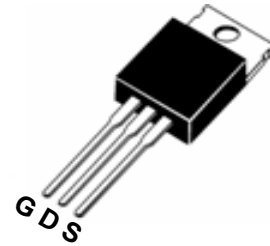




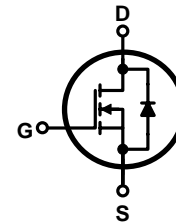
PIN Connection TO-220



- V_{DSS} , 150V
- $R_{DS(ON)}$, 12mΩ (max.) @ $V_{GS}=10V$
- I_D , 119A
- Low On-Resistance
- Low Input Capacitance
- Low Miller Charge

APPLICATIONS

- Motor / Body Load Control
- Load Switch
- Solenoid and Motor Control
- DC-DC converters and Off-line UPS



Marking Diagram



- Y = Year
- A = Assembly Location
- WW = Work Week
- FIR120N15P = Specific Device Code

Absolute Maximum Ratings ($T_A=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	150	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	$T_C=25^\circ C$	119
		$T_C=70^\circ C$	95
Drain Current-Pulsed ^{Note 1}	I_{DM}	500	A
Drain Current-Continuous	I_D	$T_A=25^\circ C$	10.7
		$T_A=70^\circ C$	8.6
Avalanche Current, L=10mH	I_{AS}	7.4	A
Avalanche Energy, L=10mH	E_{AS}	273	mJ
Maximum Power Dissipation	P_D	$T_C=25^\circ C$	250
		$T_C=70^\circ C$	160
		$T_A=25^\circ C$	2
		$T_A=70^\circ C$	1.3
Storage Temperature Range	T_{STG}	-55 to +150	°C
Operating Junction Temperature Range	T_J	-55 to +150	°C

Thermal Resistance Ratings

Parameter		Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient	$R_{\theta JA}$	Steady State	-	-	62	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	Steady State	-	-	0.5	°C/W

Electrical Characteristics ($T_j=25^\circ\text{C}$ unless otherwise noted)

OFF CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_{DS}=250\mu A$	150	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=120V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA

ON CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	2	3	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_{DS}=30A$	-	9.8	12	m Ω

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C_{iss}	$V_{DS}=30V, V_{GS}=0V, f=1\text{MHz}$	-	8505	-	pF
Output Capacitance	C_{oss}		-	566	-	
Reverse Transfer Capacitance	C_{rss}		-	227	-	

SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	$T_{d(on)}$	$V_{DD}=30V, I_D=30A, V_{GEN}=10V, R_G=3.3\Omega$	-	24	-	ns
Rise Time	t_r		-	38	-	
Turn-Off Delay Time	$T_{d(off)}$		-	82	-	
Fall Time	t_f		-	43	-	
Total Gate Charge at 10V	Q_g	$V_{DS}=30V, V_{GS}=10V, I_{DS}=30A$	-	152	-	nC
Gate to Source Gate Charge	Q_{gs}		-	33	-	
Gate to Drain "Miller" Charge	Q_{gd}		-	38	-	

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_{DS}=30A$	-	-	1.3	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F=30A, di/dt=100A/\mu s$	-	120	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	160	-	nC

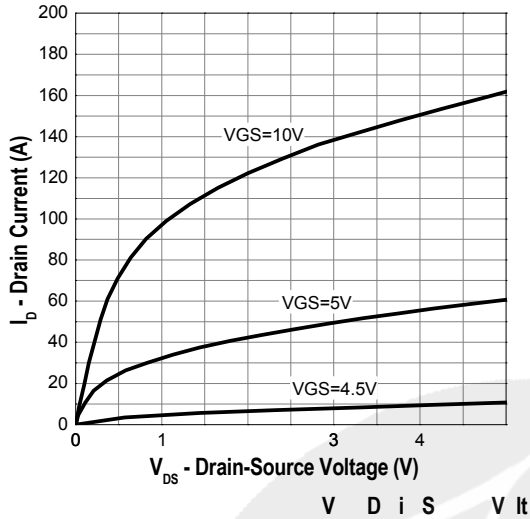
Notes:

- Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
- $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design. $R_{\theta JA}$ shown below for single device operation on FR-4 in still air.

