

**60V/50A N-Channel MOSFET**
**Features**

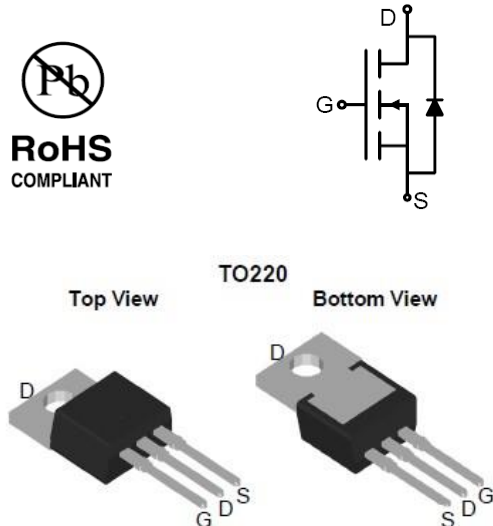
- 60V, 50A,  $R_{DS(ON),max.} = 13m\Omega @ V_{GS}=10V$
- Reliable and Rugged
- Advanced trench process technology High Density Cell Design For Ultra Low On-Resistance

**Application**

- Battery protection
- Power management

**Product Summary**

$V_{DS}$	60V
$R_{DS(on),max@VGS=10V}$	13m $\Omega$
$I_D$	50A


**Maximum Ratings**

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	60	V
Continuous drain current $T_C = 25^\circ C$ (Silicon limit) $T_C = 25^\circ C$ (Package limit) $T_C = 100^\circ C$ (Silicon limit)	$I_D$	- 50 37.5	A
Pulsed drain current $T_C = 25^\circ C, t_p$ limited by $T_{jmax}$	$I_{D\ pulse}$	175	
Avalanche energy, single pulse ( $L=0.5mH, R_g=25\Omega$ )	$E_{AS}$	150	mJ
Gate-emitter voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_C = 25^\circ C$	$P_{tot}$	115	W
Operating junction and storage temperature	$T_j, T_{stg}$	-55~175	$^\circ C$

**Thermal Resistance**

Parameter	Symbol	Value	Unit
Thermal resistance, junction – case. Max	$R_{thJC}$	0.7	°C/W
Thermal resistance, junction – ambient. Max	$R_{thJA}$	60	

**Electrical Characteristic, at  $T_j = 25^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Test Condition	Value			Unit
			min.	typ.	max.	

**Static Characteristic**

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	60	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$ $T_j=25^\circ\text{C}$ $T_j=125^\circ\text{C}$	1.2	1.8	2.5	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$ $T_j=25^\circ\text{C}$ $T_j=125^\circ\text{C}$	-	-	1 50	$\mu A$
Gate-source leakage current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-100	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=50A,$ $T_j=25^\circ\text{C}$	-	9.5	13	m $\Omega$
Transconductance	$g_{fs}$	$V_{DS}=10V, I_D=50A$	-	100	-	S

**Dynamic Characteristic**

Input Capacitance	$C_{iss}$	$V_{GS}=0V, V_{DS}=25V,$ $f=1\text{MHz}$	-	4203	-	pF
Output Capacitance	$C_{oss}$		-	262	-	
Reverse Transfer Capacitance	$C_{rss}$		-	187	-	
Gate Total Charge	$Q_G$	$V_{GS}=10V, V_{DS}=25V,$ $I_D=30A, f=1\text{MHz}$	-	84	-	nC
Gate-Source charge	$Q_{gs}$		-	14	-	
Gate-Drain charge	$Q_{gd}$		-	30	-	
Turn-on delay time	$t_{d(on)}$	$T_j=25^\circ\text{C}, V_{DD}=25V,$ $I_{DS}=30A, R_L=3\Omega$	-	10	-	ns
Rise time	$t_r$		-	13	-	
Turn-off delay time	$t_{d(off)}$		-	20	-	
Fall time	$t_f$		-	30	-	
Gate resistance	$R_G$	$V_{GS}=0V, V_{DS}=0V,$ $f=1\text{MHz}$	-	1.8	-	$\Omega$

