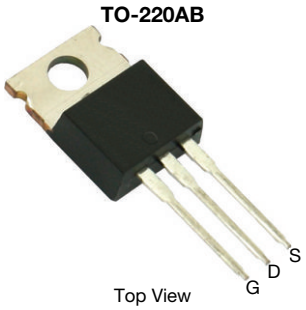
N-Channel 200 V (D-S) 175 °C MOSFET



Top View

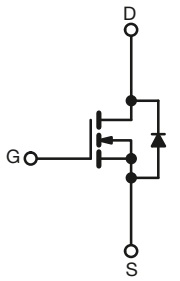
FEATURES

- ThunderFET® power MOSFET
- Tuned for the lowest R_{DS} - Q_{oss} FOM
- Maximum 175 °C junction temperature
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

- Power supplies:
  - Uninterruptible power supplies
  - AC/DC switch-mode power supplies
  - Lighting
- Synchronous rectification
- DC/DC converter
- Motor drive switch
- DC/AC inverter
- Solar micro inverter
- Class D audio amplifier



N-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	200
$R_{DS(on)}$ max. (Ω) at V_{GS} = 10 V	0.0152
$R_{DS(on)}$ max. (Ω) at V_{GS} = 7.5 V	0.0169
Q_g typ. (nC)	58
I_D (A)	90
Configuration	Single

ORDERING INFORMATION	
Package	TO-220AB
Lead (Pb)-free and halogen-free	SUP90142E-GE3

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	200	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current	T_C = 25 °C	I_D	90	A
	T_C = 125 °C		52	
Pulsed drain current (t = 100 µs)		I_{DM}	240	
Continuous source-drain diode current		I_S	90	
Single pulse avalanche current [a]	L = 0.1 mH	I_{AS}	60	
Single pulse avalanche energy [a]		E_{AS}	180	mJ
Maximum power dissipation	T_C = 25 °C	P_D	375 [b]	W
	T_C = 125 °C		125 [b]	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) [c]			260	

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	MAXIMUM	UNIT
Maximum junction-to-ambient (PCB mount) [c]		R_{thJA}	40	°C/W
Maximum junction-to-case (drain)	Steady state	R_{thJC}	0.4	

Notes

a. Duty cycle ≤ 1 %.
b. See SOA curve for voltage derating.
c. When mounted on 1" square PCB (FR4 material).
d. Package limited.

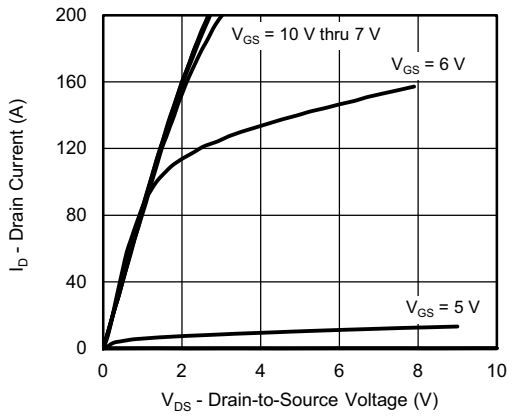
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	200	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS} , I_D = 250 µA	2	-	4	V
Gate-source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V	-	-	250	nA
Zero gate voltage drain current	I_{DSS}	V_{DS} = 200 V, V_{GS} = 0 V	-	-	1	µA
		V_{DS} = 200 V, V_{GS} = 0 V, T_J = 125 °C	-	-	150	
		V_{DS} = 200 V, V_{GS} = 0 V, T_J = 175 °C	-	-	5	mA
On-state drain current [a]	$I_{D(on)}$	V_{DS} ≥ 10 V, V_{GS} = 10 V	60	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 30 A	-	0.0126	0.0152	Ω
		V_{GS} = 7.5 V, I_D = 30 A	-	0.0133	0.0169	
Forward transconductance [a]	g_{fs}	V_{DS} = 15 V, I_D = 30 A	-	63	-	S
Dynamic [b]						
Input capacitance	C_{iss}	V_{DS} = 100 V, V_{GS} = 0 V, f = 1 MHz	-	3120	-	pF
Output capacitance	C_{oss}		-	280	-	
Reverse transfer capacitance	C_{rss}		-	24	-	
Total gate charge	Q_g	V_{DS} = 100 V, V_{GS} = 10 V, I_D = 60 A	-	58	87	nC
Gate-source charge	Q_{gs}		-	17.6	-	
Gate-drain charge	Q_{gd}		-	17.2	-	
Output charge	Q_{oss}	V_{DS} = 100 V, V_{GS} = 0 V	-	108	162	
Gate resistance	R_g	f = 1 MHz	1.5	3	5	Ω
Turn-on delay time	$t_{d(on)}$	V_{DD} = 100 V, R_L = 1.66 Ω, I_D ≅ 60 A, V_{GEN} = 10 V, R_g = 1 Ω	-	14	28	ns
Rise time	t_r		-	125	250	
Turn-off delay time	$t_{d(off)}$		-	27	54	
Fall time	t_f		-	80	150	
Drain-Source Body Diode Characteristics						
Pulse diode forward current (t = 100 µs)	I_{SM}		-	-	240	A
Body diode voltage	V_{SD}	I_F = 30 A, V_{GS} = 0 V	-	0.85	1.5	V
Body diode reverse recovery time	t_{rr}	I_F = 30 A, dI/dt = 100 A/µs	-	150	300	ns
Body diode reverse recovery charge	Q_{rr}		-	0.9	1.8	nC
Reverse recovery fall time	t_a		-	125	-	ns
Reverse recovery rise time	t_b		-	25	-	
Body diode peak reverse recovery charge	$I_{RM(REC)}$		-	11.5	20	A

