N-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
60	0.012 at V_{GS} = 10 V	60[d]	33

FEATURES

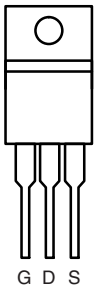
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested
- Compliant to RoHS Directive 2002/95/EC

RoHS COMPLIANT
HALOGEN FREE Available

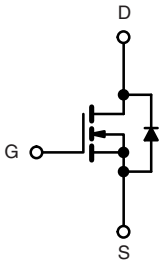
APPLICATIONS

- Synchronous Rectifier
- Power Supplies

TO-220AB



Top View



N-Channel MOSFET

Ordering Information: SUP60N06-12P-E3 (Lead (Pb)-free)
SUP60N06-12P-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T_C = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	60[d]	A
	T_C = 70 °C		54[d]	
Pulsed Drain Current		I_{DM}	80	
Avalanche Current		I_{AS}	40	
Single Avalanche Energy[a]	L = 0.1 mH	E_{AS}	80	mJ
Maximum Power Dissipation[a]	T_C = 25 °C	P_D	100[b]	W
	T_A = 25 °C[c]		3.25	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS			
Parameter	**Symbol**	**Limit**	**Unit**
Junction-to-Ambient (PCB Mount)[c]	R_{thJA}	40	°C/W
Junction-to-Case (Drain)	R_{thJC}	1.25	

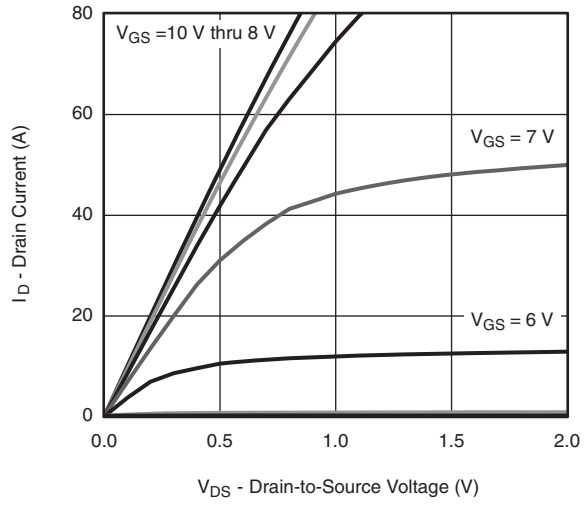
Notes:
a. Duty cycle ≤ 1 %.
b. See SOA curve for voltage derating.
c. When Mounted on 1" square PCB (FR-4 material).
d. Package limited.

SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{DS} = 0 V, I_D = 250 µA	60			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	2.5		4.5	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 250	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 60 V, V_{GS} = 0 V			1	µA
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 125 °C			50	
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 150 °C			250	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} ≥ 10 V, V_{GS} = 10 V	80			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 30 A		0.0098	0.012	Ω
		V_{GS} = 10 V, I_D = 30 A, T_J = 125 °C		0.0155	0.019	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 15 A		37		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 30 V, f = 1 MHz		1970		pF
Output Capacitance	C_{oss}			310		
Reverse Transfer Capacitance	C_{rss}			110		
Total Gate Charge[c]	Q_g	V_{DS} = 30 V, V_{GS} = 10 V, I_D = 20 A		33	55	nC
Gate-Source Charge[c]	Q_{gs}			11		
Gate-Drain Charge[c]	Q_{gd}			9		
Gate Resistance	R_g	f = 1 MHz	0.3	1.4	2.8	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 30 V, R_L = 1.53 Ω I_D ≅ 20 A, V_{GEN} = 10 V, R_g = 1 Ω		11	20	ns
Rise Time[c]	t_r			11	20	
Turn-Off Delay Time[c]	$t_{d(off)}$			16	30	
Fall Time[c]	t_f			8	15	
Source-Drain Diode Ratings and Characteristics T_C = 25 °C[b]						
Continuous Current	I_S				60	A
Pulsed Current	I_{SM}				80	
Forward Voltage[a]	V_{SD}	I_F = 10 A, V_{GS} = 0 V		0.84	1.5	V
Reverse Recovery Time	t_{rr}	I_F = 10 A, dI/dt = 100 A/µs		40	80	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			3.2	5.0	A
Reverse Recovery Charge	Q_{rr}			64	120	nC

