

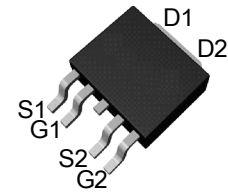
Features

- **N Channel**
30V/18A,
 $R_{DS(ON)} = 8m\Omega$ (typ.) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 9.5m\Omega$ (typ.) @ $V_{GS} = 4.5V$
- **P Channel**
-30V/-12A,
 $R_{DS(ON)} = 24m\Omega$ (typ.) @ $V_{GS} = -10V$
 $R_{DS(ON)} = 32m\Omega$ (typ.) @ $V_{GS} = -4.5V$
- 100% UIS + R_g Tested
- Reliable and Rugged
- Lead Free Available (RoHS Compliant)

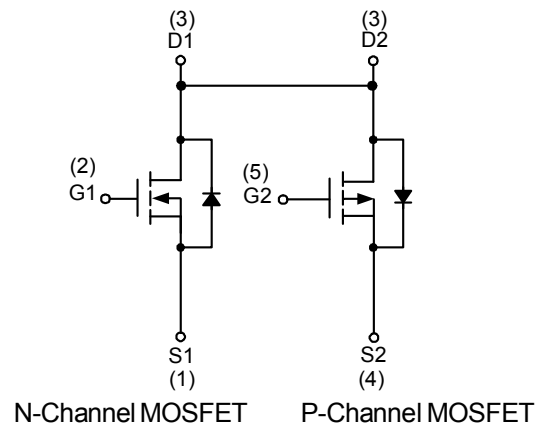
Applications

- Synchronous Rectification.
- Motor Fan Control.
- High Current, High Speed Switchin.
- H-bridge and Inverter.

Pin Description



Top View of TO-252-4



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

Symbol	Parameter		N Channel	P Channel	Unit	
Common Ratings						
V _{DSS}	Drain-Source Voltage		30	-30	V	
V _{GSS}	Gate-Source Voltage		±20	±20	V	
T _J	Maximum Junction Temperature		175		°C	
T _{STG}	Storage Temperature Range		-55 to 175		°C	
I _S	Diode Continuous Forward Current	T _C =25°C	12*	-10	A	
I _{DP} ^a	Pulse Drain Current Tested	V _{GS} =10V(N), V _{GS} =-10V(P)	48*	-48*	A	
I _D	Continuous Drain Current		T _C =25°C	12*	-12*	A
			T _C =70°C	12*	-12*	
P _D	Maximum Power Dissipation	T _C =25°C	24	24	W	
		T _C =70°C	16	16		
R _{θJC}	Thermal Resistance-Junction to Case	Steady State	6.25	6.25	°C/W	
I _D	Continuous Drain Current	T _A =25°C	18*	-11.5	A	
		T _A =70°C	18*	-9.6		
P _D	Maximum Power Dissipation	T _A =25°C	7.5	7.5	W	
		T _A =70°C	5.25	5.25		
R _{θJA} ^b	Thermal Resistance-Junction to Ambient	t ≤ 10s	20	20	°C/W	
		Steady State	60	60		
I _{AS} ^c	Avalanche Current, Single pulse	L=0.5mH	9	-9	A	
E _{AS} ^c	Avalanche Energy, Single pulse	L=0.5mH	20	20	mJ	

Note * : Max. current is limited by bonding wire.

Note a : Pulse width limited by max. junction temperature.

Note b : $R_{\theta JA}$ steady state $t=999\text{s}$. $R_{\theta JA}$ is measured with the device mounted on 1in^2 , FR-4 board with 2oz. Copper.

Note c : UIS tested and pulse width limited by maximum junction temperature 175°C (initial temperature $T_J=25^\circ\text{C}$).

N Channel Electrical Characteristics (T_A = 25°C unless otherwise noted)

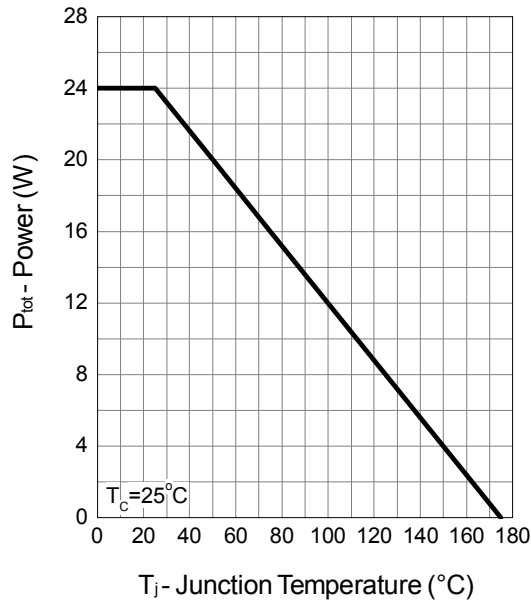
Symbol	Parameter	Test Conditions	N Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	30	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =24V, V _{GS} =0V	-	-	1	μA
		T _J =85°C	-	-	30	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	1.3	1.8	2.3	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^d	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =8A	-	8	9	mΩ
		V _{GS} =4.5V, I _{DS} =5A	-	9.5	12.5	
Diode Characteristics						
V _{SD} ^d	Diode Forward Voltage	I _{SD} =1A, V _{GS} =0V	-	0.75	1.1	V
t _{rr}	Reverse Recovery Time	I _{DS} =8A, dI _{SD} /dt=100A/μs	-	10	-	ns
Q _{rr}	Reverse Recovery Charge		-	3.5	-	nC
Dynamic Characteristics ^e						
R _G	Gate Resistance	V _{GS} =0V,V _{DS} =0V,F=1MHz	-	1.7	3.4	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, Frequency=1.0MHz	-	545	708	pF
C _{oss}	Output Capacitance		-	95	-	
C _{rss}	Reverse Transfer Capacitance		-	55	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =15V, R _L =15Ω, I _{DS} =1A, V _{GEN} =10V, R _G =6Ω	-	6	-	ns
t _r	Turn-on Rise Time		-	8.6	-	
t _{d(OFF)}	Turn-off Delay Time		-	16	-	
t _f	Turn-off Fall Time		-	3.6	-	
Gate Charge Characteristics ^e						
Q _g	Total Gate Charge	V _{DS} =15V, V _{GS} =10V, I _{DS} =8A	-	10.8	16	nC
Q _g	Total Gate Charge	V _{DS} =15V, V _{GS} =4.5V, I _{DS} =8A	-	5.2	7.8	
Q _{gth}	Threshold Gate Charge		-	0.6	-	
Q _{gs}	Gate-Source Charge		-	1	-	
Q _{gd}	Gate-Drain Charge		-	2.8	-	

