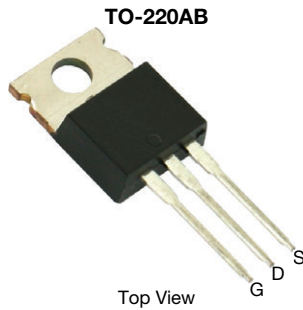


## P-Channel 60 V (D-S) MOSFET



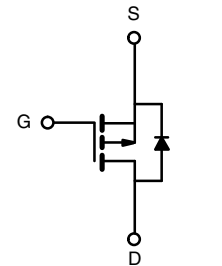
### FEATURES

- TrenchFET® power MOSFET
- 100 % UIS tested
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### APPLICATIONS

- Load switch



P-Channel MOSFET

PRODUCT SUMMARY	
$V_{DS}$ (V)	-60
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = -10$ V	0.0195
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = -4.5$ V	0.0250
$Q_g$ typ. (nC)	76
$I_D$ (A) <sup>a</sup>	-53
Configuration	Single

ORDERING INFORMATION	
Package	TO-220AB
Lead (Pb)-free	SUP53P06-20-E3

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-source voltage	$V_{DS}$	-60	V	
Gate-source voltage	$V_{GS}$	$\pm 20$		
Continuous drain current ( $T_J = 150$ °C)	$I_D$	$T_C = 25$ °C	-53 <sup>a</sup>	A
		$T_C = 70$ °C	-46.8	
		$T_A = 25$ °C	9.2 <sup>b</sup>	
		$T_A = 70$ °C	-8.1 <sup>b</sup>	
Pulsed drain current	$I_{DM}$	-150		
Avalanche current pulse	$L = 0.1$ mH	$I_{AS}$	-45	
Single pulse avalanche energy		$E_{AS}$	101	mJ
Continuous source-drain diode current	$I_S$	$T_C = 25$ °C	69 <sup>a</sup>	A
		$T_A = 25$ °C	2.1 <sup>b</sup>	
Maximum power dissipation	$P_D$	$T_C = 25$ °C	104.2 <sup>a</sup>	W
		$T_C = 70$ °C	66.7 <sup>a</sup>	
		$T_A = 25$ °C	3.1 <sup>b</sup>	
		$T_A = 70$ °C	2 <sup>b</sup>	
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +150	°C	

THERMAL RESISTANCE RATINGS					
PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT	
Maximum junction-to-ambient <sup>b</sup>	Steady state	$R_{thJA}$	33	40	°C/W
Maximum junction-to-case					

#### Notes

a. Based on  $T_C = 25$  °C



b. Surface mounted on 1" x 1" FR4 board

SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-source breakdown voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-60	-	-	V
V <sub>DS</sub> temperature coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = -250 μA	-	68	-	mV/°C
V <sub>GS(th)</sub> temperature coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>		-	-5.2	-	
Gate-source threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	-1	-	-3	V
Gate-source leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V	-	-	± 100	nA
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = -60 V, V <sub>GS</sub> = 0 V	-	-	-1	μA
		V <sub>DS</sub> = -60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C	-	-	-10	
On-state drain current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = -5 V, V <sub>GS</sub> = -10 V	-120	-	-	A
Drain-source on-state resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -30 A	-	0.0160	0.0195	Ω
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -20 A	-	0.0200	0.0250	
Forward transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -15 V, I <sub>D</sub> = -50 A	20	-	-	S
<b>Dynamic <sup>b</sup></b>						
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = -25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	-	3500	-	pF
Output capacitance	C <sub>oss</sub>		-	390	-	
Reverse transfer capacitance	C <sub>rss</sub>		-	290	-	
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> = -30 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -55 A	-	76	115	nC
		V <sub>DS</sub> = -30 V, V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -55 A	-	38	60	
Gate-source charge	Q <sub>gs</sub>		-	16	-	
Gate-drain charge	Q <sub>gd</sub>		-	19	-	
Gate resistance	R <sub>g</sub>	f = 1 MHz	-	5.2	-	Ω
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = -2 V, R <sub>L</sub> = 2 Ω I <sub>D</sub> ≅ -10 A, V <sub>GEN</sub> = -10 V, R <sub>g</sub> = 1 Ω	-	10	15	ns
Rise time	t <sub>r</sub>		-	7	15	
Turn-off delay time	t <sub>d(off)</sub>		-	70	110	
Fall time	t <sub>f</sub>		-	40	60	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous source-drain diode current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	-	-	-69	A
Pulse diode forward current <sup>a</sup>	I <sub>SM</sub>		-	-	-150	
Body diode voltage	V <sub>SD</sub>	I <sub>S</sub> = -30 A	-	-1	-1.5	V
Body diode reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = -50 A, di/dt = 100 A/μs, T <sub>J</sub> = 25 °C	-	45	68	ns
Body diode reverse recovery charge	Q <sub>rr</sub>		-	59	120	nC
Reverse recovery fall time	t <sub>a</sub>		-	29	-	ns
Reverse recovery rise time	t <sub>b</sub>		-	16	-	

