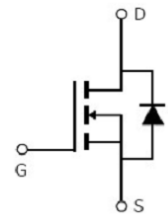


## Main Product Characteristics

$V_{DSS}$	60V
$R_{DS(on)}$	5.2m $\Omega$ (typ.)
$I_D$	80A ①


**TO-220**

**Marking and Pin Assignment**

**Schematic Diagram**

## Features and Benefits

- Advanced Process Technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 150°C operating temperature



## Description

It utilizes the latest processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in power switching application and a wide variety of other applications.

## Absolute Max Rating

Symbol	Parameter	Max.	Units
$I_D$ @ TC = 25°C	Continuous Drain Current, $V_{GS}$ @ 10V ①	80	A
$I_D$ @ TC = 100°C	Continuous Drain Current, $V_{GS}$ @ 10V ①	52	
$I_{DM}$	Pulsed Drain Current ②	320	
$P_D$ @TC = 25°C	Power Dissipation ③	108	W
$V_{DS}$	Drain-Source Voltage	60	V
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulse Avalanche Energy @ L=0.3mH	205.4	mJ
$I_{AS}$	Single Pulse Avalanche Current @ L=0.3mH	37	A
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to +150	°C

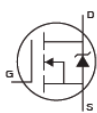
## Thermal Resistance

Symbol	Characterizes	Value	Units
$R_{\theta JC}$	Junction-to-case ③	1.4	°C/W

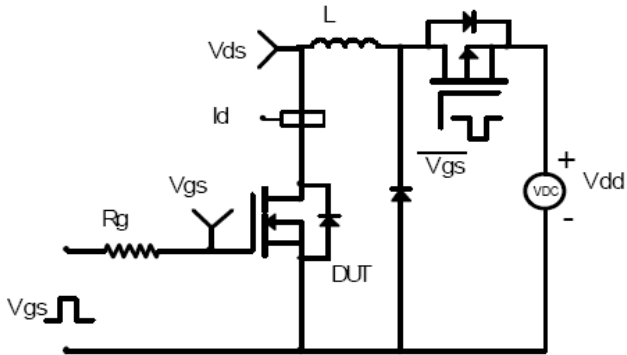
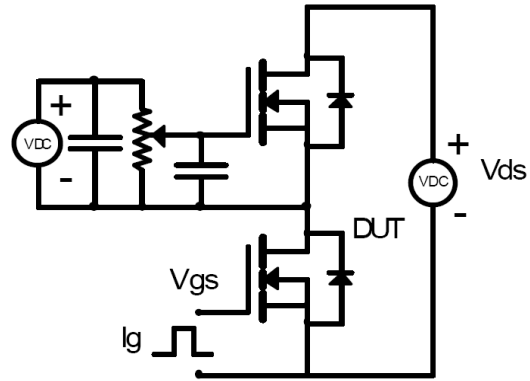
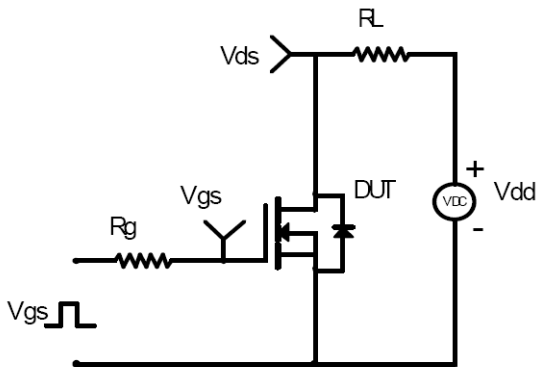
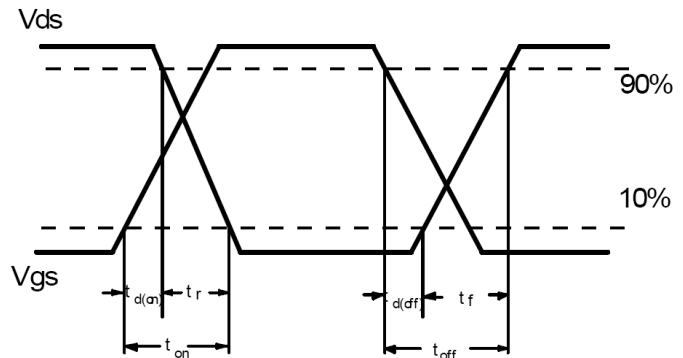
## Electrical Characterizes @ $T_A=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	60	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	5.2	7	m $\Omega$	$V_{GS}=10V, I_D=30A$
$V_{GS(th)}$	Gate threshold voltage	2.0	2.9	4.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$I_{DSS}$	Drain-to-Source leakage current	—	—	1	$\mu A$	$V_{DS} = 60V, V_{GS} = 0V$
$I_{GSS}$	Gate-to-Source forward leakage	—	—	100	nA	$V_{GS} = 20V$
		—	—	-100		$V_{GS} = -20V$
$Q_g$	Total gate charge	—	90	—	nC	$I_D = 30A,$ $V_{DS}=30V,$ $V_{GS} = 10V$
$Q_{gs}$	Gate-to-Source charge	—	7	—		
$Q_{gd}$	Gate-to-Drain("Miller") charge	—	16	—		
$t_{d(on)}$	Turn-on delay time	—	18	—	nS	$V_{GS}=10V, V_{DD}=33V,$ $R_{GEN}=2.2\Omega$ $I_D=30A$
$t_r$	Rise time	—	31	—		
$t_{d(off)}$	Turn-Off delay time	—	36	—		
$t_f$	Fall time	—	10	—		
$C_{iss}$	Input capacitance	—	3967	—	pF	$V_{GS} = 0V$ $V_{DS} = 30V$ $f = 1MHz$
$C_{oss}$	Output capacitance	—	267	—		
$C_{riss}$	Reverse transfer capacitance	—	236	—		