Note d : Pulse test ; pulse width≤300μs, duty cycle≤2%.

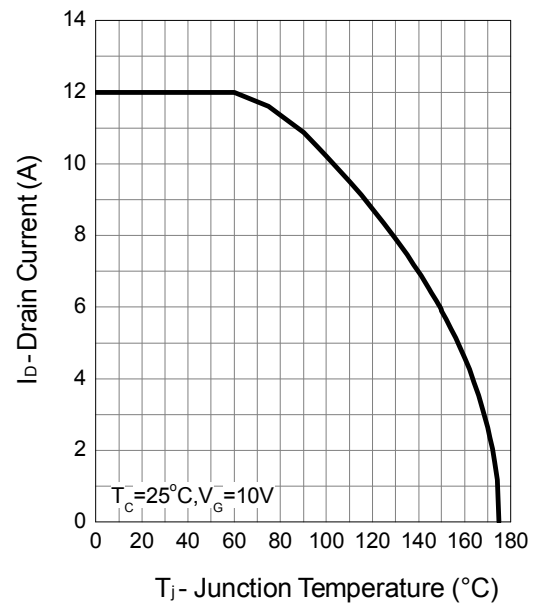
Note e : Guaranteed by design, not subject to production testing.

N Channel Typical Operating Characteristics

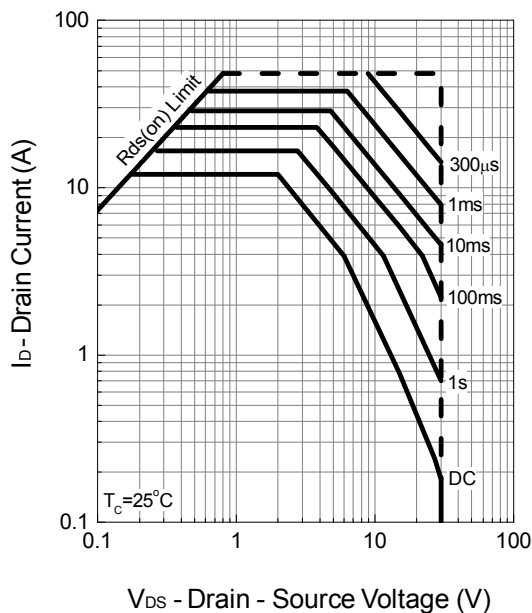
Power Dissipation



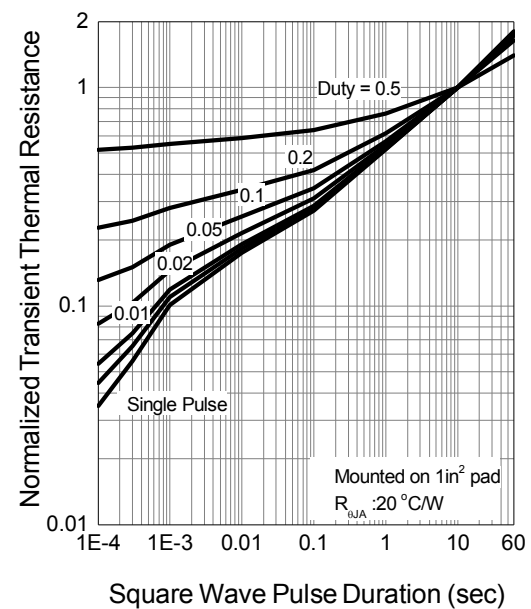
Drain Current



Safe Operation Area

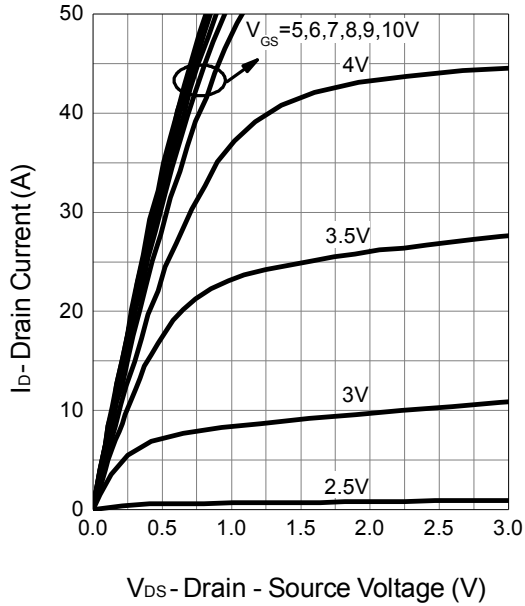


Thermal Transient Impedance

