

## SUP60N02-4M5P-E3-VB Datasheet

### N-Channel 20-V (D-S) MOSFET


**RoHS**  
 COMPLIANT

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>
20	0.004 @ $V_{GS} = 4.5$ V	100
	0.005 @ $V_{GS} = 2.5$ V	95

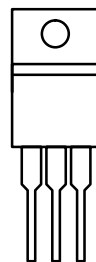
#### FEATURES

- Trench Power MOSFET
- 100 %  $R_g$  and UIS Tested
- Compliant to RoHS Directive 2011/65/EU

#### APPLICATIONS

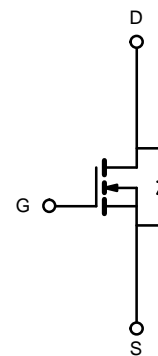
- OR-ing
- Server
- DC/DC

TO-220AB



G D S

Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		$V_{DS}$	20	V
Gate-Source Voltage		$V_{GS}$	$\pm 12$	
Continuous Drain Current ( $T_J = 175^\circ\text{C}$ )	$T_C = 25^\circ\text{C}$	$I_D$	100	A
	$T_C = 100^\circ\text{C}$		85	
Pulsed Drain Current		$I_{DM}$	260	
Avalanche Current		$I_{AR}$	35	
Repetitive Avalanche Energy <sup>b</sup>		$E_{AR}$	45	mJ
Power Dissipation		$P_D$	125 <sup>a</sup>	W
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to 175	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS				
Parameter		Symbol	Limit	Unit
Junction-to-Ambient	PCB Mount (TO-263) <sup>c</sup>	$R_{thJA}$	40	$^\circ\text{C/W}$
	Free Air (TO-220AB)		62.5	
Junction-to-Case		$R_{thJC}$	1.25	

