

## Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	$I_D$
60V	23mΩ@10V	30A

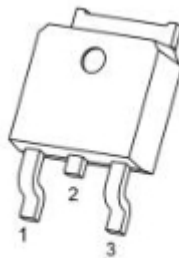
## Feature

- $V_{DS} = 60V, I_D = 30A$
- $R_{DS(ON)} < 40m\Omega @ V_{GS} = 10V$   
 $R_{DS(ON)} < 50m\Omega @ V_{GS} = 4.5V$
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high EAS
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

## Applications

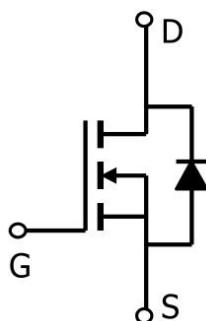
- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

## Package



**TO-252(G:1 D:2 S:3)**

## Circuit diagram



## Marking



## Absolute maximum ratings

(T<sub>a</sub>=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DS</sub>	60	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Drain Current-Continuous(Tc=25°C)	I <sub>D</sub>	30	A
Pulsed Drain Current	I <sub>DM</sub>	120	A
Maximum Power Dissipation(Tc=25°C)	P <sub>D</sub>	45	W
Single pulse avalanche energy <sup>(1)</sup>	E <sub>AS</sub>	72	mJ
Thermal Resistance,Junction-to-Case <sup>(2)</sup>	R <sub>θJC</sub>	3.3	°C/W
Operating Junction and Storage Temperature Range	T <sub>STG.</sub> , T <sub>J</sub>	-55 To 175	°C

## Electrical characteristics

(T<sub>A</sub>=25°C, unless otherwise noted)

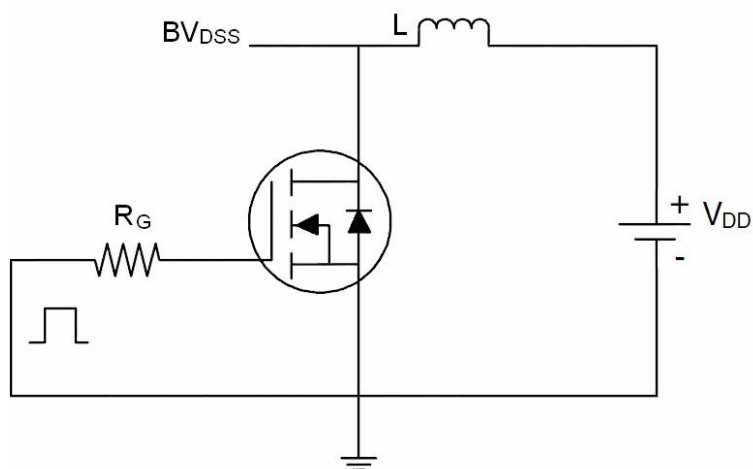
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV (BR)DSS	V <sub>GS</sub> = 0V, I <sub>D</sub> =250μA	60			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> = 0V			1	uA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V			±100	uA
On Characteristics <sup>(3)</sup>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.2	1.6	2.5	V
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =20A		23	32	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A		30	40	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =5A	11			S
Dynamic Characteristics <sup>(4)</sup>						
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz		590		pF
Output capacitance	C <sub>OSS</sub>			70		
Reverse transfer capacitance	C <sub>rss</sub>			64		
Switching Characteristics <sup>(4)</sup>						
Turn-on Delay Time	T <sub>d(on)</sub>	V <sub>DD</sub> =30V, I <sub>D</sub> =2A, V <sub>GS</sub> =10V, R <sub>G</sub> =3Ω		6		nS
Turn-on Rise Time	T <sub>r</sub>			6.1		
Turn-Off Delay Time	T <sub>d(off)</sub>			17		
Turn-Off Fall Time	t <sub>f</sub>			3		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =30V , I <sub>D</sub> =10A , V <sub>GS</sub> =10V,		25.3		pF
Gate-Source Charge	Q <sub>gs</sub>			4.7		
Gate-Drain Charge	Q <sub>gd</sub>			6.1		
Drain-Source Body Diode Characteristics						
Diode Forward Voltage <sup>(3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V ,I <sub>S</sub> =20A			1.2	V
Diode Forward Current <sup>(2)</sup>	I <sub>S</sub>				20	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>j</sub> = 25°C, I <sub>F</sub> =20A		29.5		nS
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100A/μs <sup>(3)</sup>		50		nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