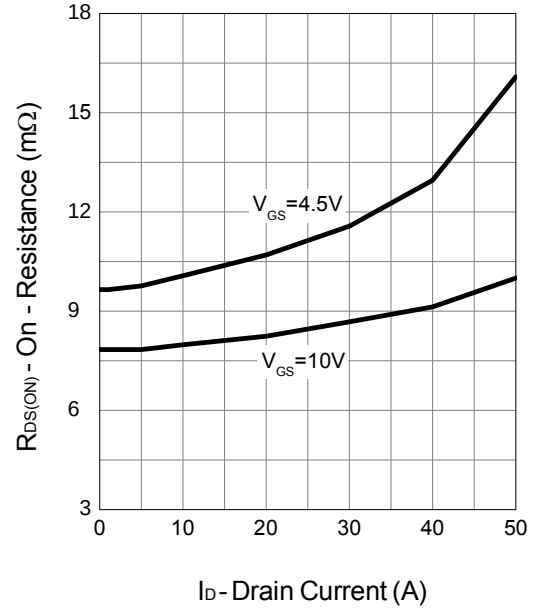


N Channel Typical Operating Characteristics (Cont.)

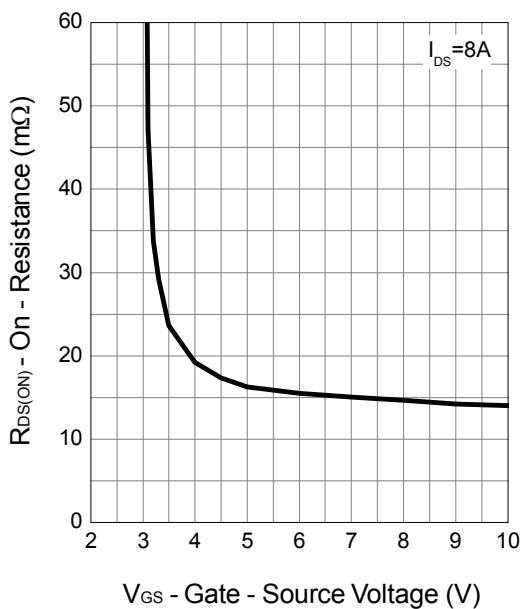
Output Characteristics



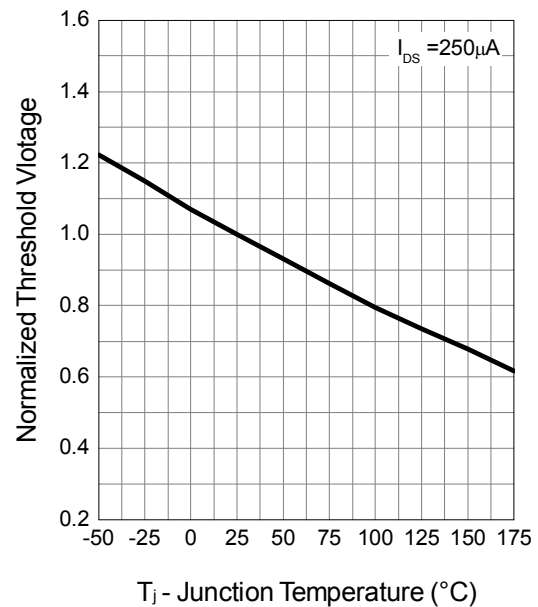
Drain-Source On Resistance



Gate-Source On Resistance

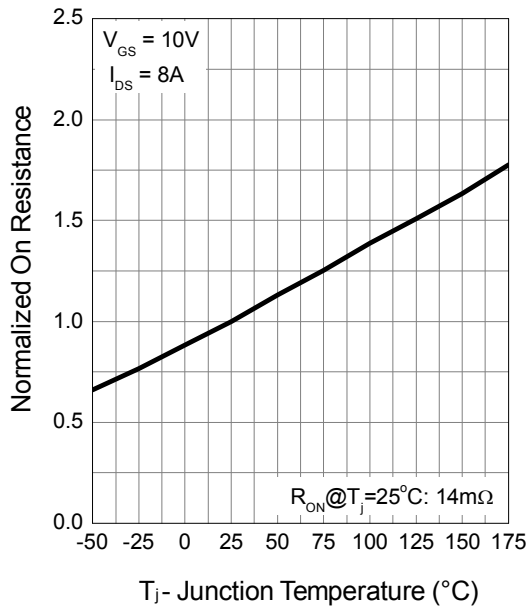


Gate Threshold Voltage

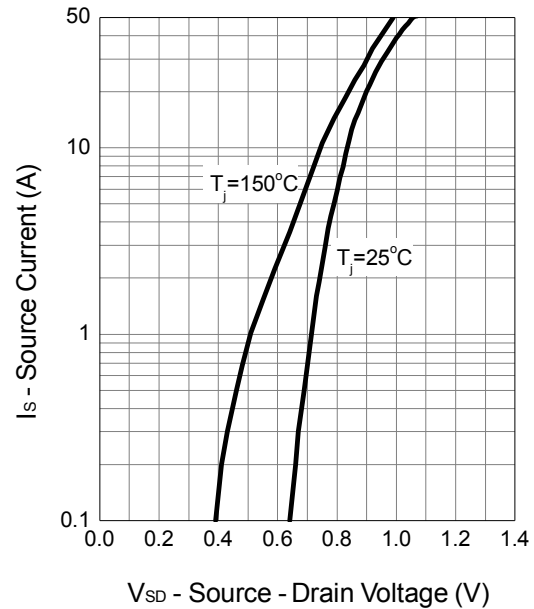


N Channel Typical Operating Characteristics (Cont.)

