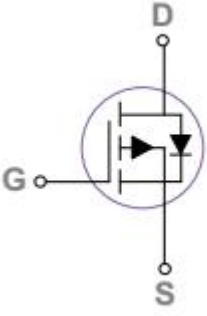
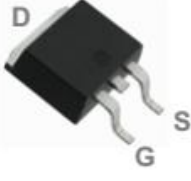


## P-Channel Power MOSFET

<p><b>General Features</b></p> <ul style="list-style-type: none"> <li>● <math>V_{DS} = -60V, I_D = -11A</math>  <math>R_{DS(ON)} &lt; 180\ m\Omega @ V_{GS} = -10V</math>  <math>R_{DS(ON)} &lt; 220\ m\Omega @ V_{GS} = -4.5V</math></li> <li>● Improved dv/dt capability</li> <li>● Fast switching</li> <li>● Good stability and uniformity with high EAs</li> <li>● Excellent package for good heat dissipation</li> </ul>	 <p style="text-align: center;"><b>Schematic diagram</b></p>
<p><b>Applications</b></p> <ul style="list-style-type: none"> <li>● Power switching application</li> <li>● Hard switched and high frequency circuits</li> <li>● LED Lighting</li> </ul>	 <p style="text-align: center;"><b>TO252 Pin Configuration</b></p>

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous ( $T_C = 25^\circ C$ )	$I_D(25^\circ C)$	-11	A
Drain Current-Continuous ( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	-8	A
Pulsed Drain Current	$I_{DM}$	-28	A
Maximum Power Dissipation ( $T_C = 25^\circ C$ )	$P_D$	15.6	W
Derating factor		0.125	W/ $^\circ C$
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-50 To 150	$^\circ C$

**Thermal Characteristic**

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	3.3	°C/W
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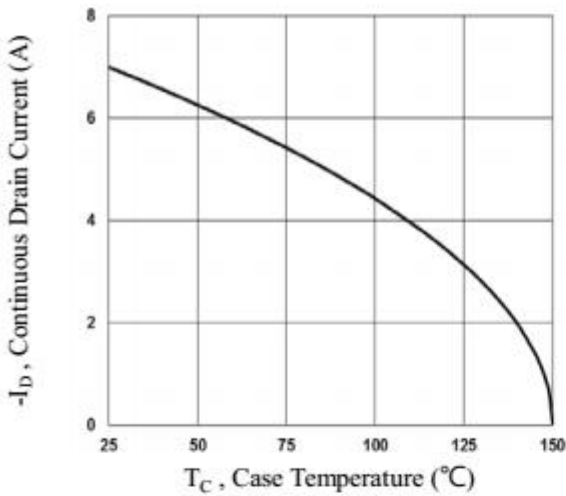
**Electrical Characteristics ( $T_C=25^\circ\text{C}$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	-60	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-60V, V_{GS}=0V$	-	-	-1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics (Note 3)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.2	-1.6	-2.5	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-3A$	-	153	180	m $\Omega$
		$V_{GS}=-4.5V, I_D=-1.5A$	-	198	220	
Forward Transconductance	$g_{FS}$	$V_{DS}=-10V, I_D=-2A$	-	3	-	S
<b>Dynamic Characteristics (Note 4)</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=-30V, V_{GS}=0V,$ $F=1.0MHz$	-	425	615	PF
Output Capacitance	$C_{oss}$		-	35	50	PF
Reverse Transfer Capacitance	$C_{rss}$		-	20	30	PF
<b>Switching Characteristics (Note 4)</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-30V, I_D=-1A$ $V_{GS}=-10V, R_G=6\Omega$	-	5.2	10	nS
Turn-on Rise Time	$t_r$		-	19	36	nS
Turn-Off Delay Time	$t_{d(off)}$		-	35	67	nS
Turn-Off Fall Time	$t_f$		-	10.6	20	nS
Total Gate Charge	$Q_g$	$V_{DS}=-30V, I_D=-3A,$ $V_{GS}=-10V$	-	8.2	12	nC
Gate-Source Charge	$Q_{gs}$		-	1.8	3.6	nC
Gate-Drain Charge	$Q_{gd}$		-	1.5	3	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage <sup>(Note 3)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=-1A, T_J=25^\circ C$	-	-	-1.0	V
Diode Forward Current <sup>(Note 2)</sup>	$I_S$	$V_G=V_D=0V$	-	-	-7	A
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