**Body Diode Characteristic**

Maximum Continuous Drain to Source Diode Forward Current	$I_S$		-	-	50	A
Maximum Pulsed Drain to Source Diode Forward Current	$I_{SM}$		-	-	175	A
Drain to Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=30A$	-	0.8	1.0	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F=20A,$ $di/dt=100A/\mu s$	-	35	-	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	60	-	nC

## Typical Performance Characteristics

Figure 1: Power Dissipation

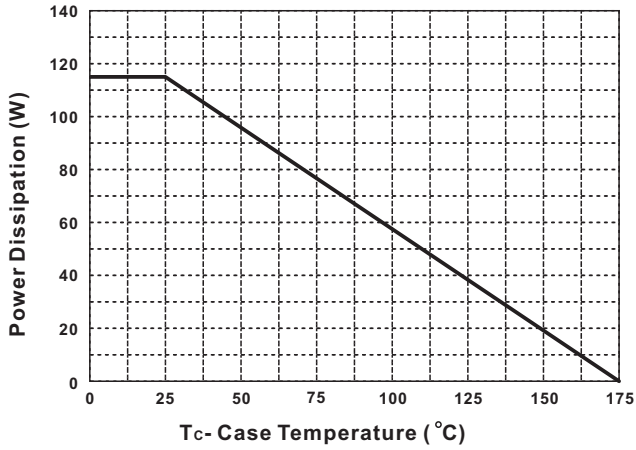


Figure 2: Drain Current

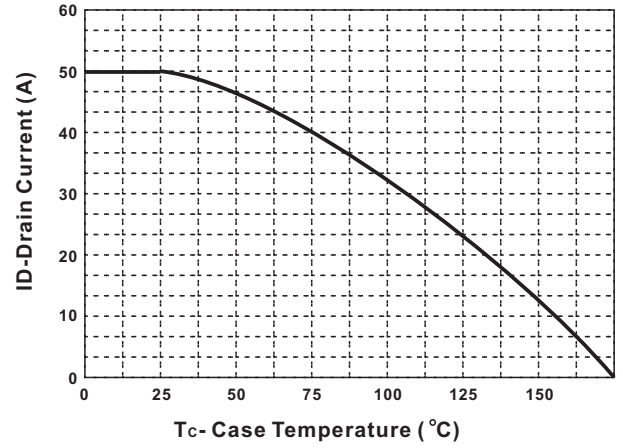


Figure 3: Safe Operation Area

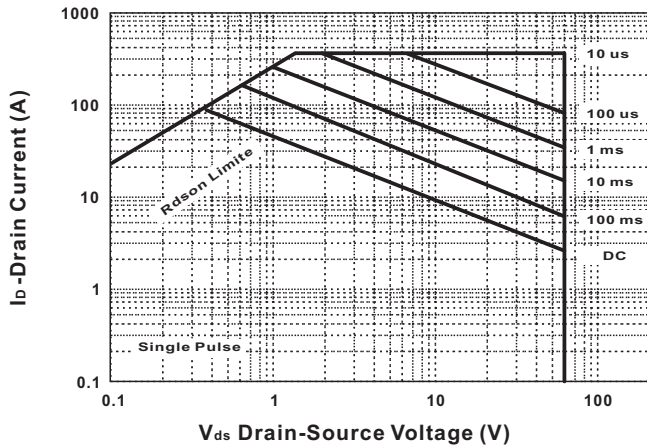


Figure 4: Thermal Transient Impedance

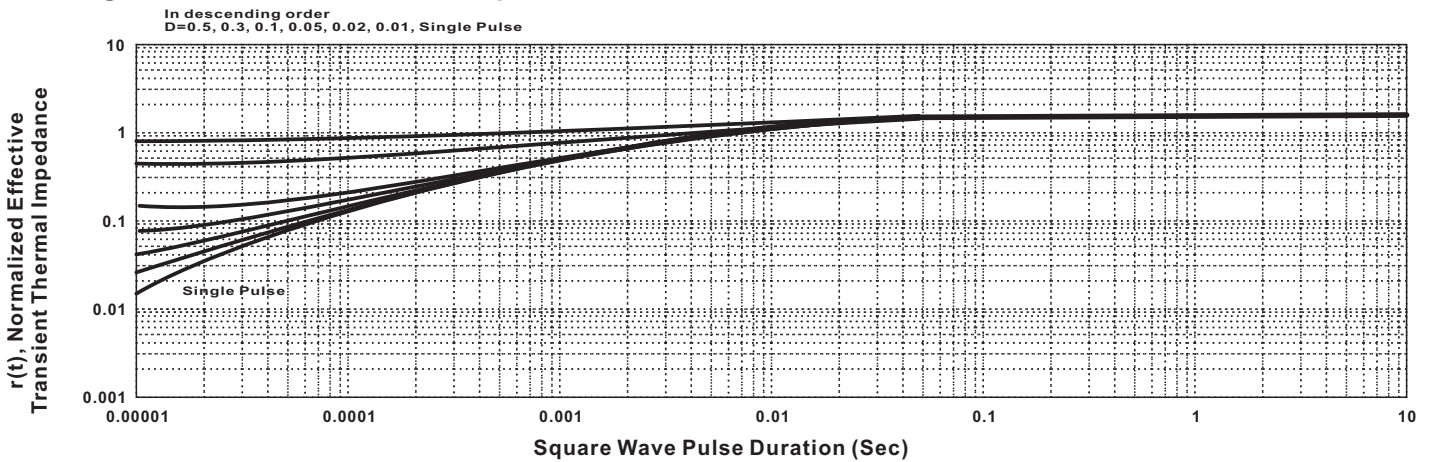


Figure 5: Output Characteristics

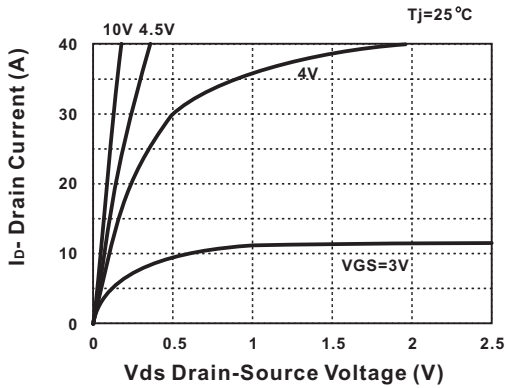


Figure 6: Drain-Source On Resistance