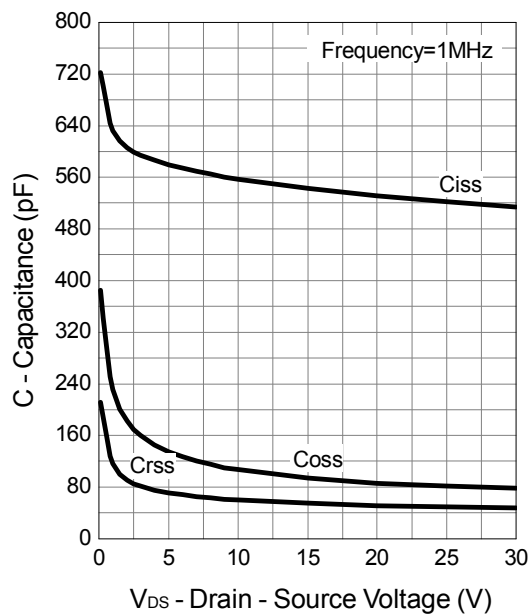
Drain-Source On Resistance



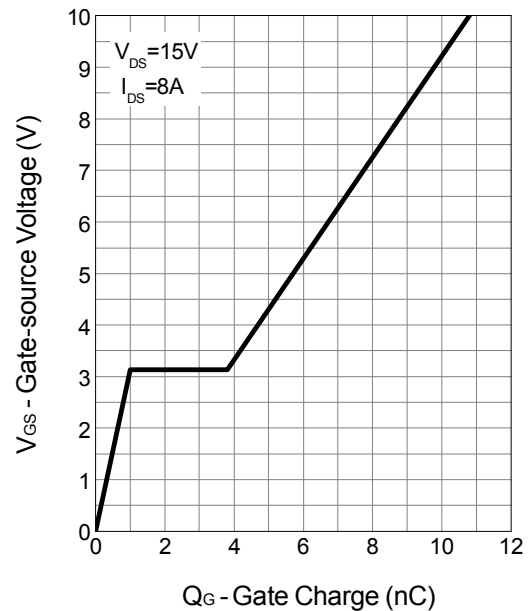
Source-Drain Diode Forward



Capacitance



Gate Charge



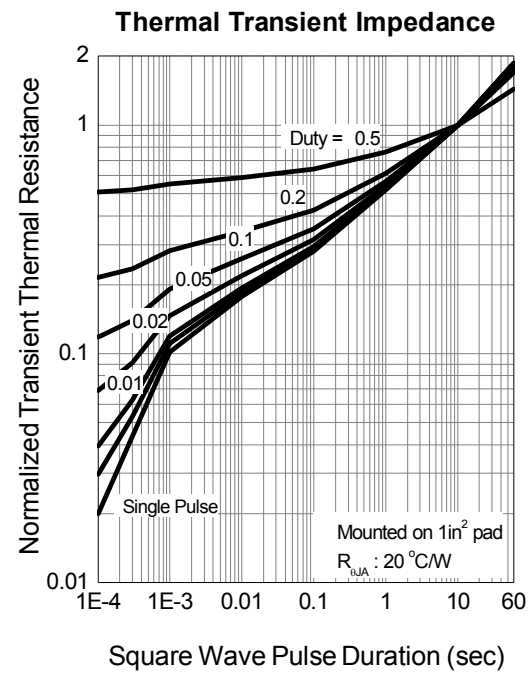
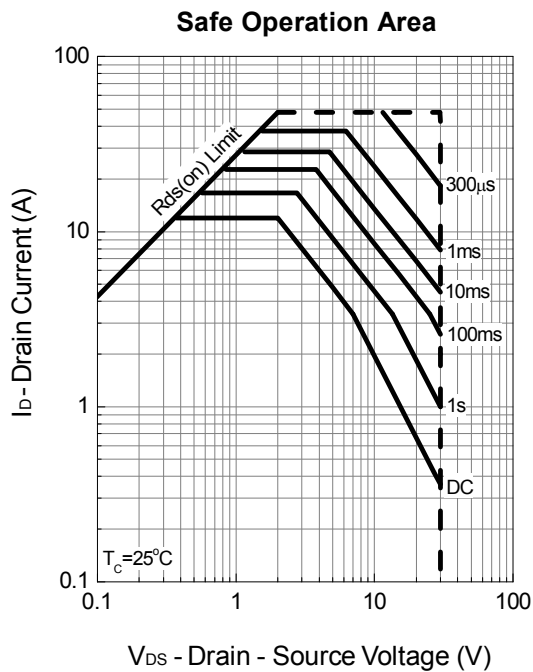
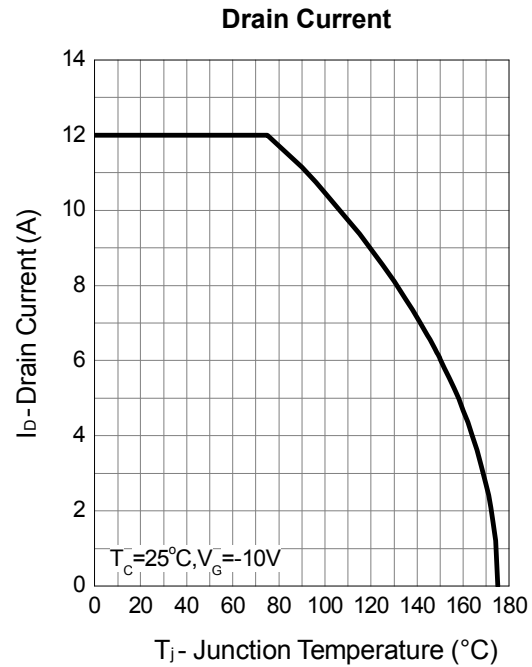
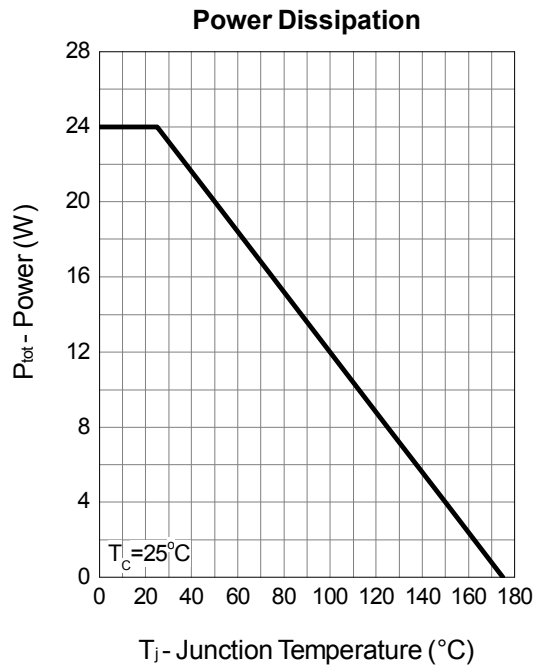
P Channel Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	P Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =-250μA	-30	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-24V, V _{GS} =0V	-	-	-1	μA
		T _J =85°C	-	-	-30	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =-250μA	-1.3	-1.8	-2.3	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^d	Drain-Source On-state Resistance	V _{GS} =-10V, I _{DS} =-12A	-	24	33.5	mΩ
		V _{GS} =-4.5V, I _{DS} =-5A	-	32	44	
Diode Characteristics						
V _{SD} ^d	Diode Forward Voltage	I _{SD} =-1A, V _{GS} =0V	-	-0.75	-1	V
t _{rr}	Reverse Recovery Time	I _{DS} =-12A, dI _{SD} /dt= 100A/μs	-	11	-	ns
Q _{rr}	Reverse Recovery Charge		-	4	-	nC
Dynamic Characteristics ^e						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	3.3	6.6	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-15V, Frequency=1.0MHz	-	580	754	pF
C _{oss}	Output Capacitance		-	105	-	
C _{rss}	Reverse Transfer Capacitance		-	72	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =-15V, R _L =15Ω, I _{DS} =-1A, V _{GEN} =-10V, R _G =6Ω	-	8.7	-	ns
t _r	Turn-on Rise Time		-	10	-	
t _{d(OFF)}	Turn-off Delay Time		-	22	-	
t _f	Turn-off Fall Time		-	9	-	
Gate Charge Characteristics ^e						
Q _g	Total Gate Charge	V _{DS} =-15V, V _{GS} =-10V, I _{DS} =-12A	-	13	-	nC
Q _{gs}	Gate-Source Charge		-	1	-	
Q _{gd}	Gate-Drain Charge		-	4	-	