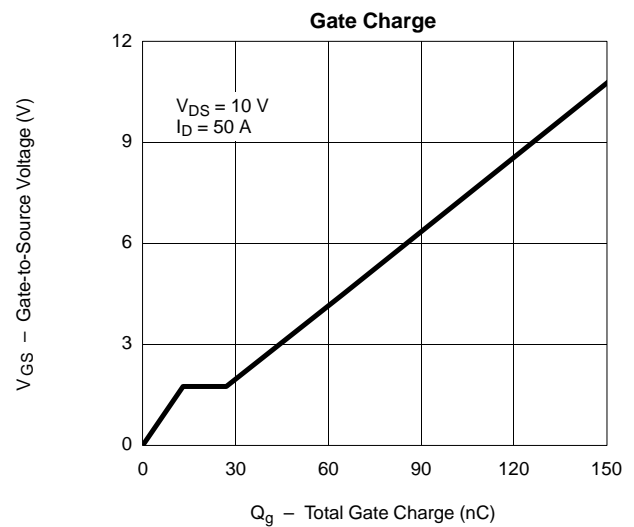
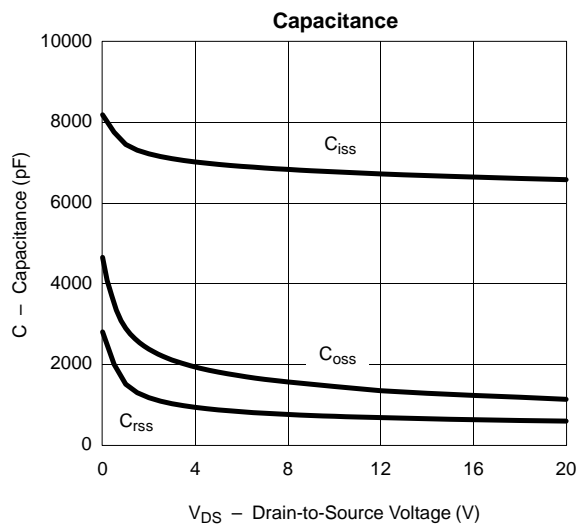
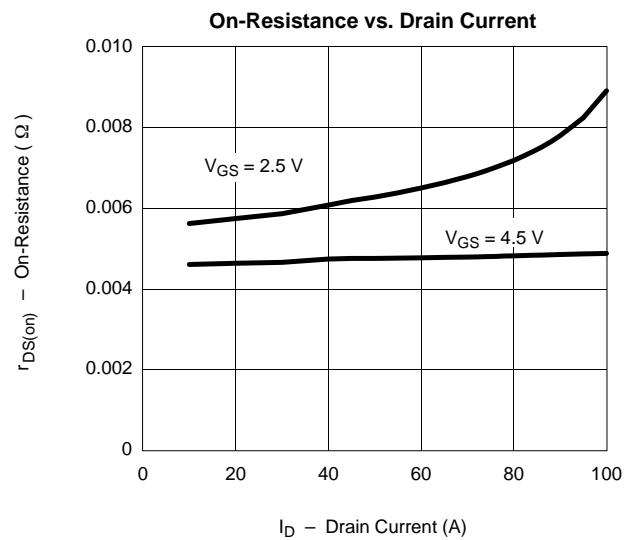
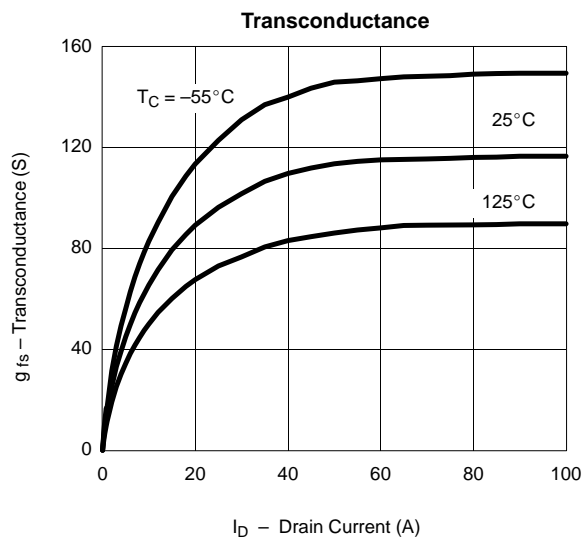
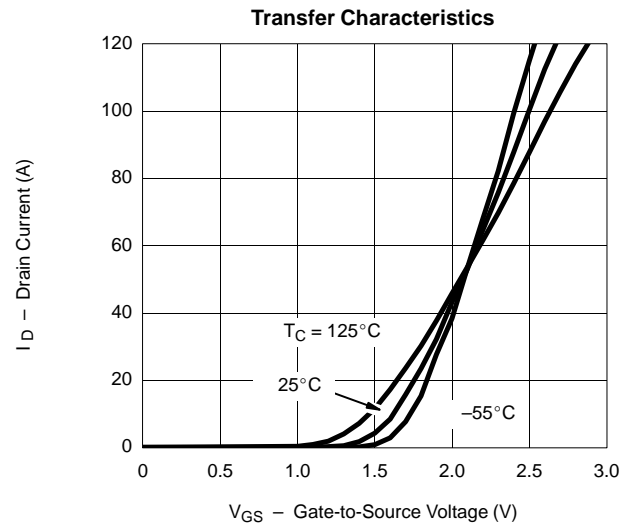
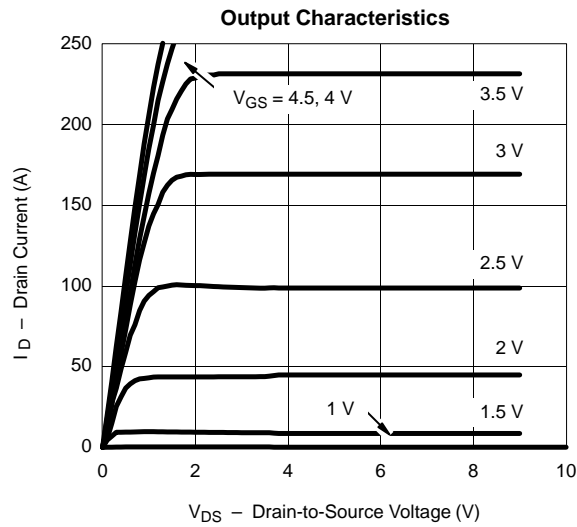
#### Notes:

- See SOA curve for voltage derating.
- Duty cycle  $\leq 1\%$ .
- When mounted on 1" square PCB (FR-4 material).