### Note:

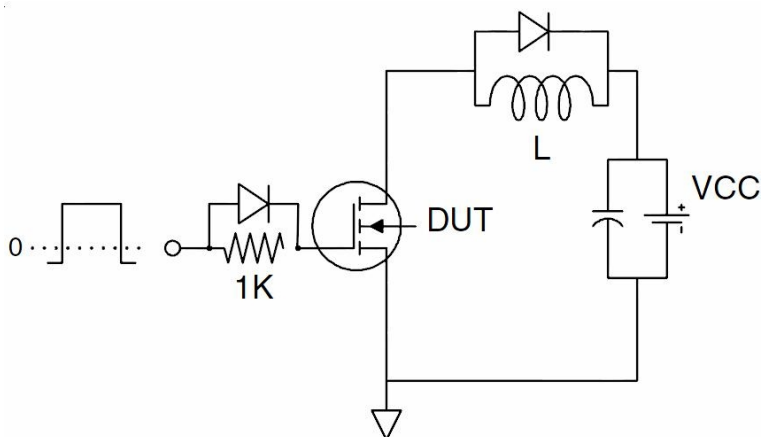
1. E<sub>AS</sub> condition: T<sub>J</sub> = 25°C, V<sub>DD</sub> = 30V, V<sub>G</sub> = 10V, L = 0.5mH, R<sub>G</sub> = 25Ω.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