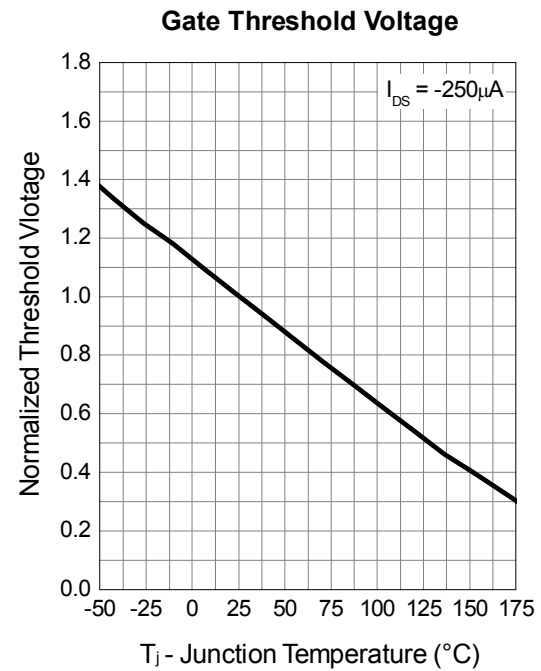
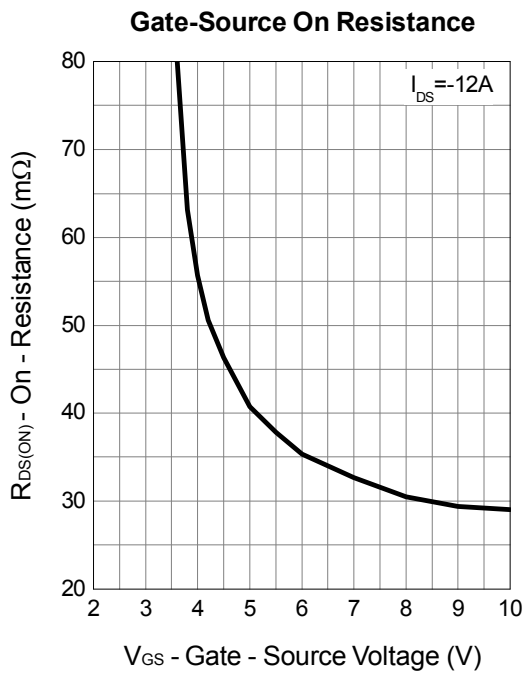
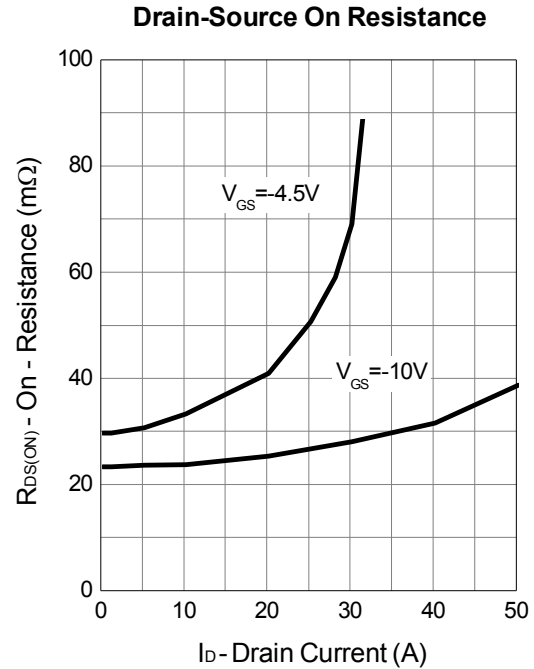
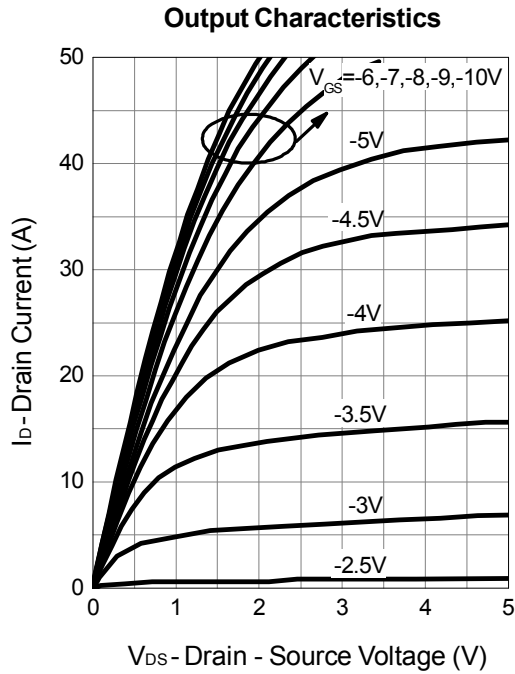
Note d : Pulse test; pulse width≤300μs, duty cycle≤2%.

Note e : Guaranteed by design, not subject to production testing.