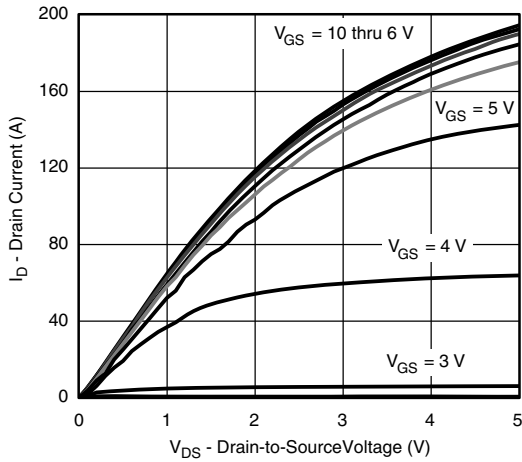
**Notes**

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %  
b. Guaranteed by design, not subject to production testing

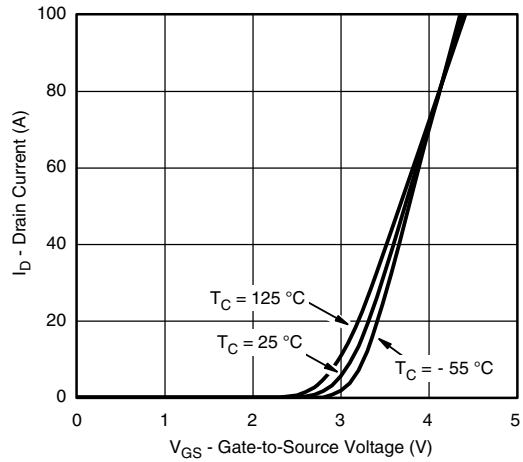
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



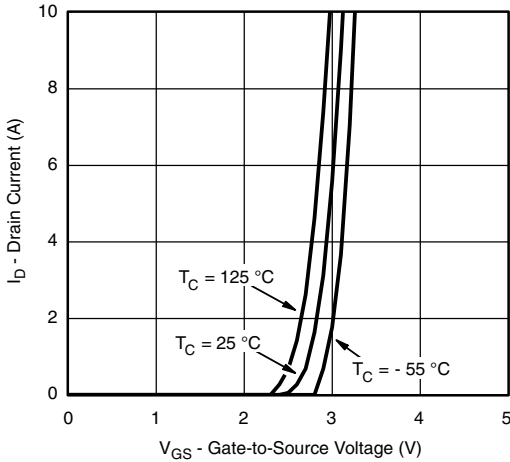
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



