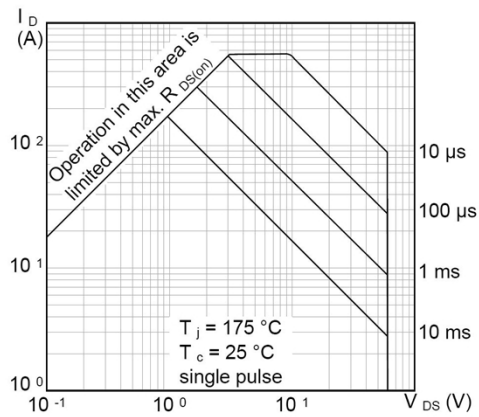
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV (BR)DSS	V _{GS} = 0V, I _D =250μA	60			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =48V,V _{GS} = 0V			1	uA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V			±100	uA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.2	1.7	2.2	V
Static Drain-Source On-Resistance	R _{DS(on)}	V _{GS} =10V, I _D =20A		2.8	3.5	mΩ
		V _{GS} =4.5V, I _D =20A		3.2	4.3	
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, f=1MHz		3910		pF
Output Capacitance	C _{oss}			1300		
Reverse Transfer Capacitance	C _{rss}			11		
Switching Characteristics						
Total Gate Charge	Q _g	V _{DS} =30V , V _{GS} =10V, I _D =20A		53		pF
Gate-Source Charge	Q _{gs}			17		
Gate-Drain Charge	Q _{gd}			10		
Turn-on Delay Time	T _{d(on)}	V _{DD} =30V, V _{GS} =10V, R _G =4.7Ω, I _D =20A		15		nS
Turn-on Rise Time	T _r			34		
Turn-off Delay Time	T _{d(off)}			33		
Turn-off Fall Time	T _f			9		
Diode Characteristics						
Diode Forward Voltage ²	V _{SD}	V _{GS} =0V ,I _S =1A,T _J =25℃			1.2	V

Note :

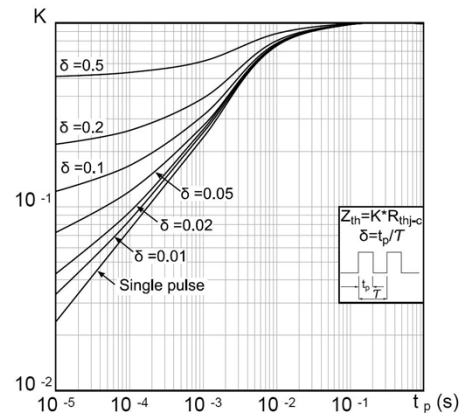
1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
2. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
3. The EAS data shows Max. rating . The test condition is $V_{DD}=30V, V_{GS}=10V, L=0.5mH, R_G=25\Omega$
4. The power dissipation is limited by 150°C junction temperature
5. The data is theoretically the same as I_D and IDM , in real applications , should be limited by total power dissipation.