## Source-Drain Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode) ①	—	—	80	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	320		
$V_{SD}$	Diode Forward Voltage	—	—	1.3	V	$I_S=60A, V_{GS}=0V, T_J = 25^\circ\text{C}$
$t_{rr}$	Reverse Recovery Time	—	33	—	ns	$I_S=30A, di/dt=100A/us$
$Q_{rr}$	Reverse Recovery Charge	—	46	—	nC	

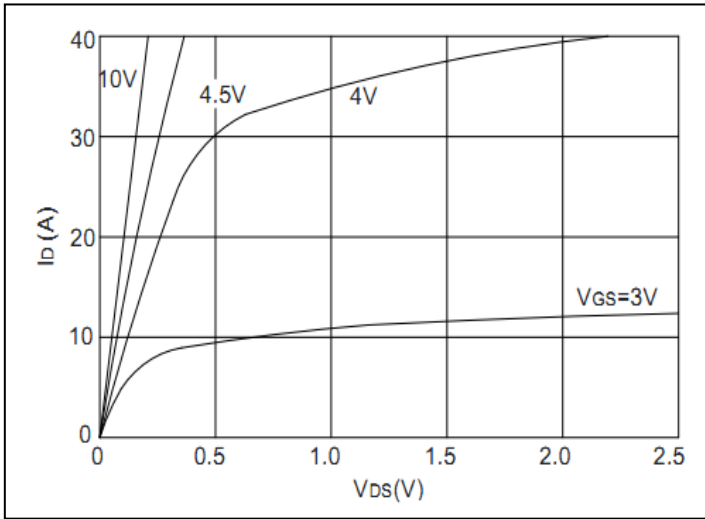
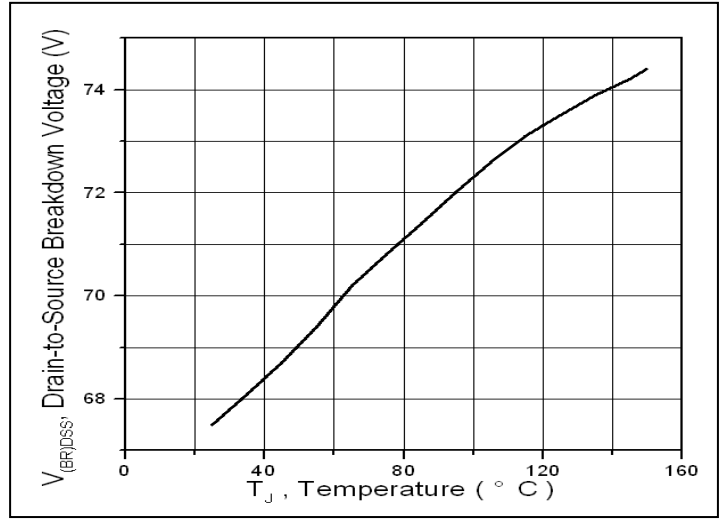
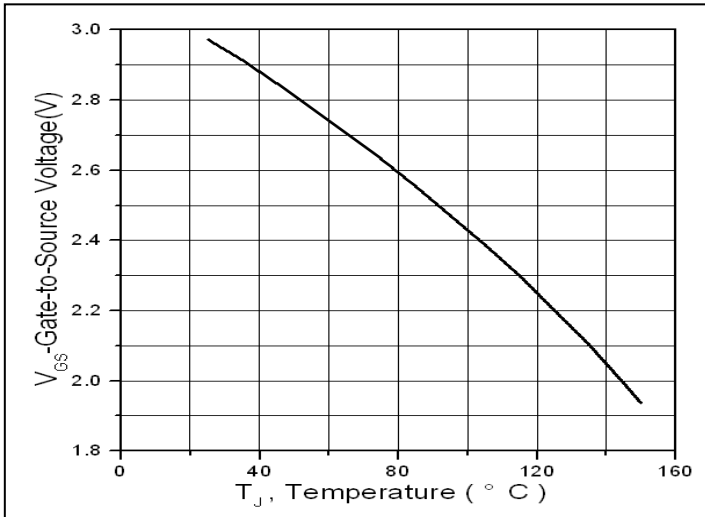
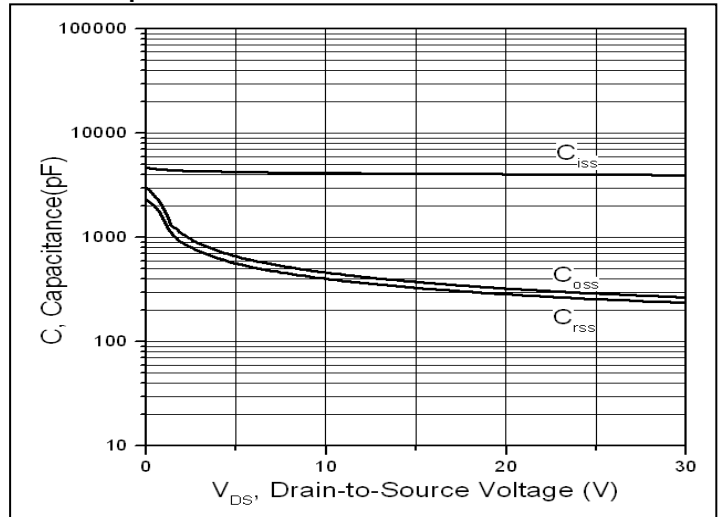
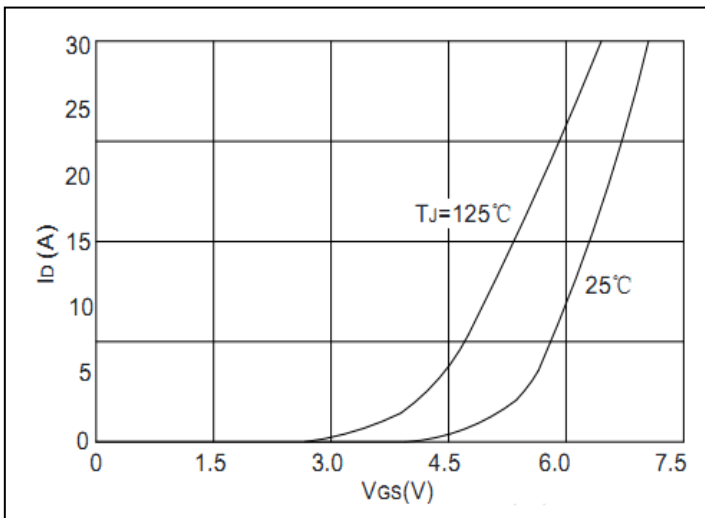
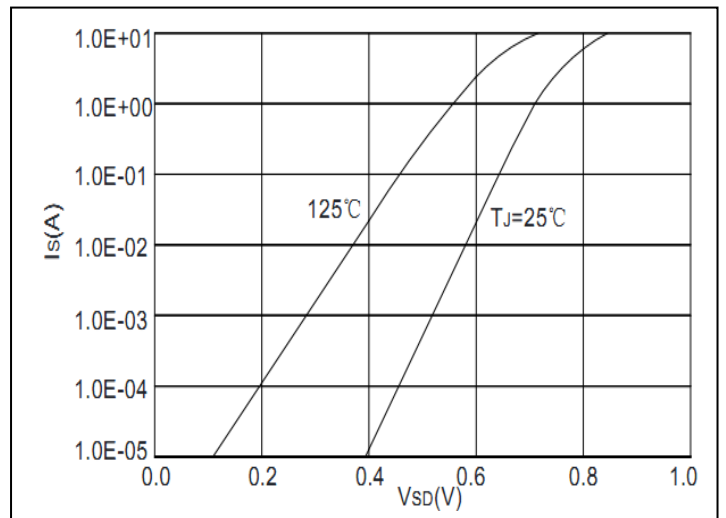
## Test circuits and Waveforms