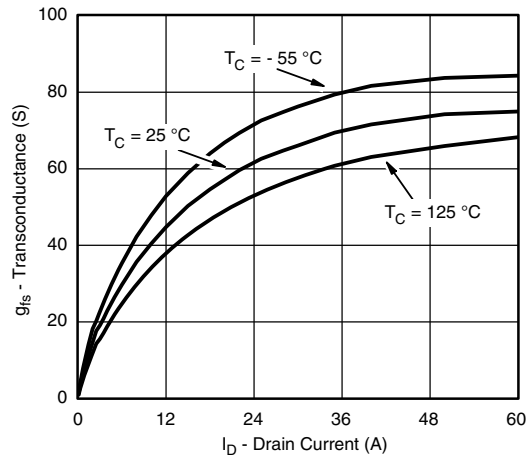
Output Characteristics



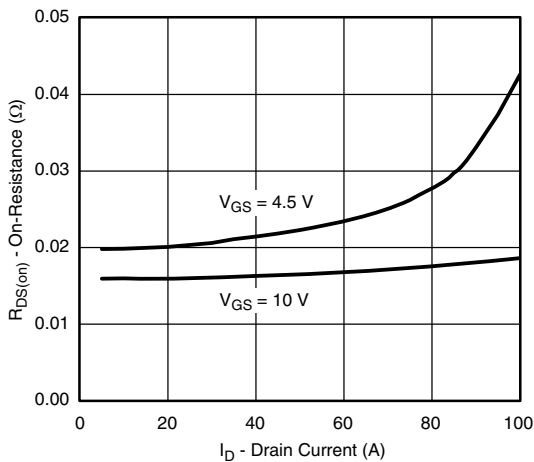
Transfer Characteristics



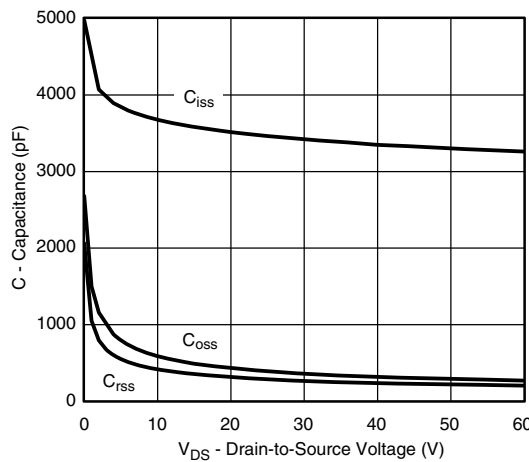
Transfer Characteristics



Transconductance



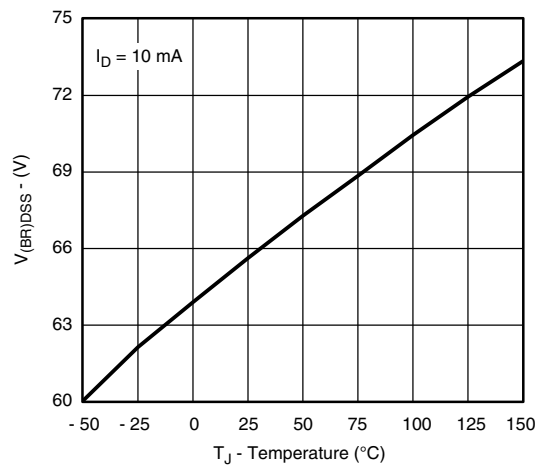