Notes

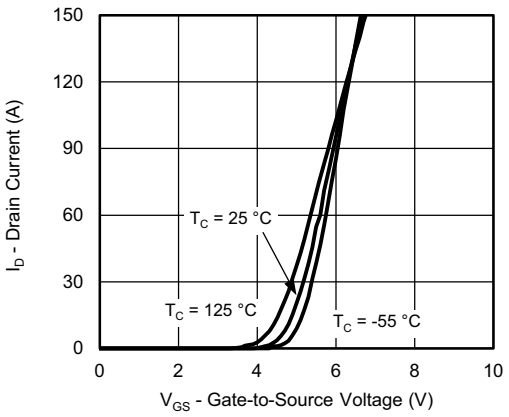
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

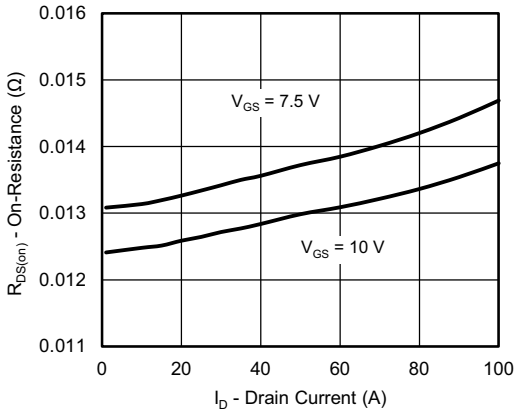
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