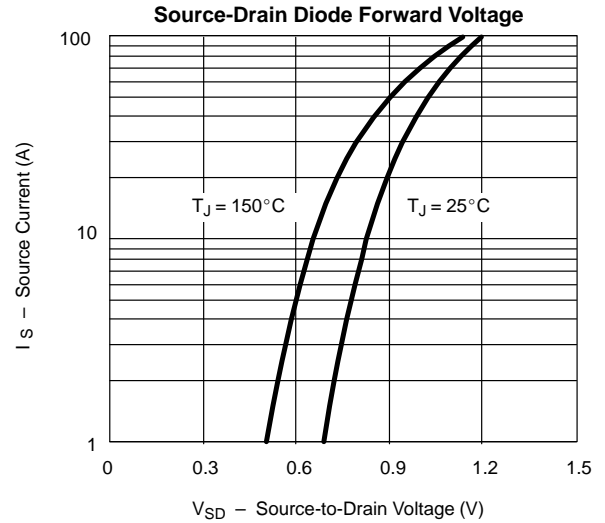
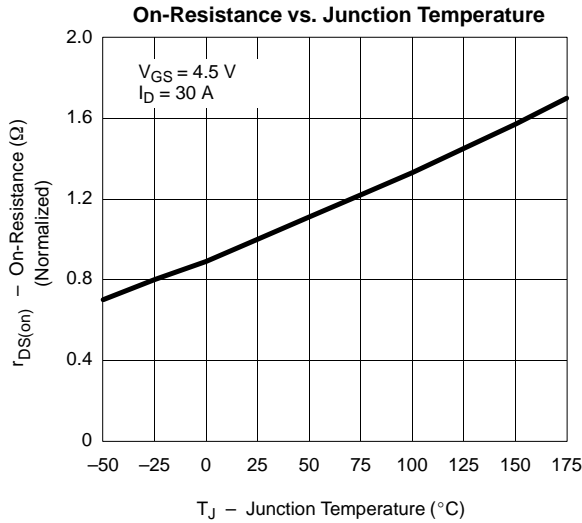
MOSFET SPECIFICATIONS (T <sub>J</sub> =25 °C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	20			V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 250 μA	0.5		1.5	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 12 V			± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C			50	
		V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175°C			150	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 4.5 V	120			A
Drain-Source On-State Resistance <sup>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 30 A		0.004		Ω
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 125°C		0.007		
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 175°C		0.010		
		V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 20 A		0.005		
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 30 A	20			S
Dynamic <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 20 V, f = 1 MHz		6000		pF
Output Capacitance	C <sub>oss</sub>			1100		
Reversen Transfer Capacitance	C <sub>rss</sub>			600		
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 85 A		65	130	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			13		
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			14		
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 10 V, R <sub>L</sub> = 0.12 Ω I <sub>D</sub> ≈ 85 A, V <sub>GEN</sub> = 4.5 V, R <sub>G</sub> = 2.5 Ω		25	40	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			120	180	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			80	120	
Fall Time <sup>c</sup>	t <sub>f</sub>			100	150	
Source-Drain Diode Ratings and Characteristics (T <sub>C</sub> = 25 °C) <sup>b</sup>						
Pulsed Current	I <sub>SM</sub>				240	A
Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = 100 A, V <sub>GS</sub> = 0 V		1.2	1.5	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 50 A, di/dt = 100 A/μs		45	100	ns

Notes:

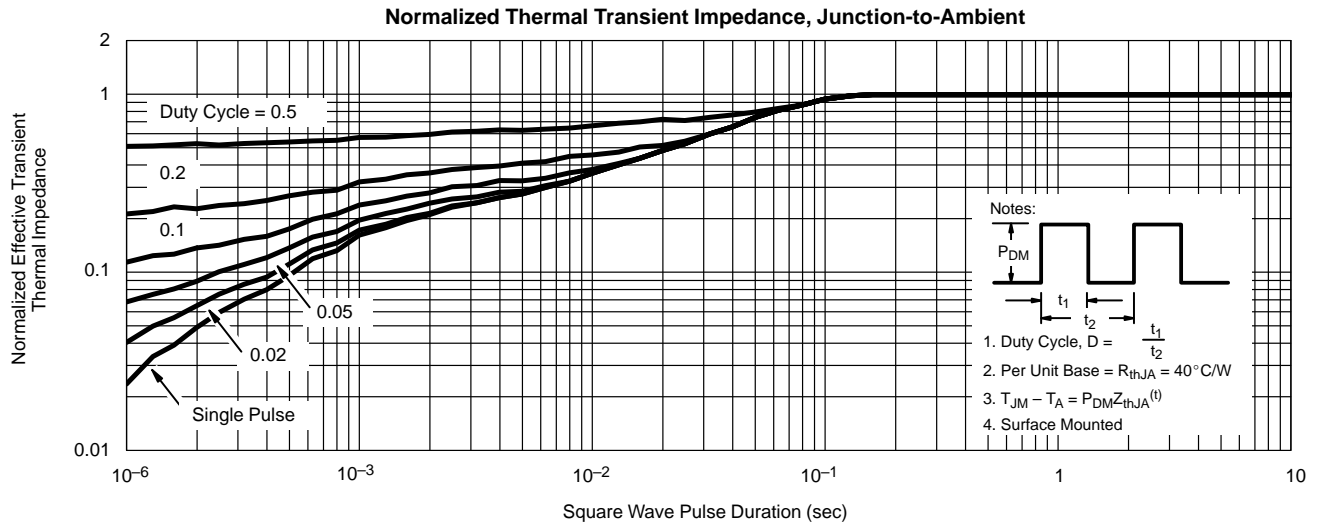
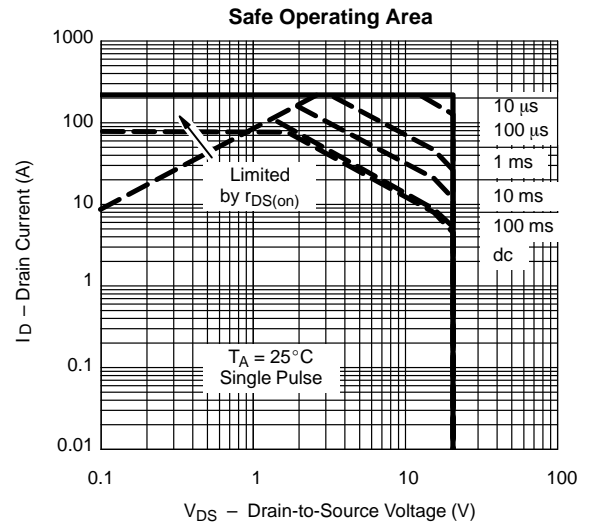
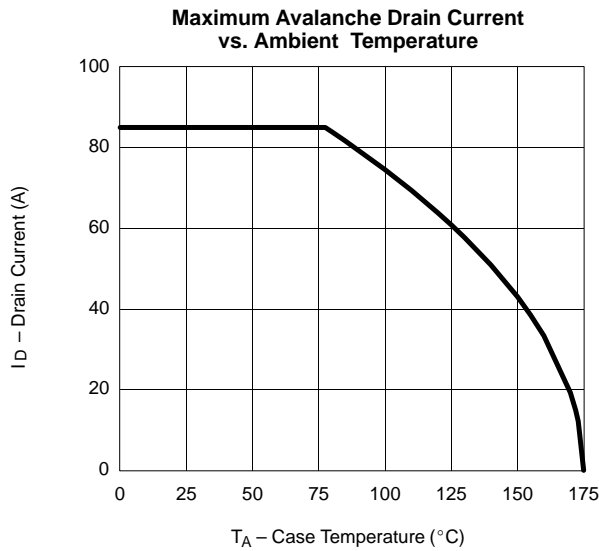
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.  
 c. Independent of operating temperature.

**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**


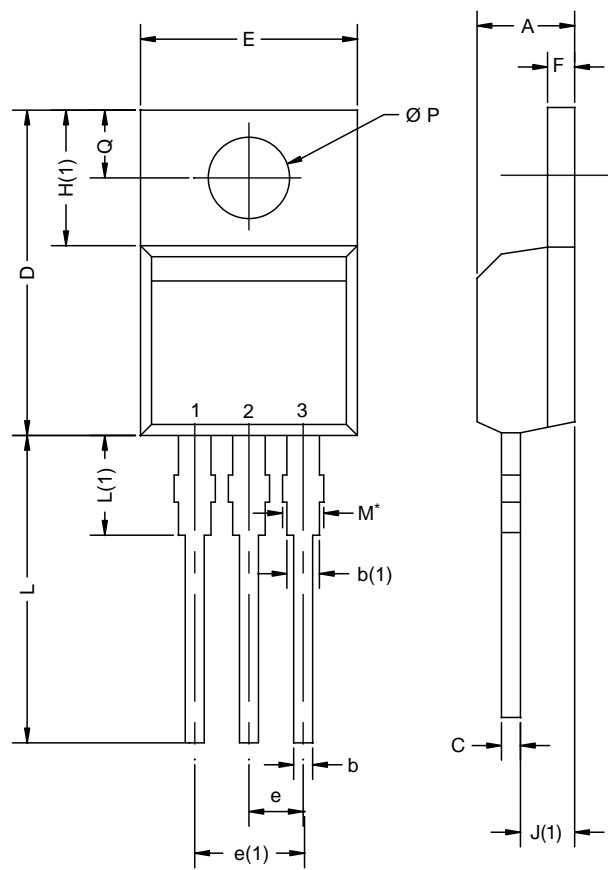
**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**



**THERMAL RATINGS**



TO-220AB



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
$\varnothing P$	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118

ECN: X12-0208-Rev. N, 08-Oct-12  
DWG: 5471

**Notes**  
\* M = 1.32 mm to 1.62 mm (dimension including protrusion)  
Heatsink hole for HVM

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