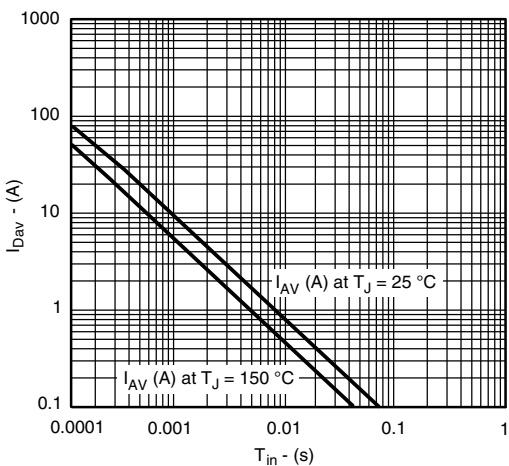
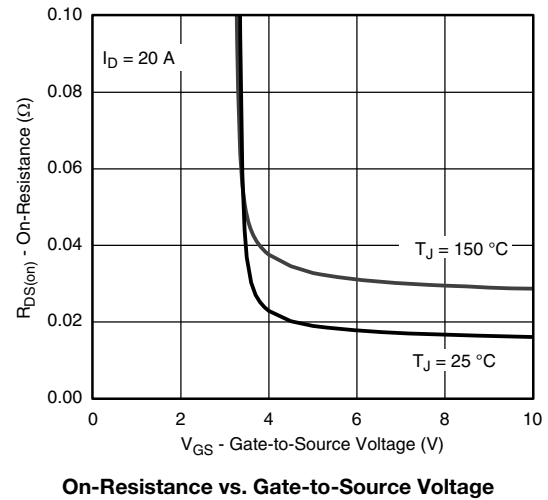
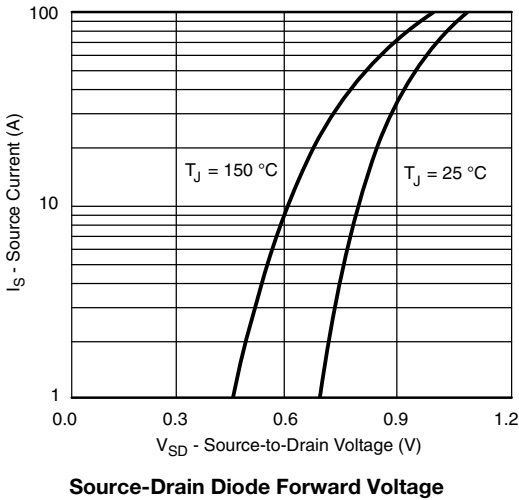
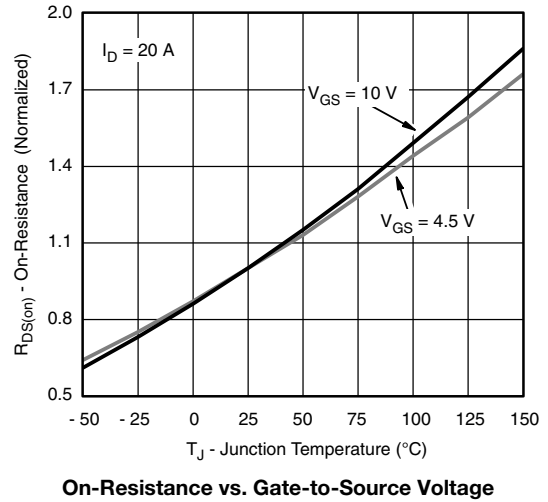
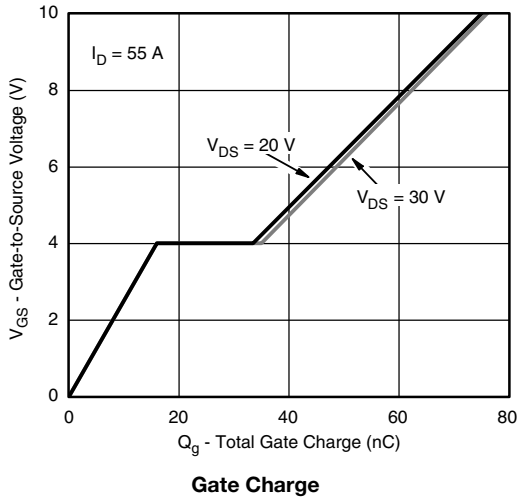
On-Resistance vs. Drain Current