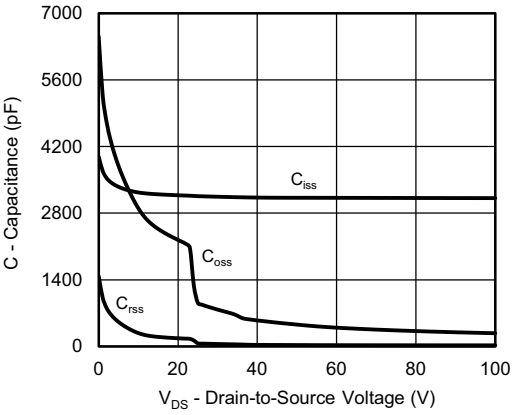
Output Characteristics



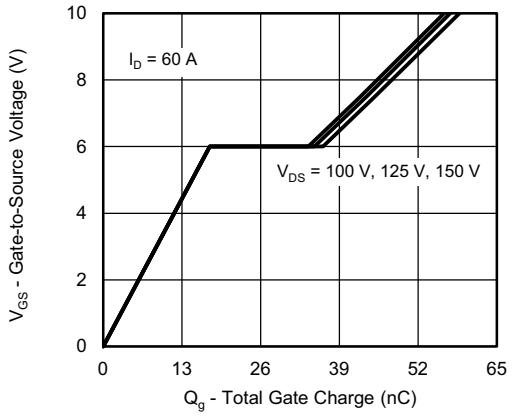
Transfer Characteristics



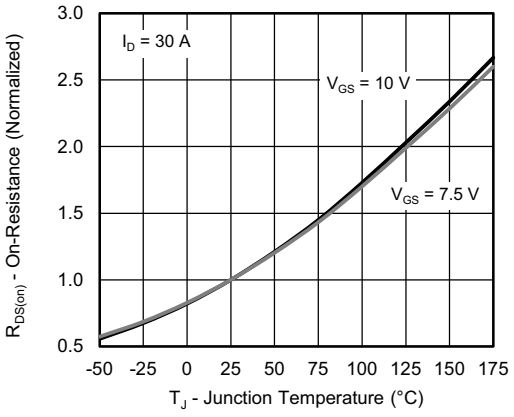
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

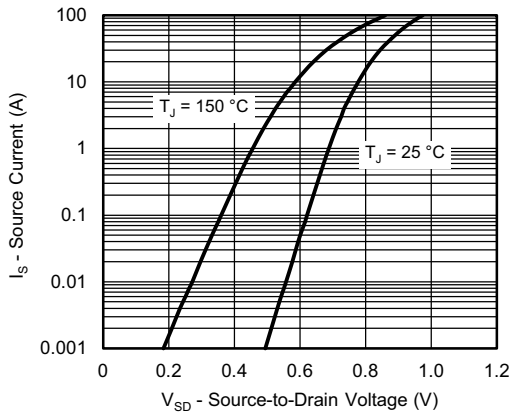


Gate Charge

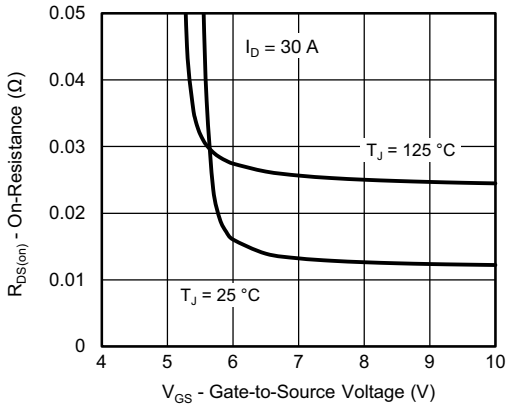


On-Resistance vs. Junction Temperature

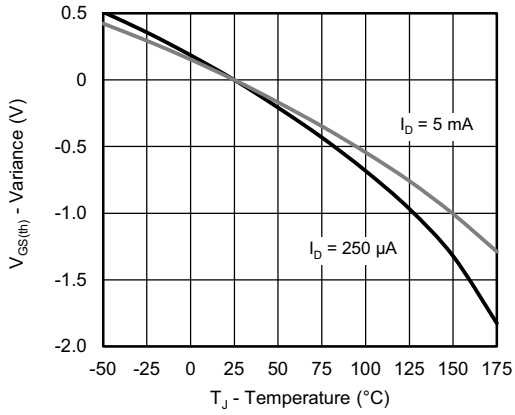
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



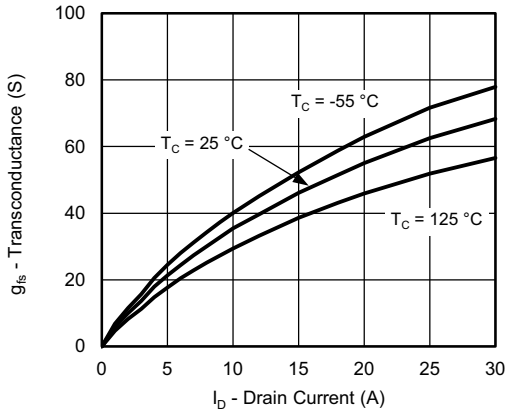
Source-Drain Diode Forward Voltage



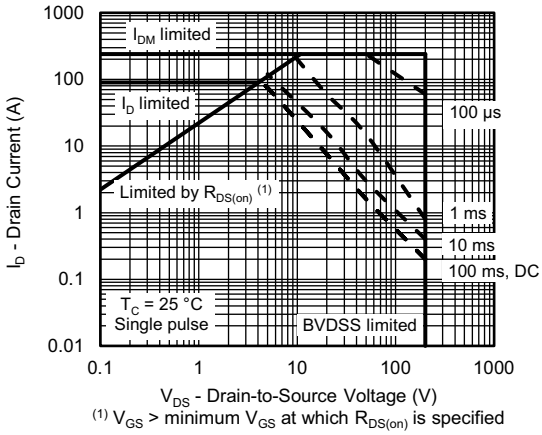
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