Typical Characteristics

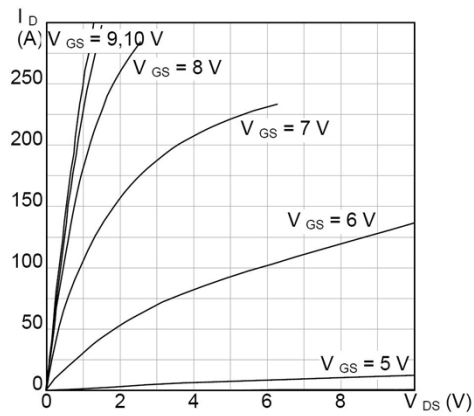
Safe operating area



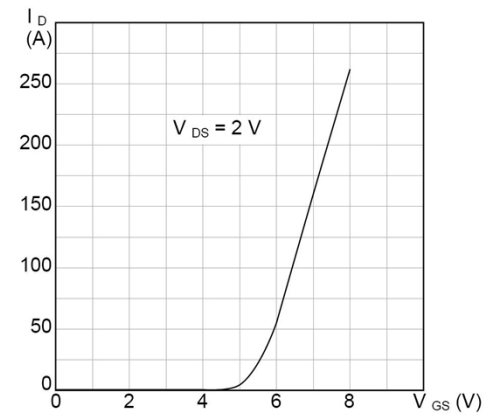
Thermal impedance



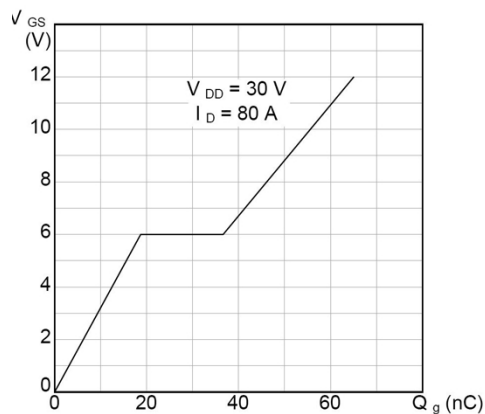
Output characteristics



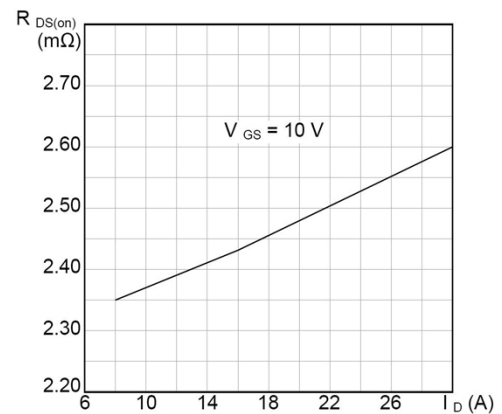
Transfer characteristics



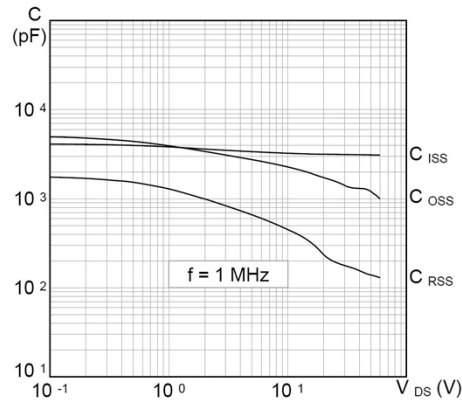
Gate charge vs gate-source voltage



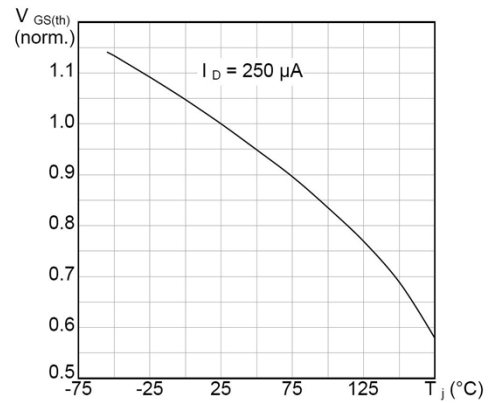
Static drain-source on-resistance



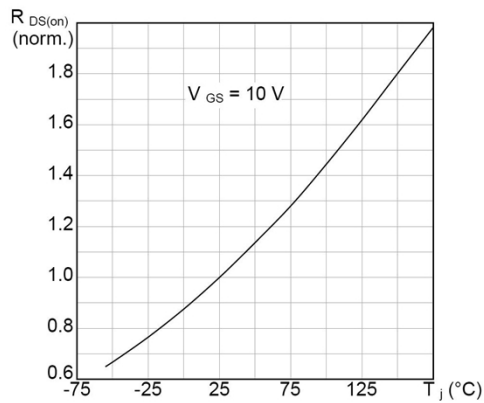
Capacitance variations



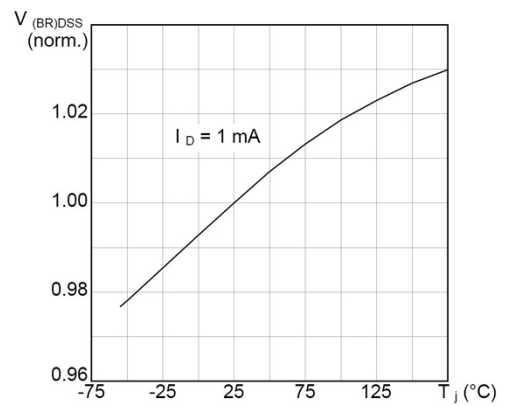
Normalized gate threshold voltage vs temperature



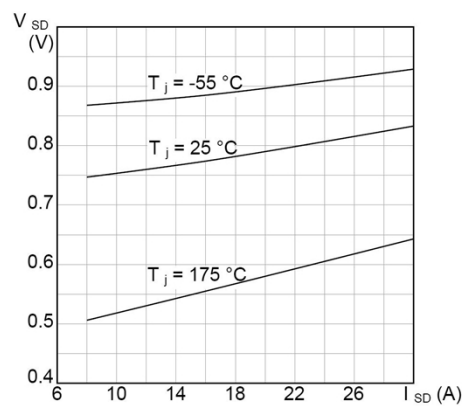
Normalized on-resistance vs temperature



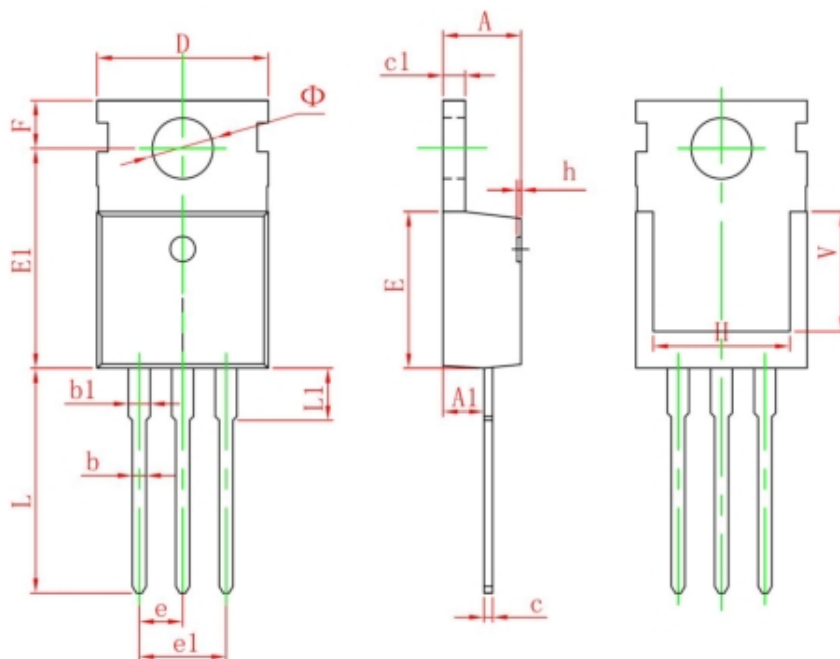
Normalized $V_{(BR)DSS}$ vs temperature



Source-drain diode forward characteristics



TO-220-3L-C Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.950	9.750	0.352	0.384
E1	12.650	13.050	0.498	0.514
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	6.900 REF.		0.276 REF.	
Φ	3.400	3.800	0.134	0.150