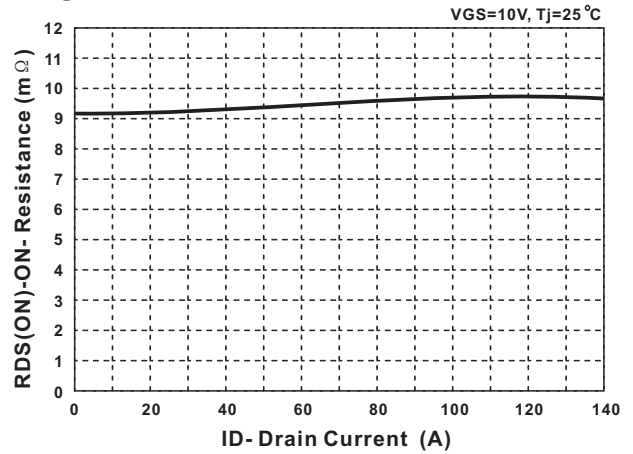


Figure 7: On-Resistance vs. Temperature

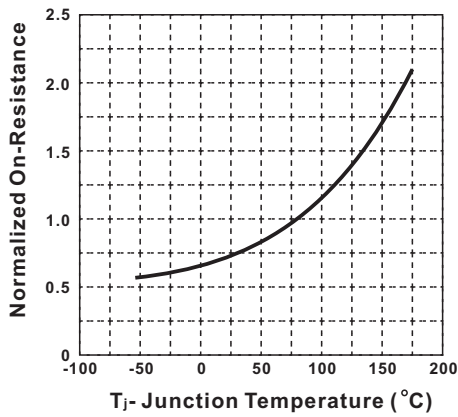


Figure 8: Source-Drain Diode Forward

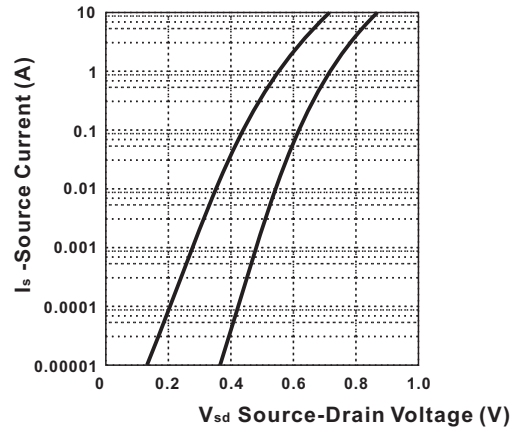


Figure 9: Capacitance Characteristics

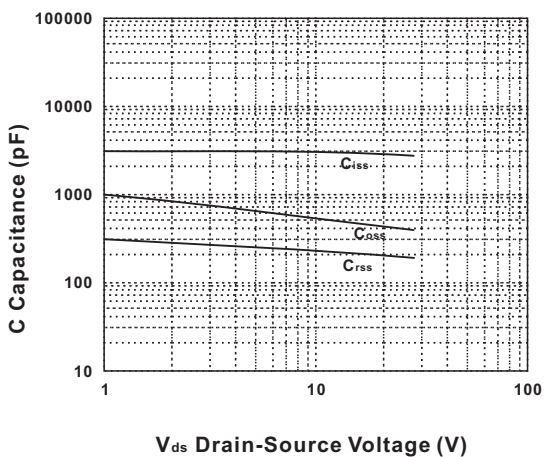
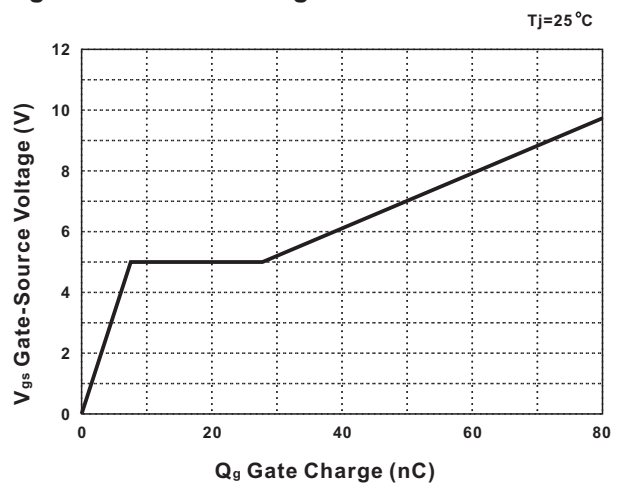
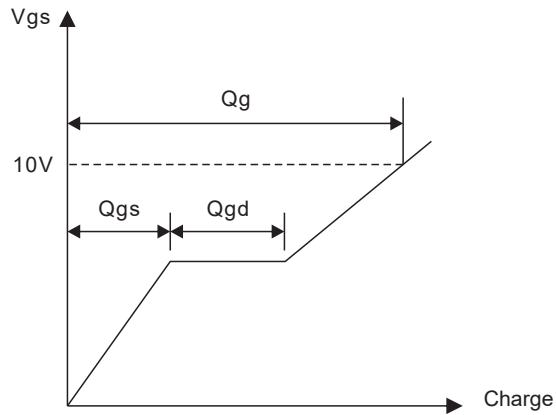
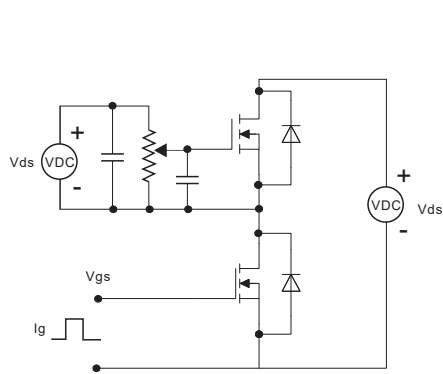