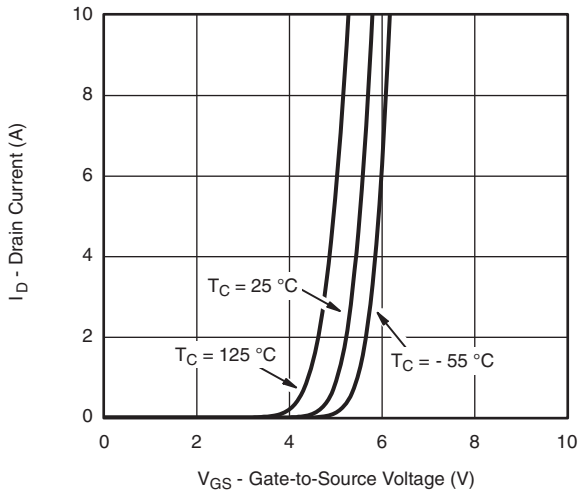
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

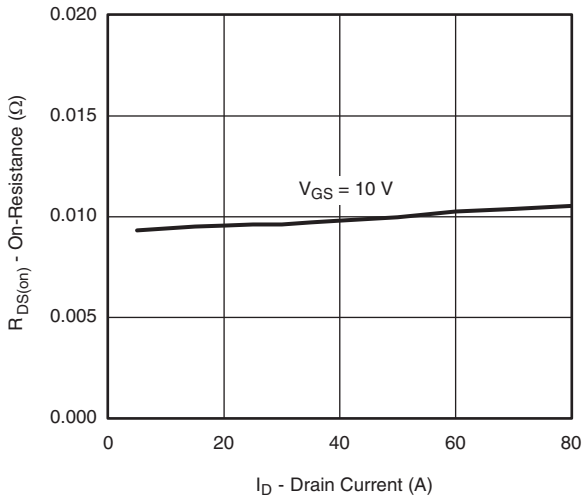
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