## Test Circuits

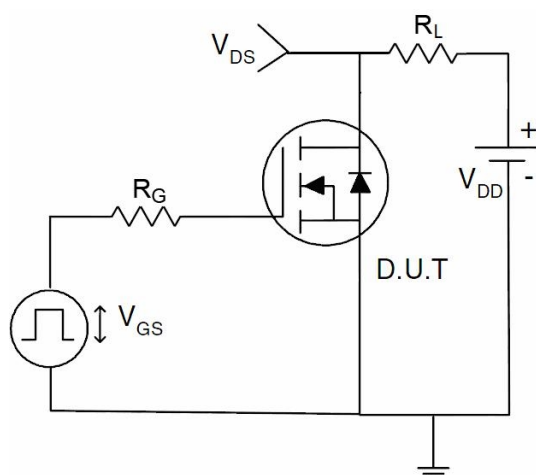
- EAS Test Circuits



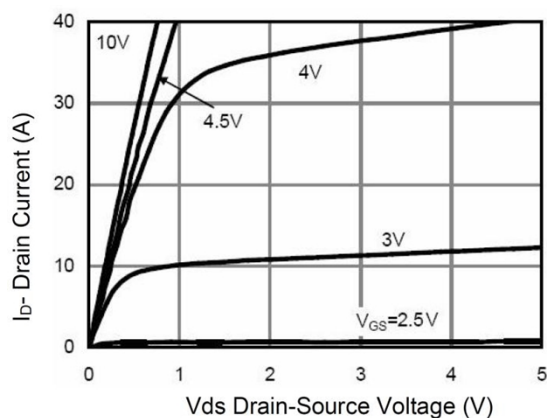
- Gate Charge Test Circuit



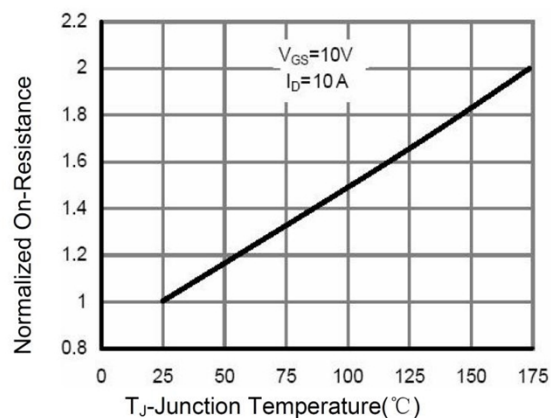
- Switch Time Test Circuit



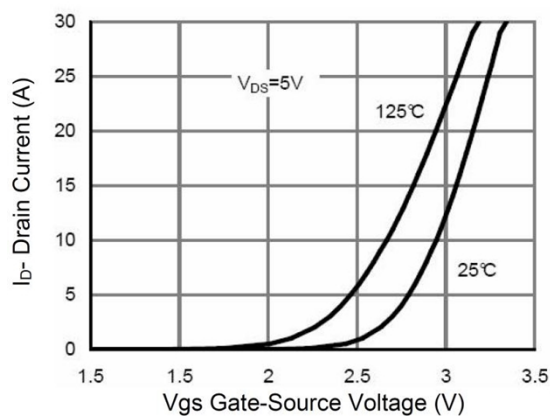
## Typical Characteristics



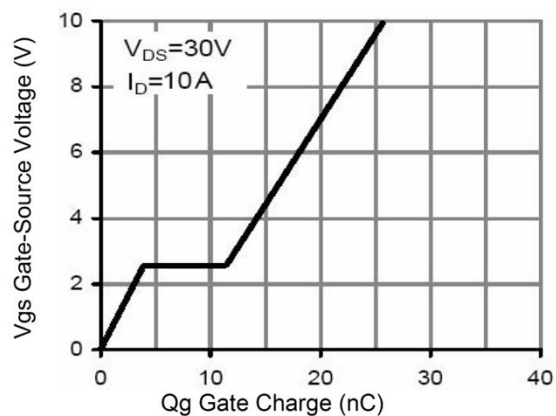
**Output Characteristics**



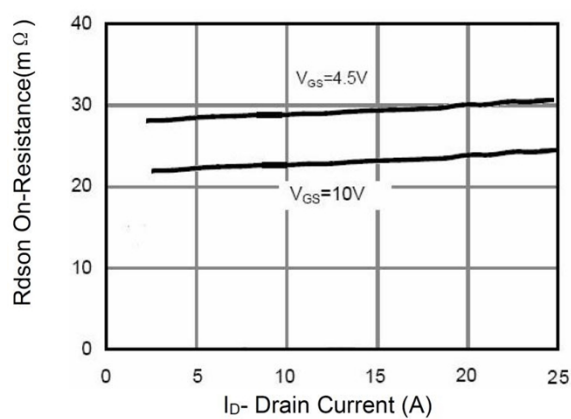
**$R_{DS(on)}$ -Junction Temperature**



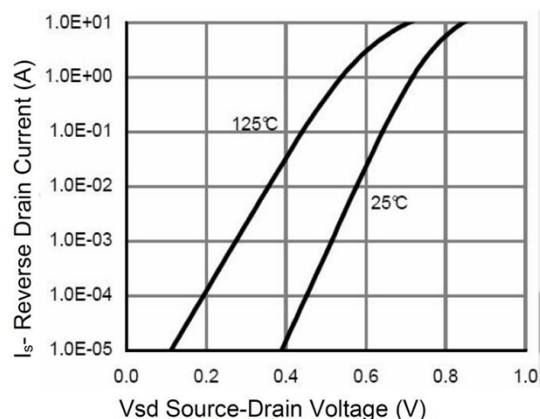
**Transfer Characteristics**



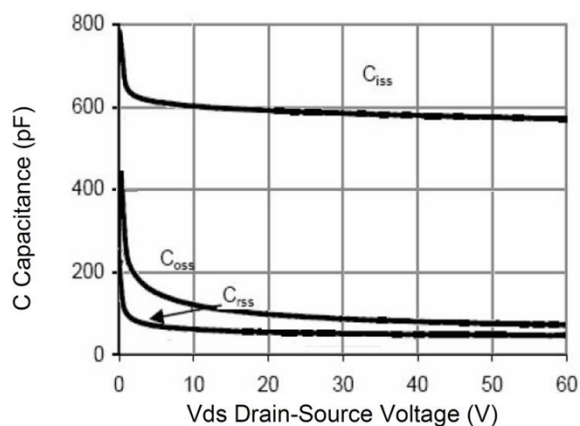