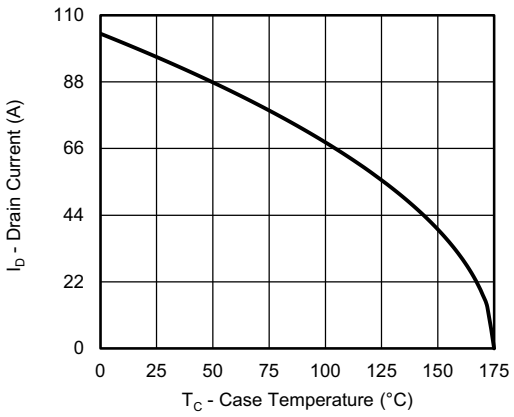


Transconductance

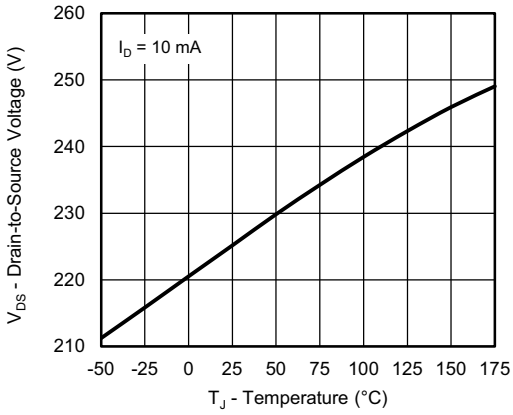


Safe Operating Area, Junction-to-Ambient

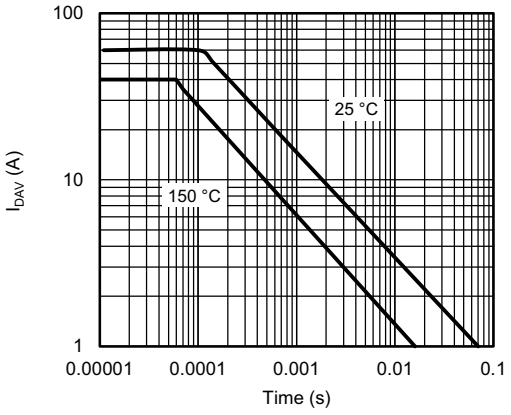
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating [a]