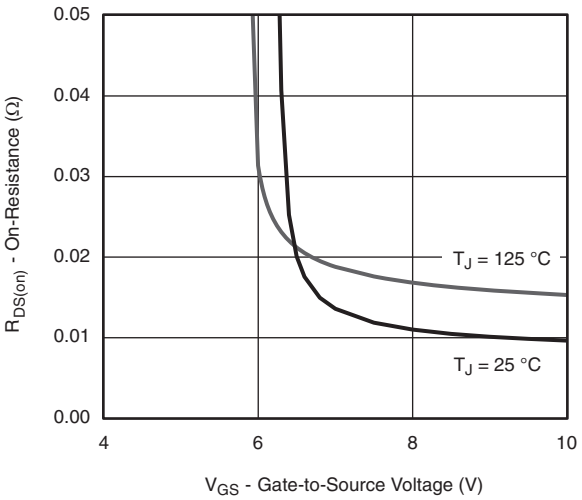
Output Characteristics



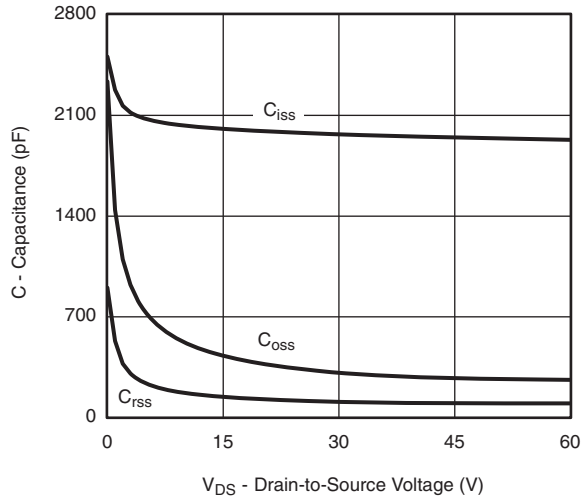
Transfer Characteristics



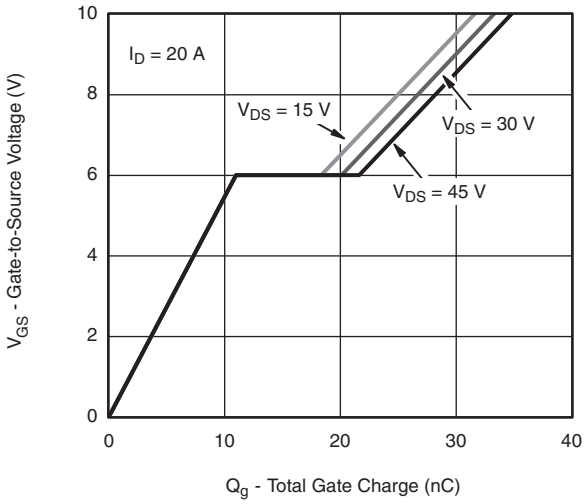
On-Resistance vs. Drain Current



On-resistance vs. Gate-to-Source Voltage

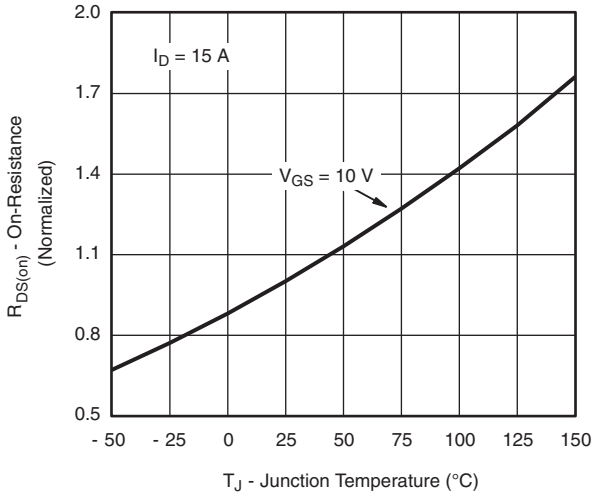


Capacitance

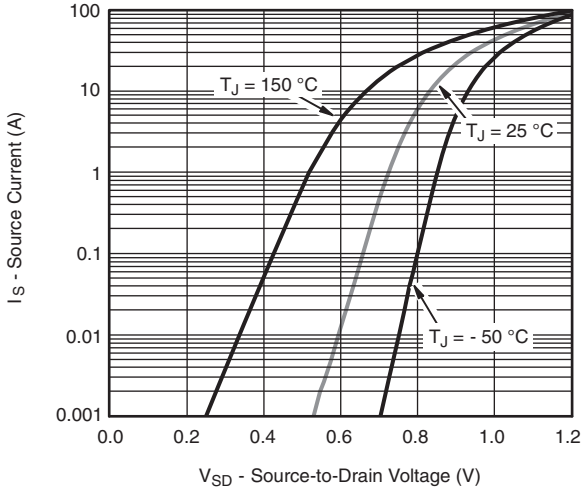


Gate Charge

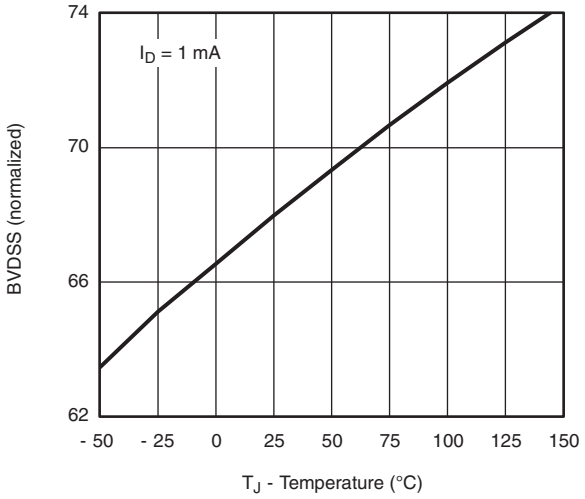
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