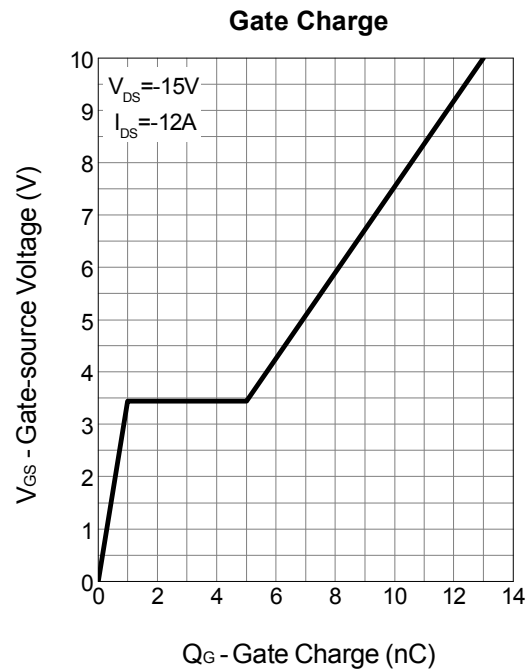
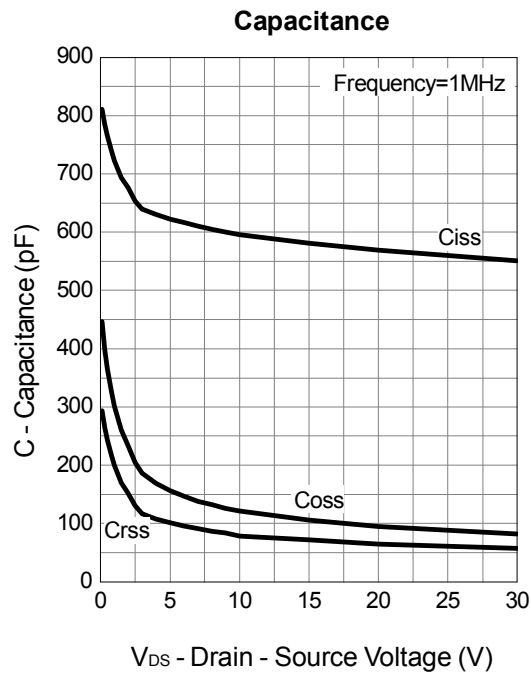
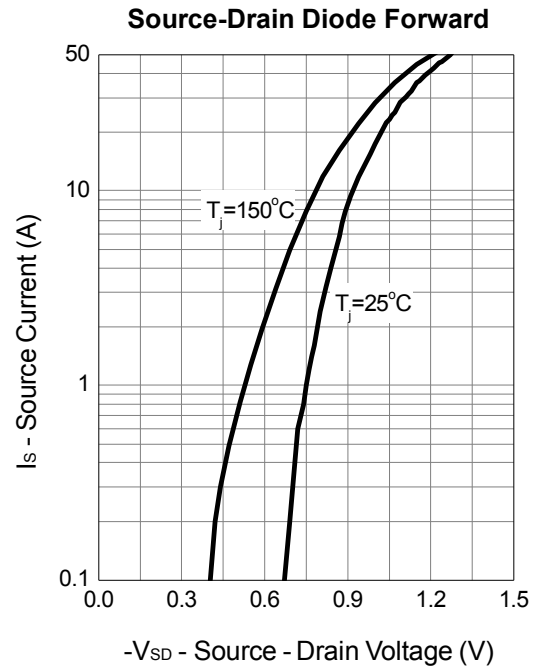
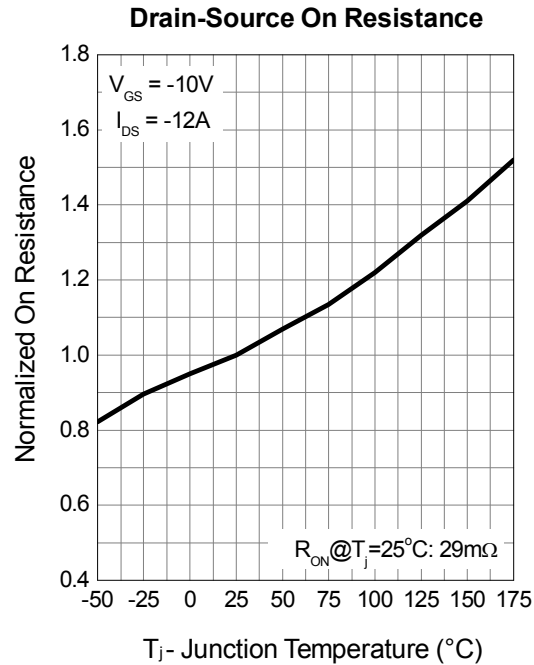
P Channel Typical Operating Characteristics



P Channel Typical Operating Characteristics (Cont.)

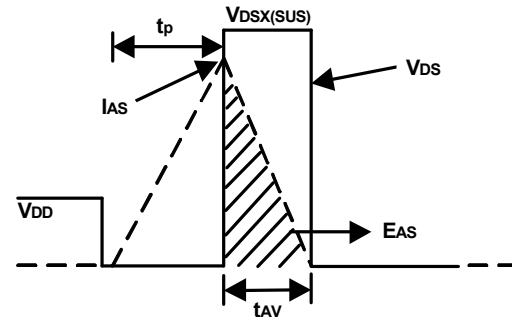
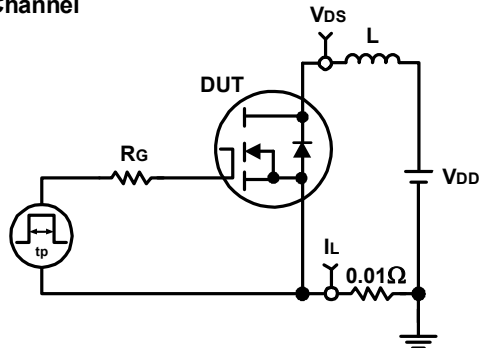


P Channel Typical Operating Characteristics (Cont.)

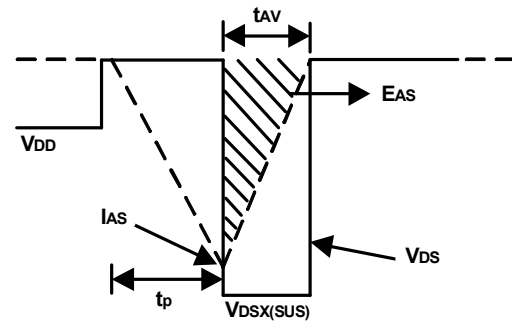
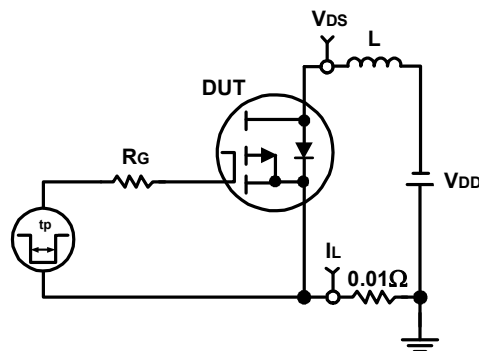