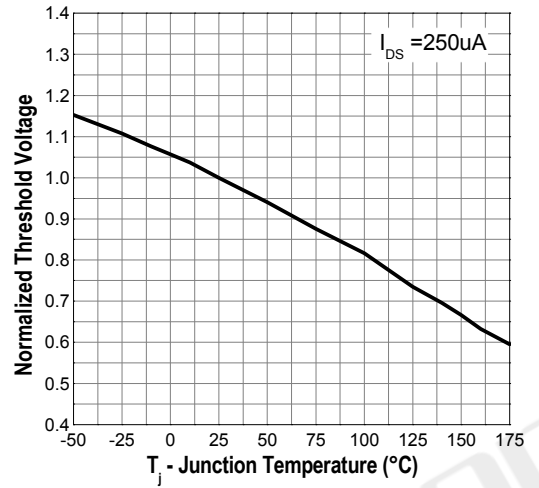


Typical Operating Characteristics

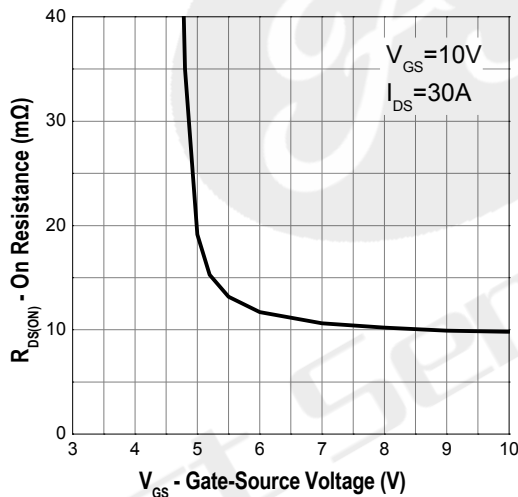
Output Characteristics



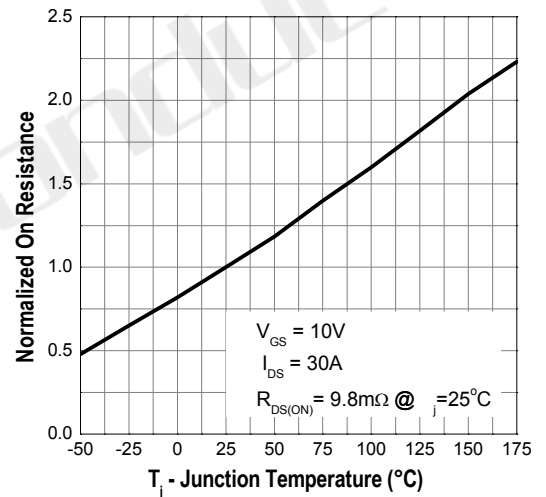
Gate Threshold Voltage



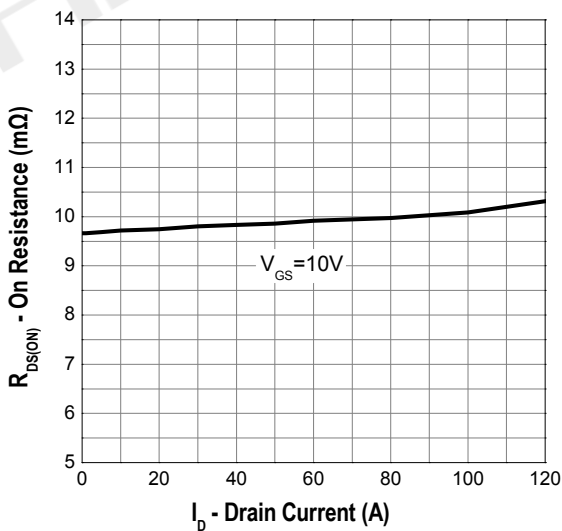
Gate-Source On Resistance



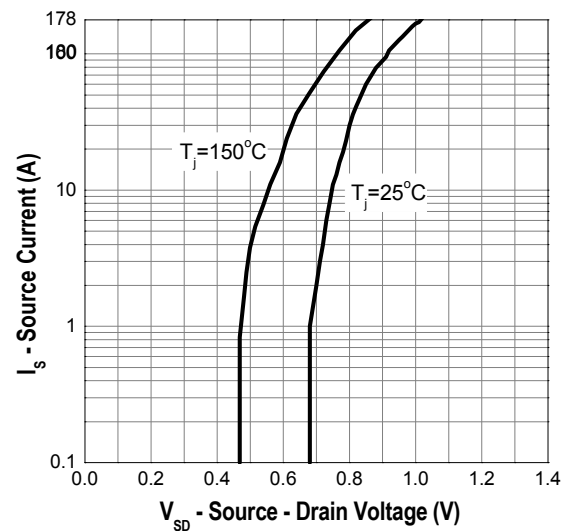
Drain-Source On Resistance



Drain-Source On Resistance



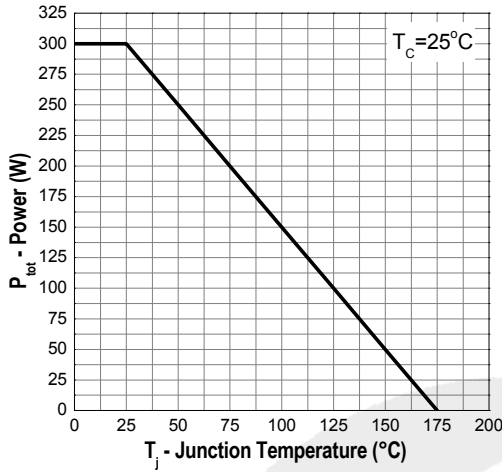
Source-Drain Diode Forward



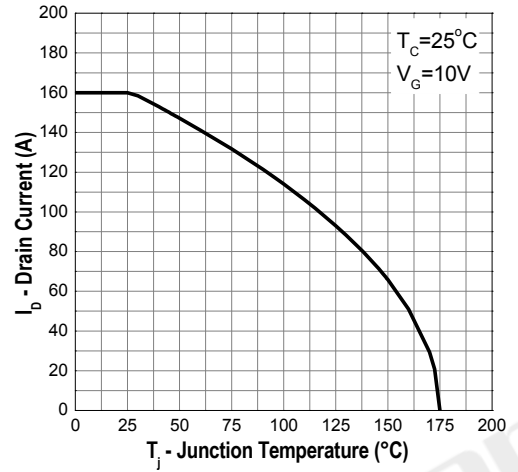


Typical Operating Characteristics (Cont.)