**EAS Test Circuit:**

**Gate charge test circuit:**

**Switching Time Test Circuit:**

**Switching Waveforms:**


### Notes:

- ① Calculated continuous current based on maximum allowable junction temperature.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.

### Typical Electrical and Thermal Characteristics


**Figure 1: Typical Output Characteristics**

**Figure 2. Drain-to-Source Breakdown Voltage vs. Temperature**

**Figure 3. Gate to Source Cut-off Voltage**

**Figure 4. Capacitance**

**Figure 5. Transfer Characteristics**

**Figure 6. Body Diode Characteristics**

Typical electrical and thermal characteristics

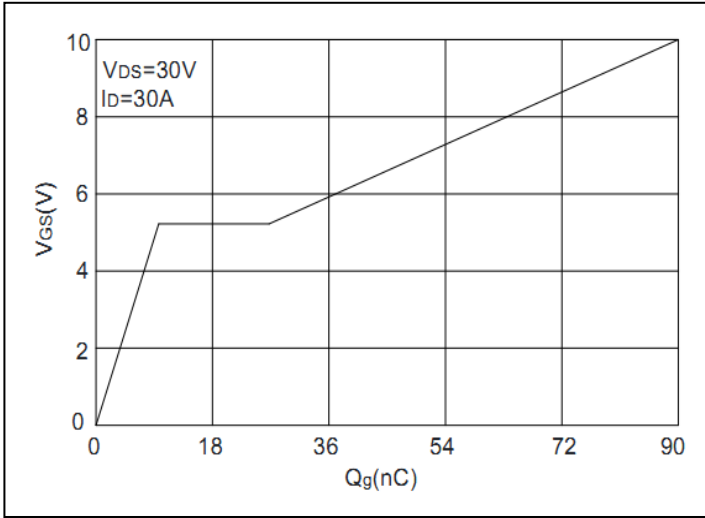


Figure 7. Gate Charge