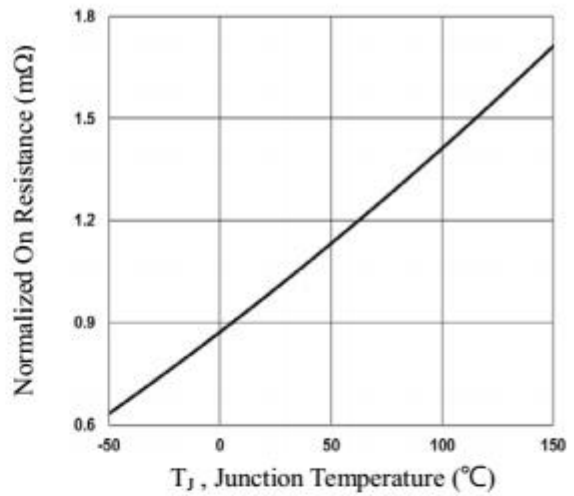
**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

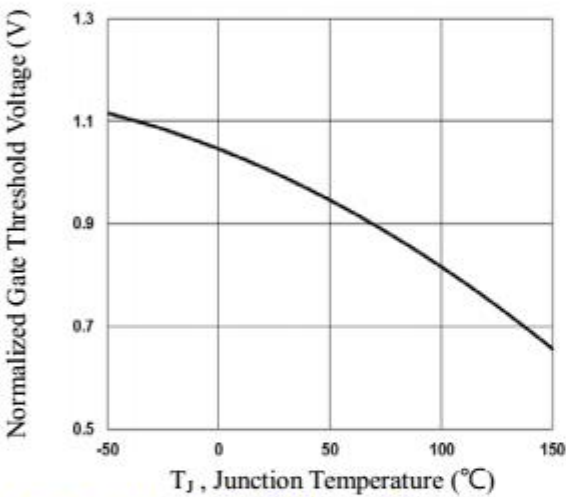
## Typical Electrical and Thermal Characteristics (Curves)



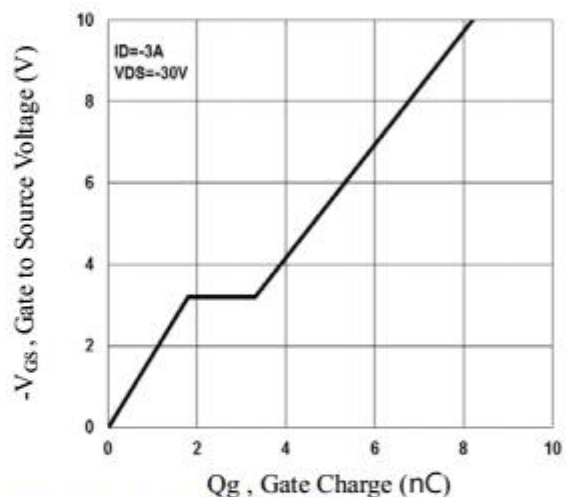
**Fig.1 Continuous Drain Current vs.  $T_C$**



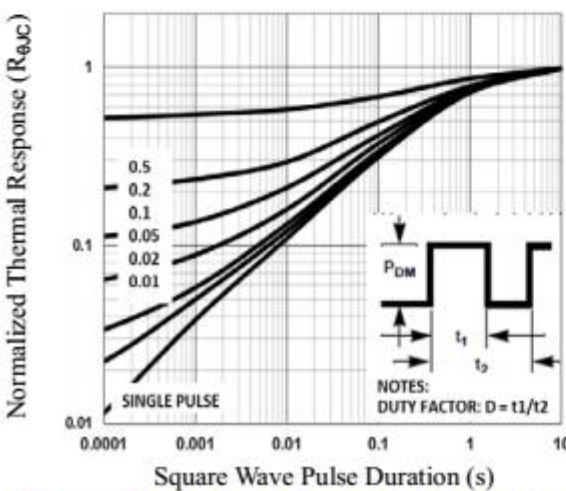
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$**



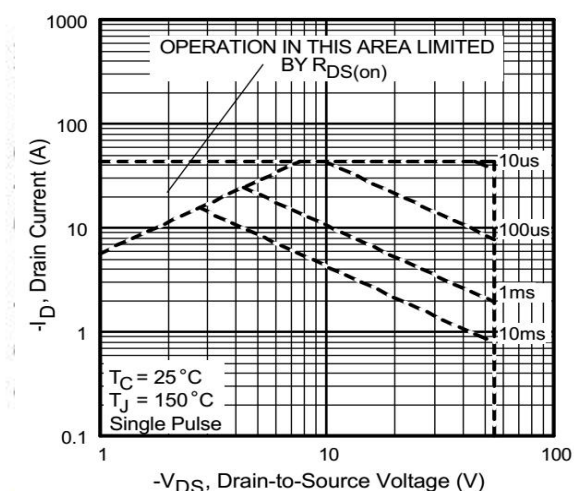
**Fig.3 Normalized  $V_{th}$  vs.  $T_J$**