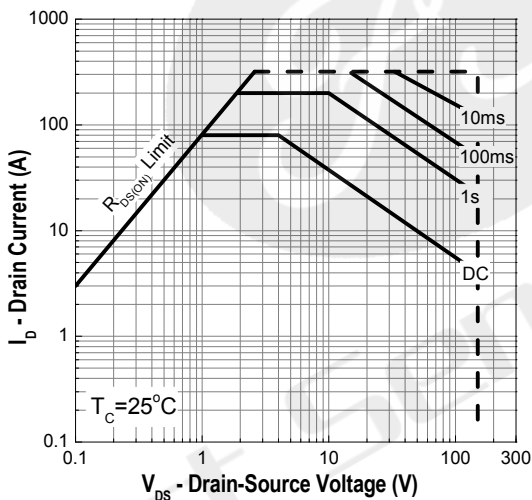
Power Dissipation



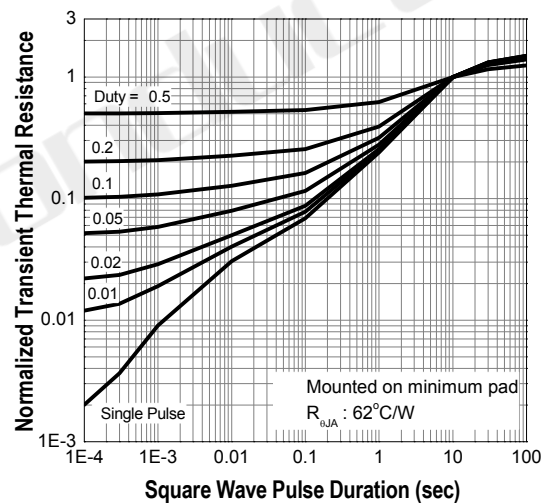
Drain Current



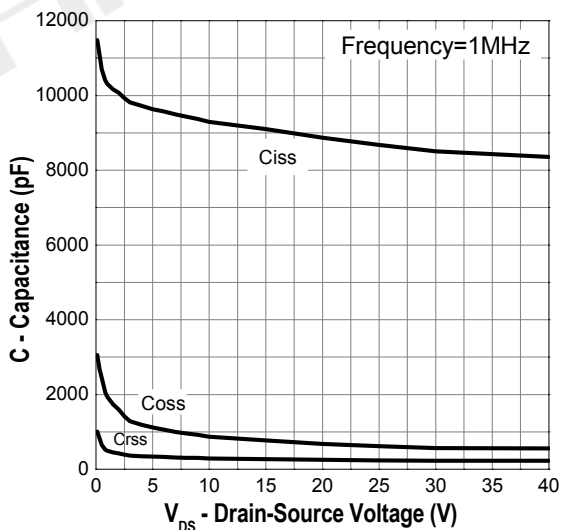
Safe Operation Area



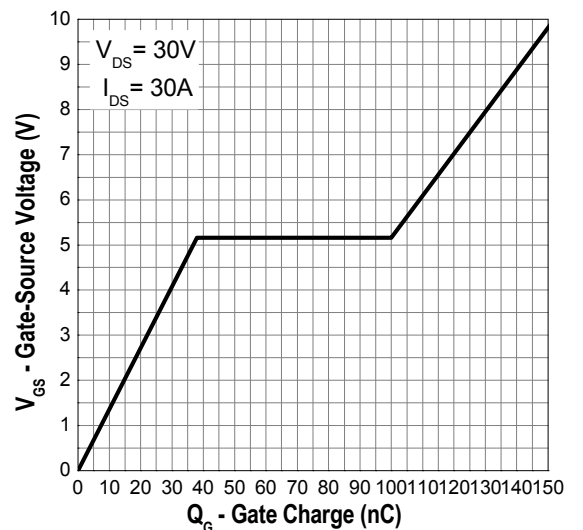
Transient Thermal Impedance



Capacitance

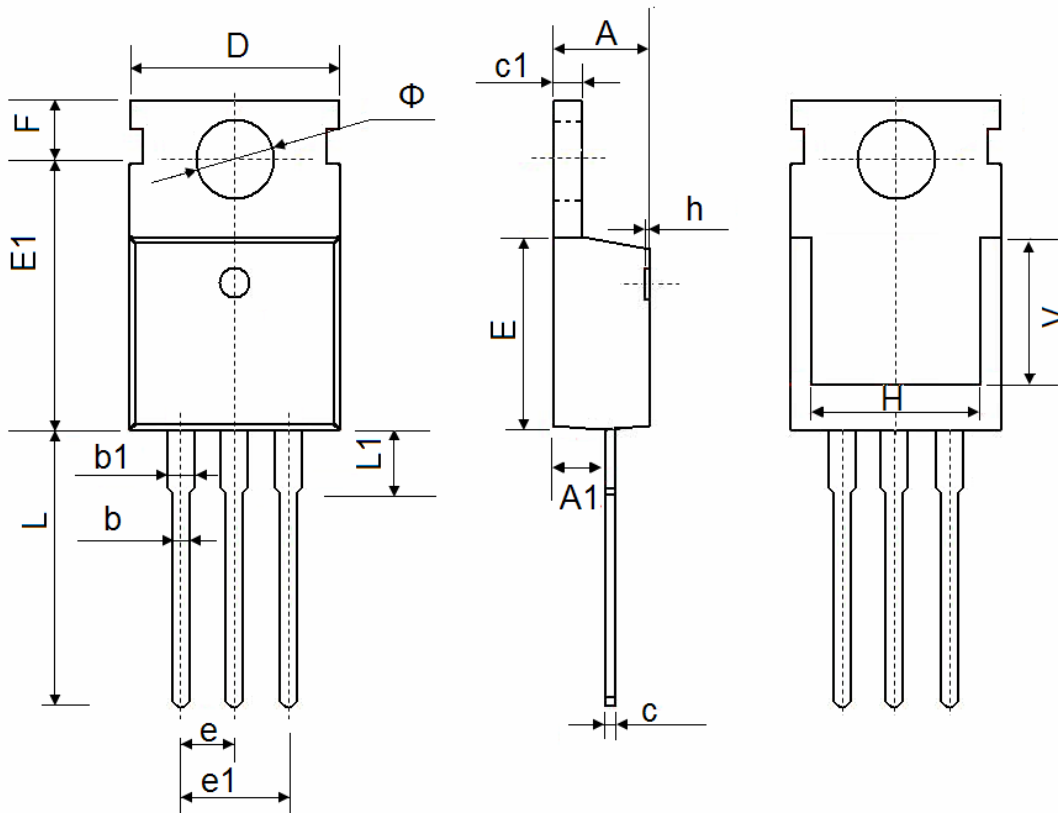


Gate Charge





TO-220AB Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150



Declaration

- FIRST reserves the right to change the specifications, the same specifications of products due to different packaging line mold, the size of the appearance will be slightly different, shipped in kind, without notice! Customers should obtain the latest version information before ordering, and verify whether the relevant information is complete and up-to-date.
- Any semiconductor product under certain conditions has the possibility of failure or failure, The buyer has the responsibility to comply with safety standards and take safety measures when using FIRST products for system design and manufacturing, To avoid To avoid potential failure risks, which may cause personal injury or property damage!
- Product promotion endless, our company will wholeheartedly provide customers with better products!

ATTACHMENT

Revision History

Date	REV	Description	Page
2018.01.01	1.0	Initial release	