Figure 10: Gate Charge Characteristics

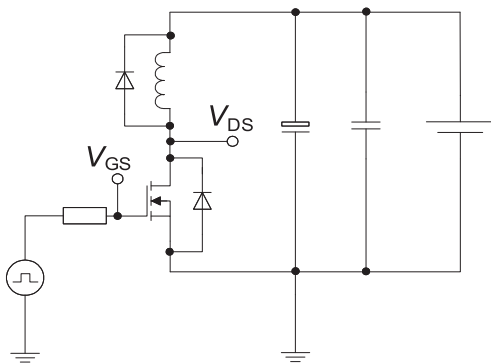


## Test Circuit & Waveform

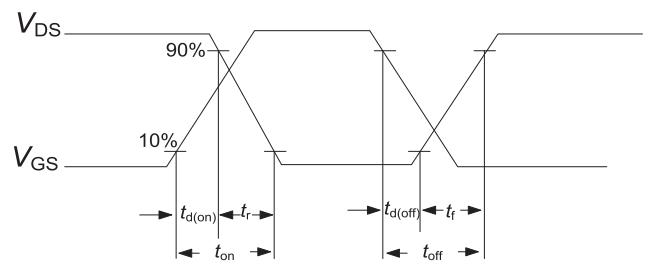
Gate Charge Test Circuit & Waveform



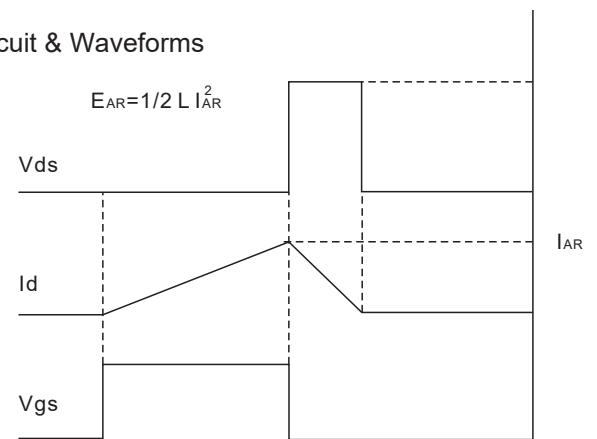
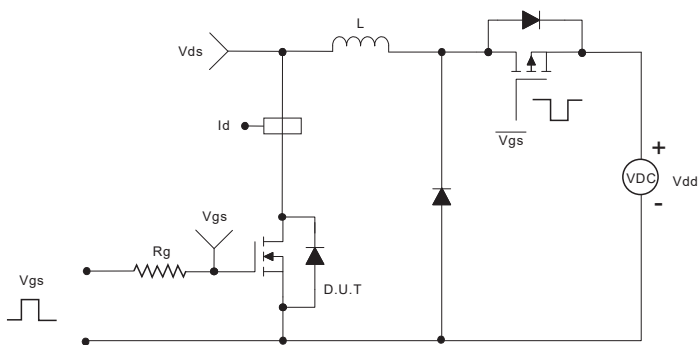
Switching Times Test Circuit for Inductive Load