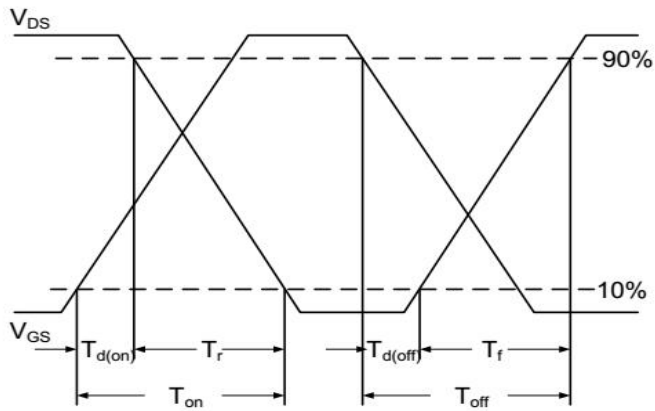
**Fig.4 Gate Charge Waveform**



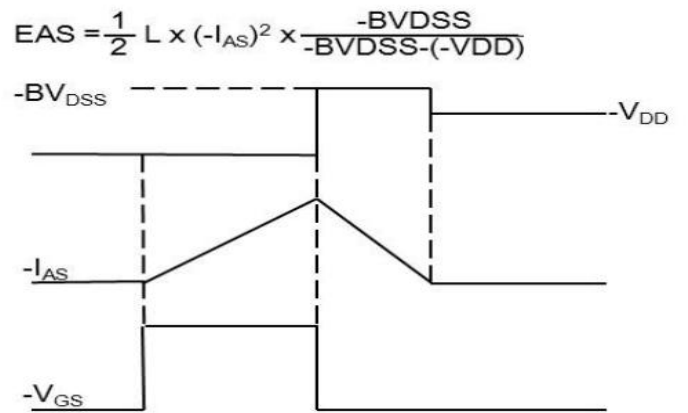
**Fig.5 Normalized Transient Impedance**



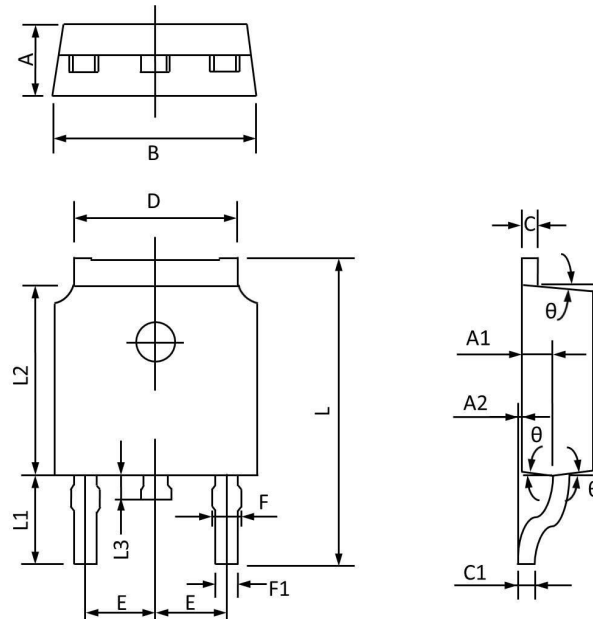
**Fig.6 Maximum Safe Operation Area**



**Fig.7 Switching Time Waveform**



**Fig.8 EAS Waveform**

**TO252 Package Information**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
<b>A</b>	<b>2.20</b>	<b>2.40</b>	<b>0.087</b>	<b>0.094</b>
<b>A1</b>	<b>0.91</b>	<b>1.11</b>	<b>0.036</b>	<b>0.044</b>
<b>A2</b>	<b>0.00</b>	<b>0.15</b>	<b>0.000</b>	<b>0.006</b>
<b>B</b>	<b>6.50</b>	<b>6.70</b>	<b>0.256</b>	<b>0.264</b>
<b>C</b>	<b>0.46</b>	<b>0.580</b>	<b>0.018</b>	<b>0.230</b>
<b>C1</b>	<b>0.46</b>	<b>0.580</b>	<b>0.018</b>	<b>0.030</b>
<b>D</b>	<b>5.10</b>	<b>5.46</b>	<b>0.201</b>	<b>0.215</b>
<b>E</b>	<b>2.186</b>	<b>2.386</b>	<b>0.086</b>	<b>0.094</b>
<b>F</b>	<b>0.74</b>	<b>0.94</b>	<b>0.029</b>	<b>0.037</b>
<b>F1</b>	<b>0.660</b>	<b>0.860</b>	<b>0.026</b>	<b>0.034</b>
<b>L</b>	<b>9.80</b>	<b>10.40</b>	<b>0.386</b>	<b>0.409</b>
<b>L1</b>	<b>2.9REF</b>		<b>0.114REF</b>	
<b>L2</b>	<b>6.00</b>	<b>6.20</b>	<b>0.236</b>	<b>0.244</b>
<b>L3</b>	<b>0.60</b>	<b>1.00</b>	<b>0.024</b>	<b>0.039</b>
$\theta$	<b>3°</b>	<b>9°</b>	<b>3°</b>	<b>9°</b>