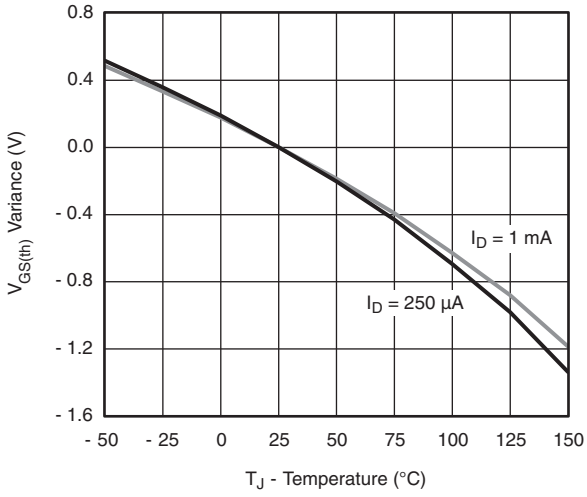
On-Resistance vs. Junction Temperature



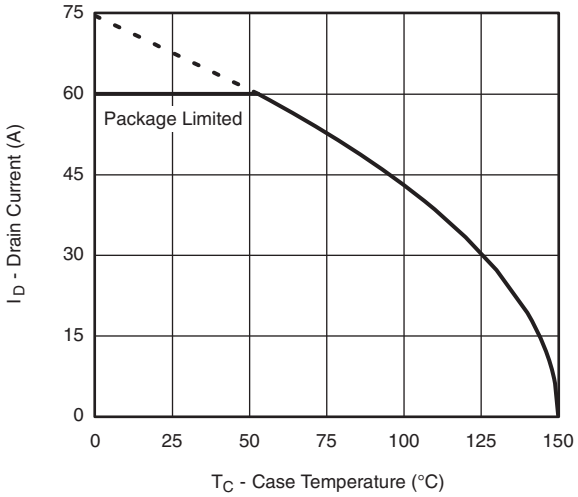
Source-Drain Diode Forward Voltage



Drain-Source Breakdown vs. Junction Temperature

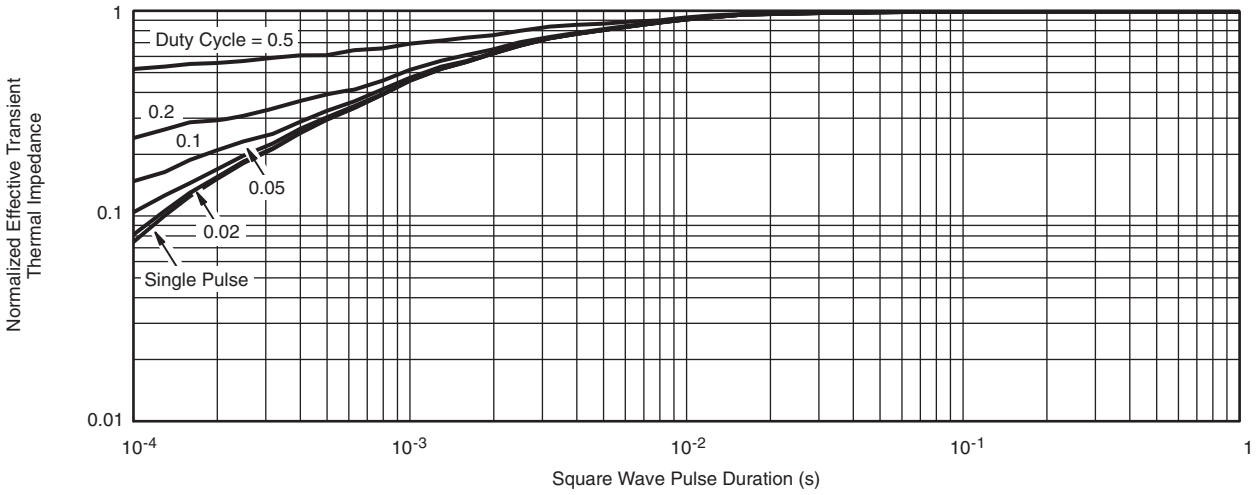


Threshold Voltage



Maximum Drain Current vs. Case Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Case

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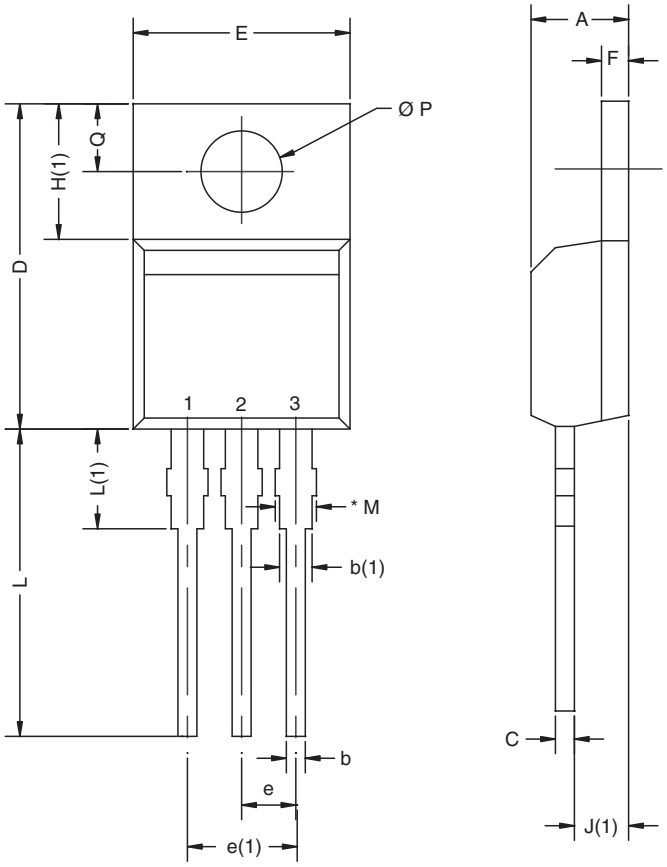

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	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
Ø P	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118
ECN: X10-0416-Rev. M, 01-Nov-10 DWG: 5471				

Note

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

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