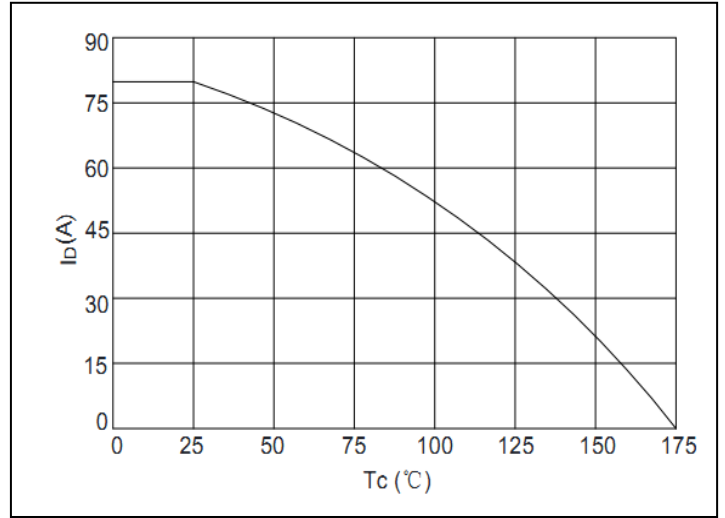


Figure 8. Drain Current vs Case Temperature

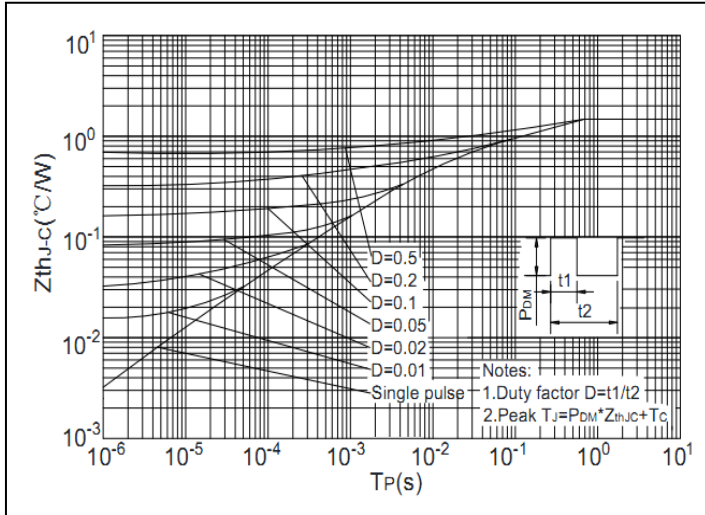


Figure 9. Normalized Maximum Transient Thermal Impedance

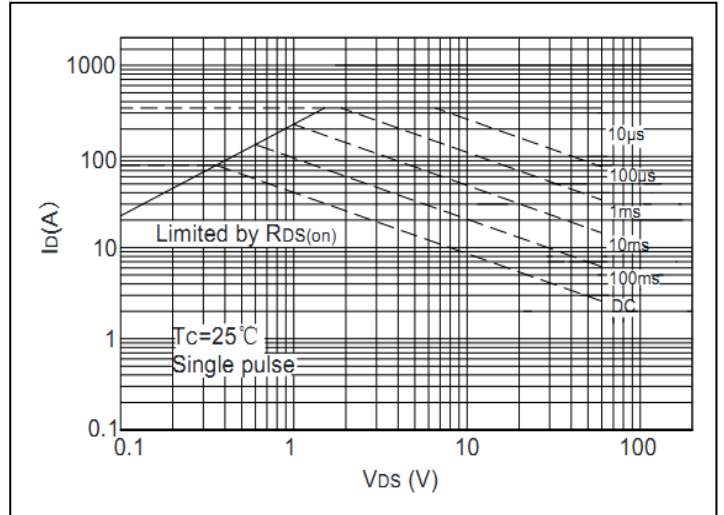
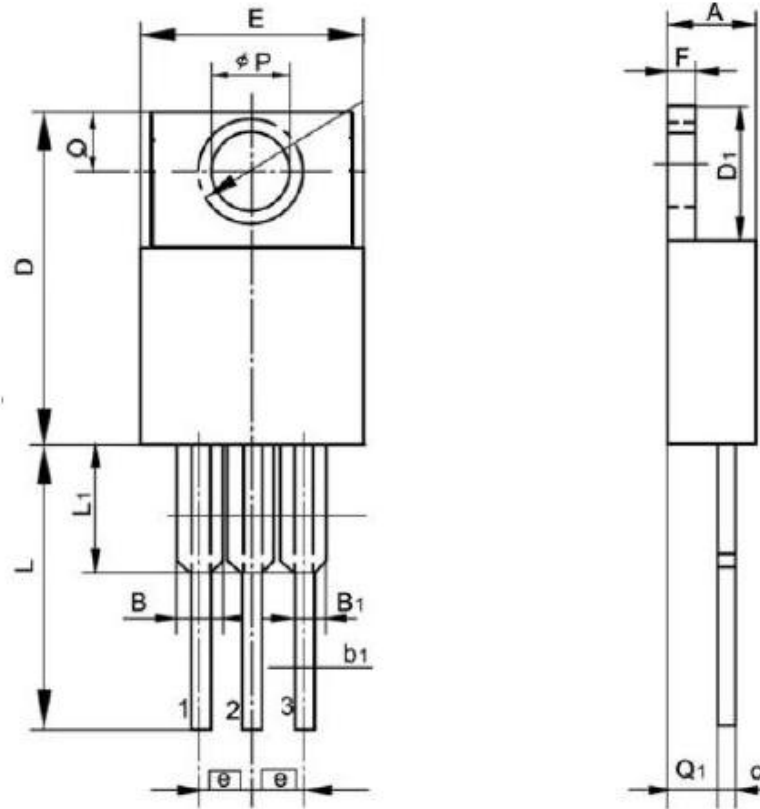


Figure 10: Safe Operation Area

**Mechanical Data:**
**TO220 Package Outline Dimension**


UNIT: mm

SYMBOL	min	nom	max	SYMBOL	min	nom	max
A	4.00		4.80	E	9.70		10.70
B	1.15		1.45	e		2.54	
B1	0.90		1.40	F	1.10		1.40
b1	0.65		0.95	L	12.50		14.50
c	0.30		0.50	L1	2.90	3.40	3.90
D	14.40		16.40	Q	2.50		3.10
D1	5.90		6.90	Q1	2.00		3.00
				$\phi P$	3.60		4.00

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