Capacitance

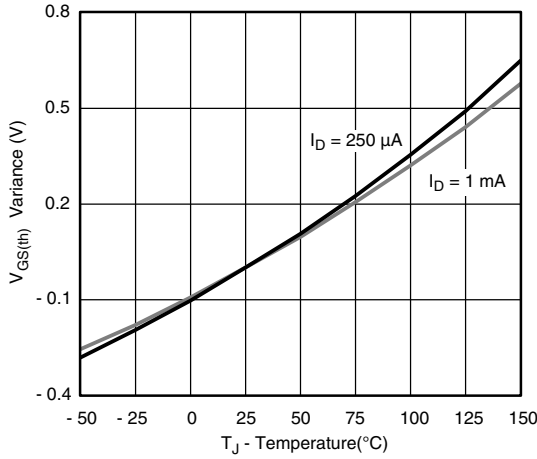


**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

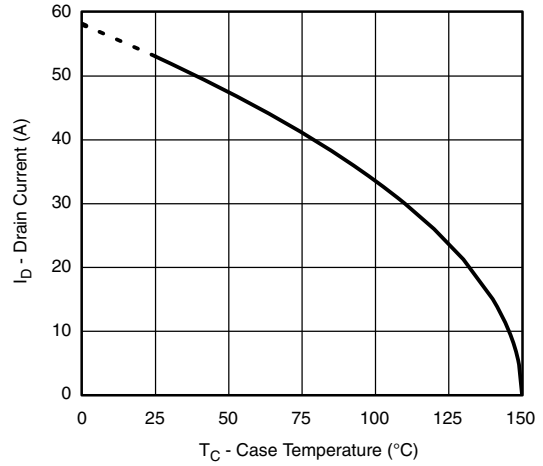




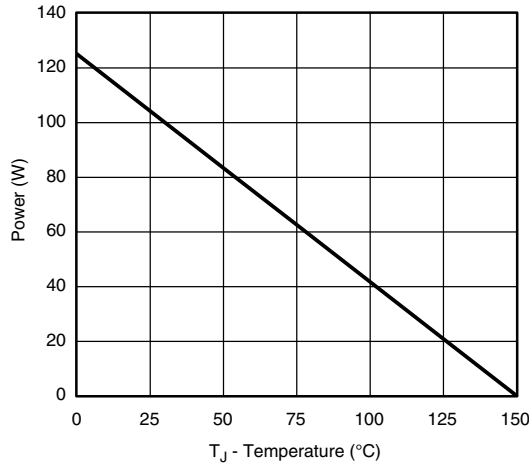
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



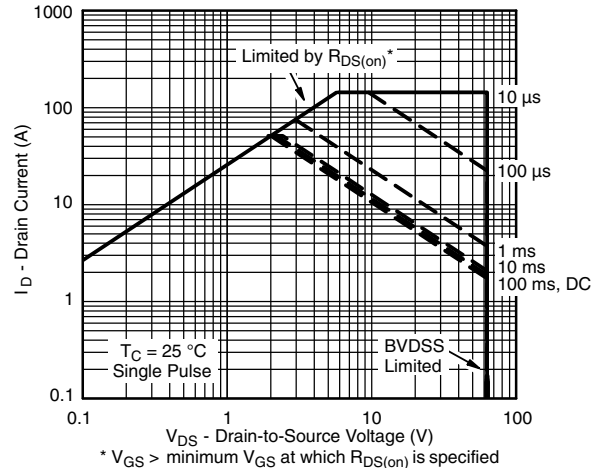
Threshold Voltage



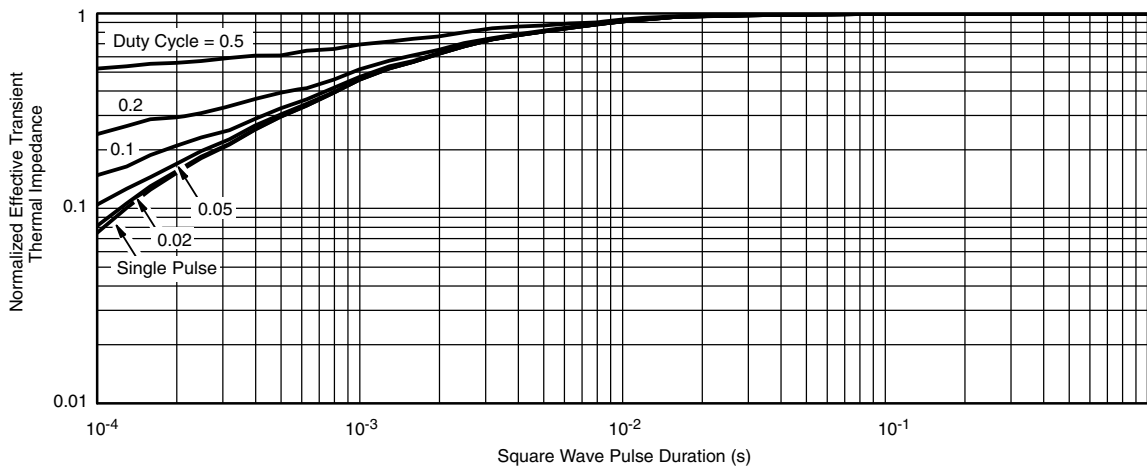
Max. Drain Current vs. Case Temperature



Power Derating, Junction-to-Case



Safe Operating Area, Junction-to-Case



Normalized Thermal Transient Impedance, Junction-to-Case

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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
D2	12.19	12.70	0.480	0.500
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: T14-0413-Rev. P, 16-Jun-14  
DWG: 5471

Note

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





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