**Gate Charge**



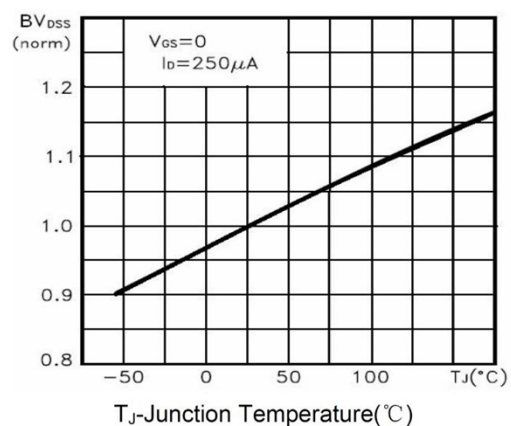
**$R_{DS(on)}$ - Drain Current**



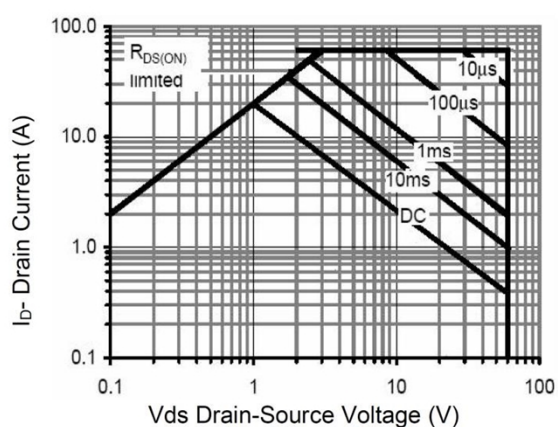
**Source- Drain Diode Forward**



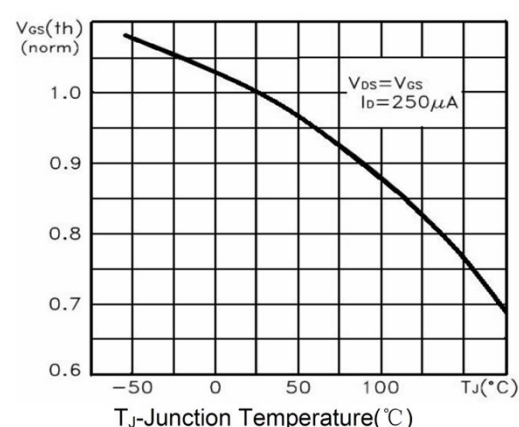
Capacitance vs V<sub>ds</sub>



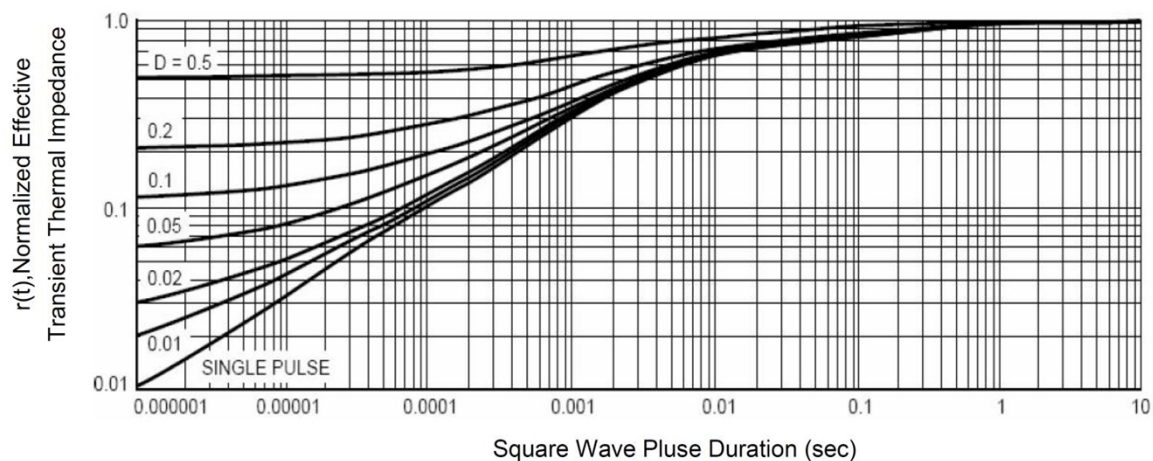
BV<sub>DSS</sub> vs Junction Temperature



Safe Operation Area

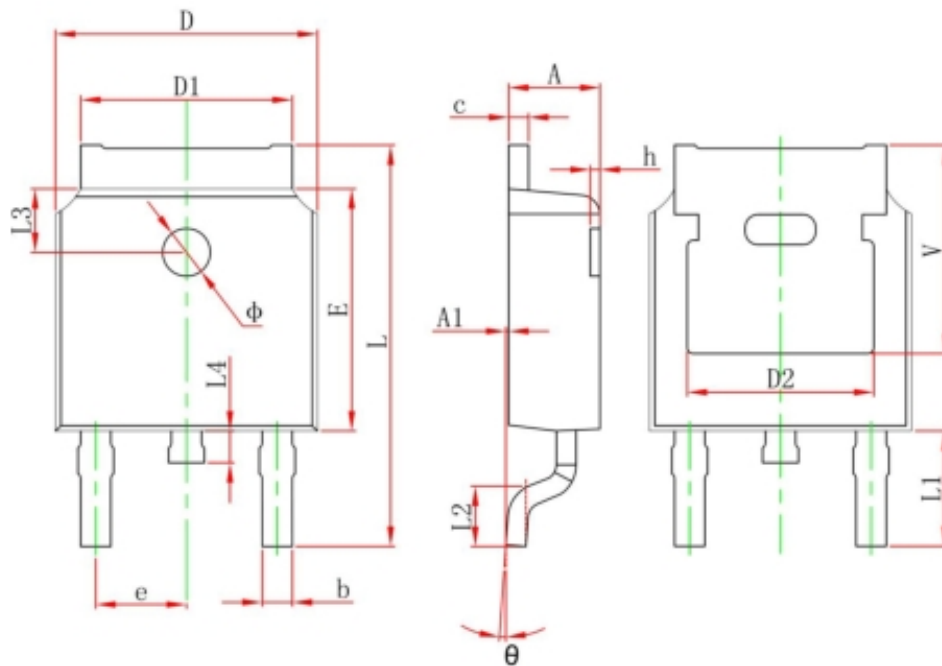


V<sub>GS(th)</sub> vs Junction Temperature



Normalized Maximum Transient Thermal Impedance

## TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 REF.		0.211 REF.	