Avalanche Test Circuit and Waveforms

N Channel

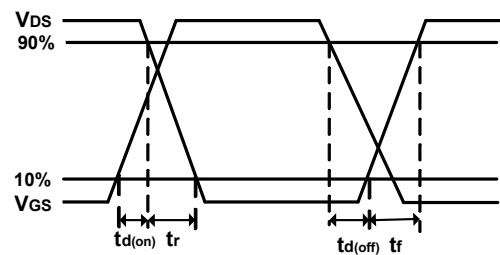
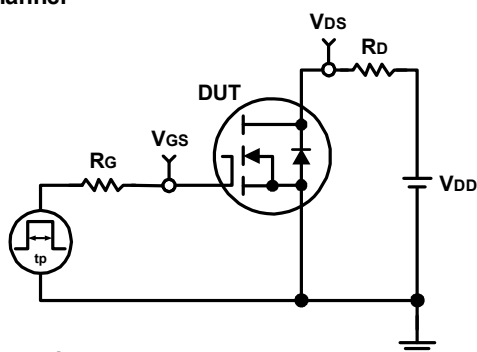


P Channel

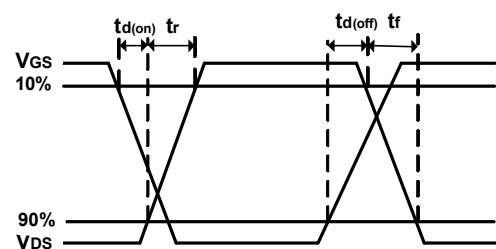
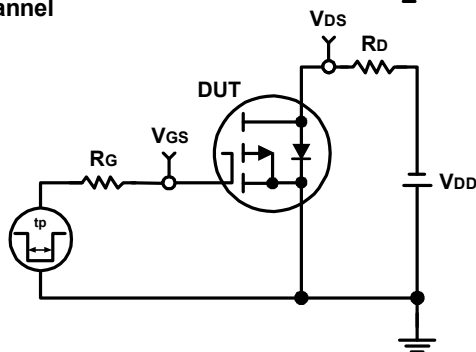


Switching Time Test Circuit and Waveforms

N Channel

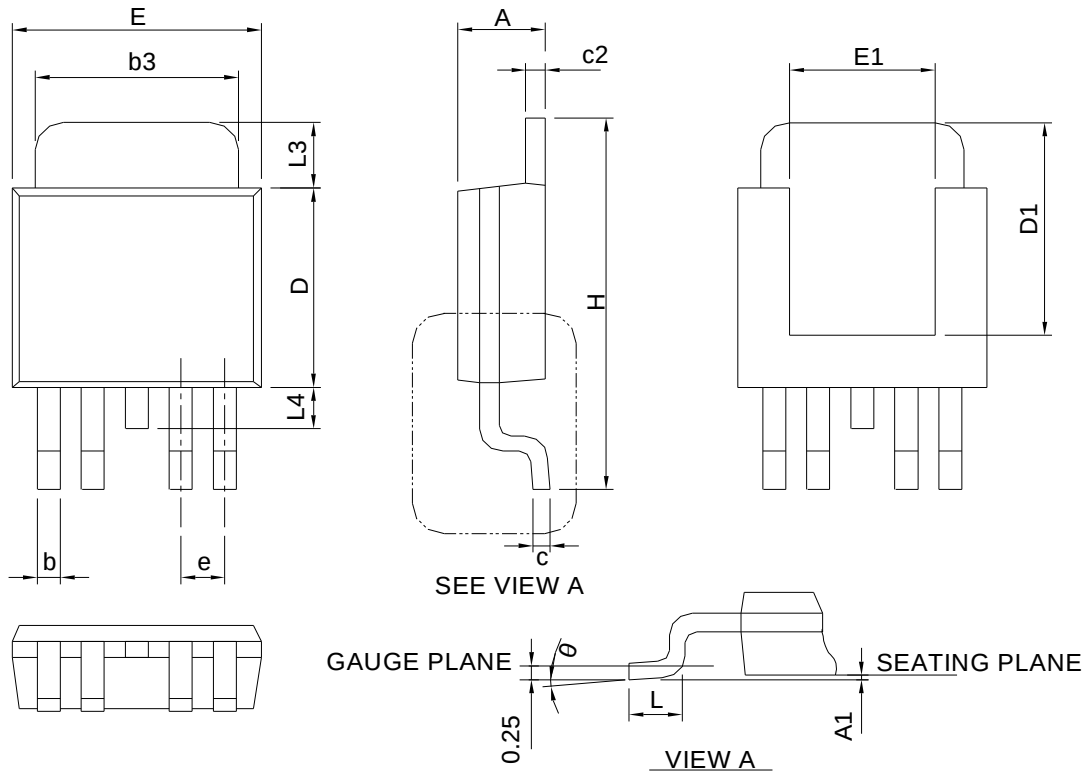


P Channel



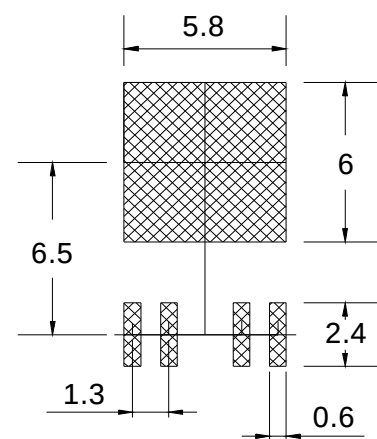
Package Information

TO-252-4



SYMBOL	TO-252-4			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1	-	0.2	-	0.008
b	0.50	0.71	0.020	0.028
b3	4.32	5.46	0.170	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.236
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.236
e	1.30 BSC		0.051 BSC	
H	9.40	10.41	0.370	0.410
L	1.40	1.78	0.055	0.070
L3	0.89	2.03	0.035	0.080
L4	-	1.02	-	0.040
θ	0°	8°	0°	8°

RECOMMENDED LAND PATTERN



UNIT: mm