Drain Source Breakdown vs. Junction Temperature

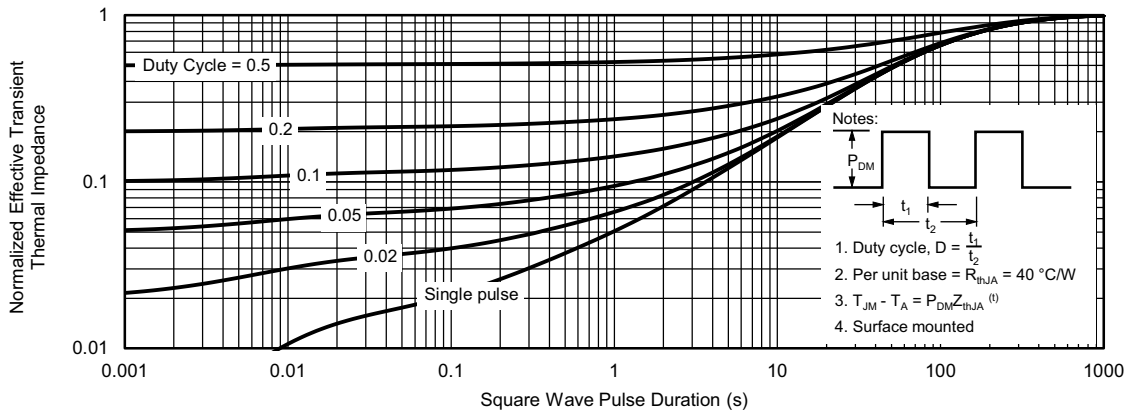


I_{DAV} vs. Time

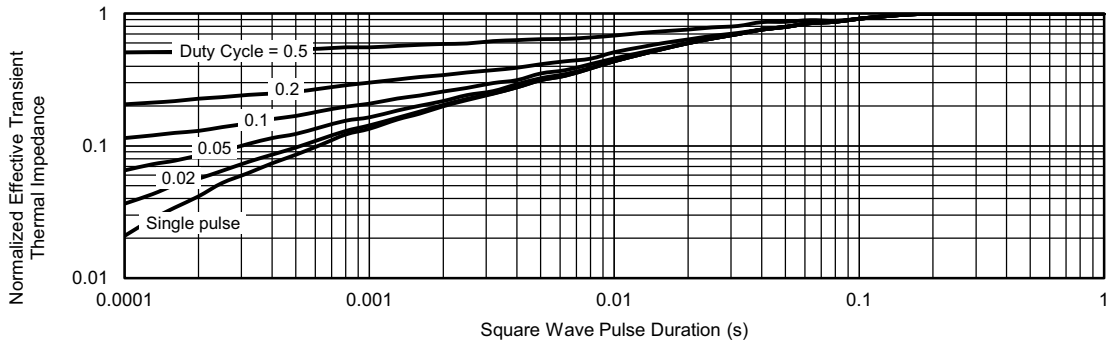
Note

a. The power dissipation P_D is based on T_J max. = 25 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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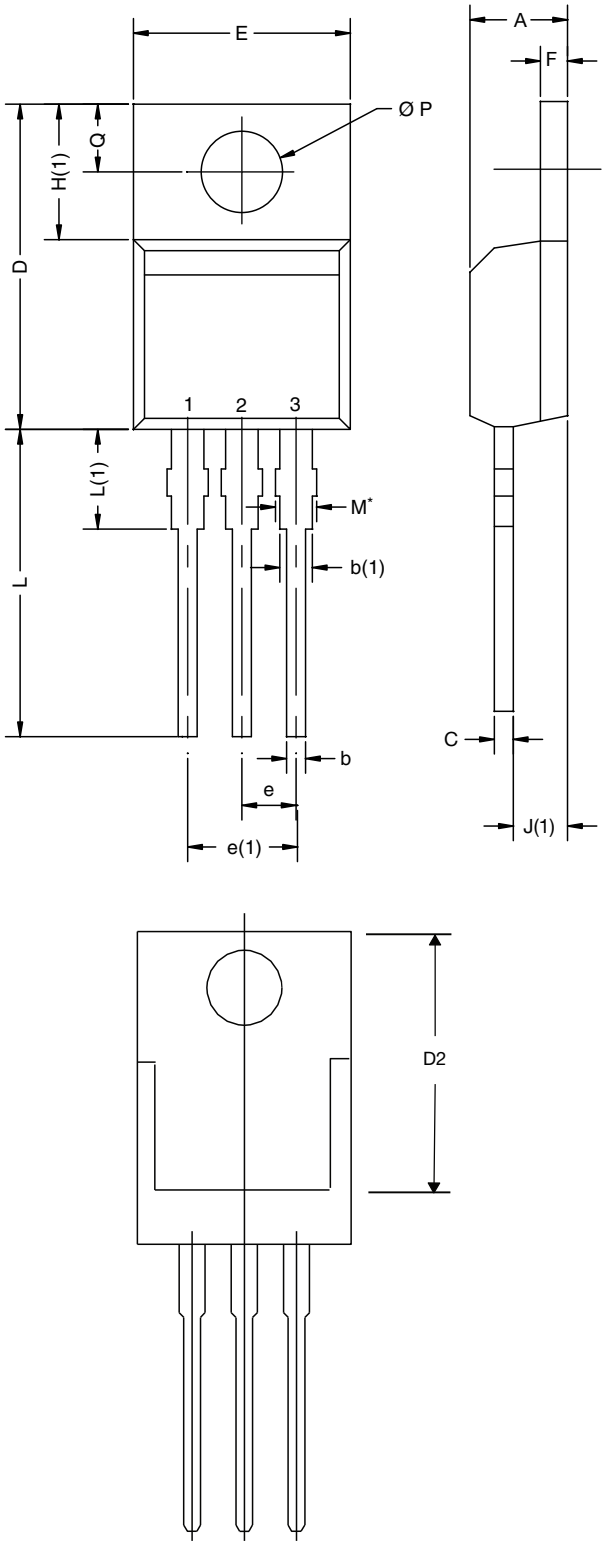
TO-220AB



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
Ø 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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