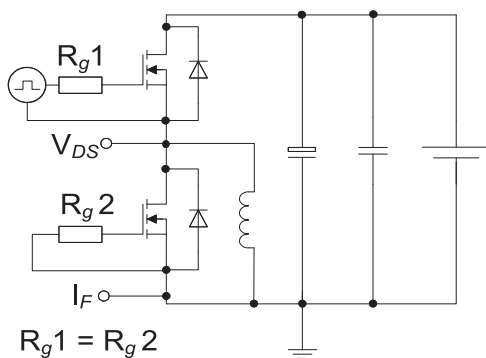
Switching Times Waveform



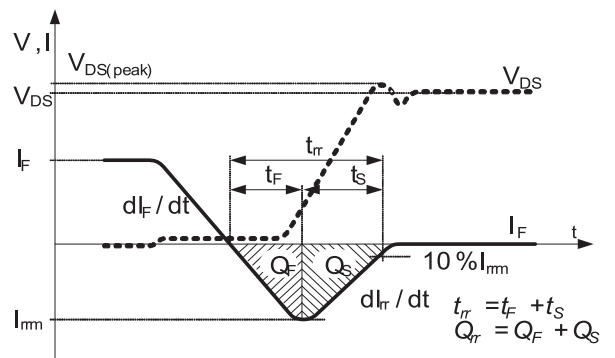
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



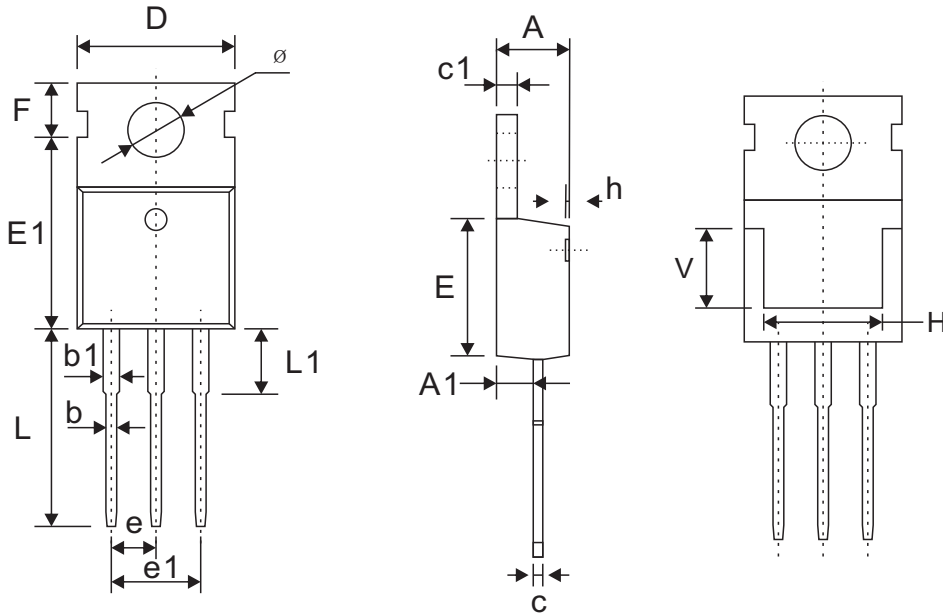
Test Circuit for Diode Characteristics



Diode Recovery Waveform



TO-220 Package Information



Dimension	Millimeters	
	Min.	Max.
A	4.40	4.60
A1	2.25	2.55
b	0.71	0.91
b1	1.17	1.37
c	0.33	0.65
c1	1.20	1.40
D	9.91	10.25
E	8.95	9.75
E1	12.65	12.95
e	2.54 (Typ.)	
e1	4.98	5.18
F	2.65	2.95
H	7.90	8.10
h	0.00	0.30
L	12.90	13.40
L1	2.85	3.25
V	7.50 (Ref.)	
ø	3.40	3.80

Revision history

Date	Revision	Changes
28-May-2020	1.0	Initial release

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