TM25G04GD

N+P-Channel Enhancement Mode Mosfet

General Description

- Low $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

Applications

- Load switch
- PWM

General Features

N Channel

V_{DS} = 40V I_D =25A

$R_{DS(ON)}$ = 17mΩ (typ.) @ V_{GS} = 10V

P Channel

V_{DS} = -40V I_D =-23A

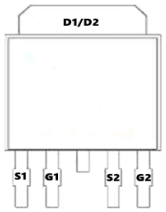
$R_{DS(ON)}$ = 35mΩ (typ.) @ V_{GS}=-10V

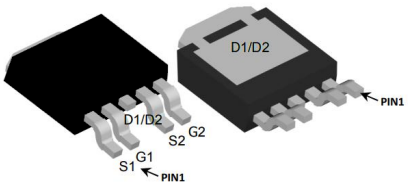
100% UIS Tested

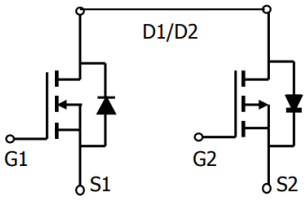
100% R_g Tested

Green Product

GD:TO-252-4L







Marking: 25G04 OR 4012

Absolute Maximum Ratings (T_A = 25°C unless otherwise noted)

Symbol	Parameter		N Channel	P Channel	Unit
Common Ratings					
V_{DSS}	Drain-Source Voltage		40	-40	V
V_{GSS}	Gate-Source Voltage		±20	±20	
T_J	Maximum Junction Temperature		150		°C
T_{STG}	Storage Temperature Range		-55 to 150		
I_S	Diode Continuous Forward Current	T_C=25°C	10	-10	A
I_D	Continuous Drain Current	T_C=25°C	25	-23	
		T_C=100°C	19.2	-13.2	
P_D	Maximum Power Dissipation	T_C=25°C	32.9	32.9	W
		T_C=100°C	13.2	13.2	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		3.8	3.8	°C/W
					A
I_{DM} [a]	Pulsed Drain Current	T_C=25°C	80*	-70*	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	t ≤ 10s	25	25	°C/W
		Steady State [c]	60	60	
I_{AS} [b]	Avalanche Current, Single pulse	L=0.5mH	10	-9	A
E_{AS} [b]	Avalanche Energy, Single pulse	L=0.5mH	25	25	mJ

Note * : Limited by package.

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

Note b : UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature Tj=25°C).

Note c : Surface Mounted on 1in² pad area, t =999sec.

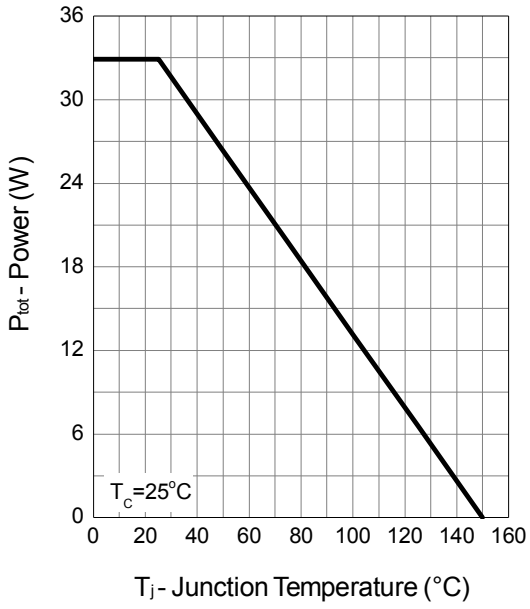
N Channel Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	N Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250μA	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=32V, V_{GS}=0V	-	-	1	μA
		T_J=85°C	-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250μA	1.5	2	2.5	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}=10A	-	17	24	mΩ
		V_{GS}=4.5V, I_{DS}=5A	-	25	37	
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}=10A, dI_{SD}/dt=100A/μs	-	13	-	ns
Q_{rr}	Reverse Recovery Charge		-	8.7	-	nC
Dynamic Characteristics [e]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz	-	2.5	-	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=20V, Frequency=1.0MHz	-	815	-	pF
C_{oss}	Output Capacitance		-	95	-	
C_{rss}	Reverse Transfer Capacitance		-	60	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=20V, R_L=20Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω	-	7.8	-	ns
t_r	Turn-on Rise Time		-	6.9	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	22.4	-	
t_f	Turn-off Fall Time		-	4.8	-	
Gate Charge Characteristics [e]						
Q_g	Total Gate Charge	V_{DS}=20V, V_{GS}=10V, I_{DS}=10A	-	15.7	22	nC
Q_g	Total Gate Charge	V_{DS}=20V, V_{GS}=4.5V, I_{DS}=10A	-	7.5	10.5	
Q_{gth}	Threshold Gate Charge		-	1.85	-	
Q_{gs}	Gate-Source Charge		-	3.24	-	
Q_{gd}	Gate-Drain Charge		-	2.75	-	

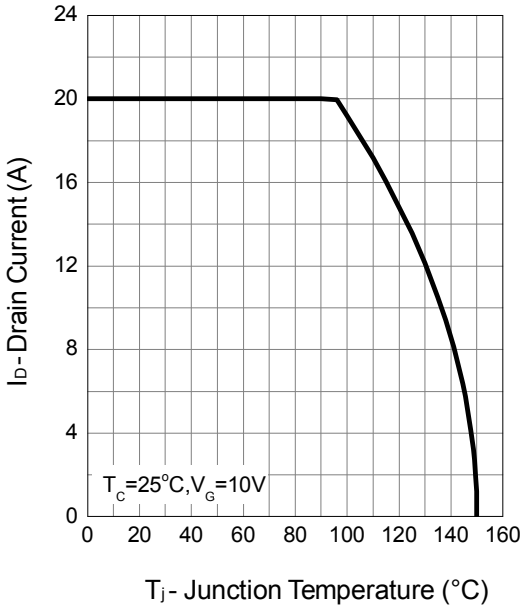
Note d：Pulse test ; pulse width≤300μs, duty cycle≤2%.
Note e：Guaranteed by design, not subject to production testing.

N Channel Typical Operating Characteristics

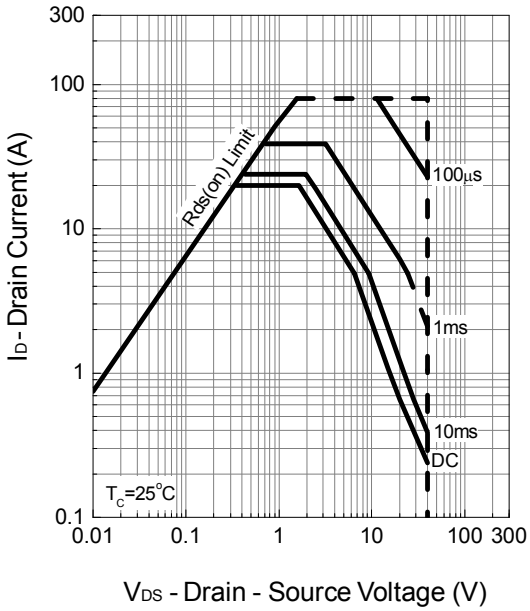
Power Dissipation



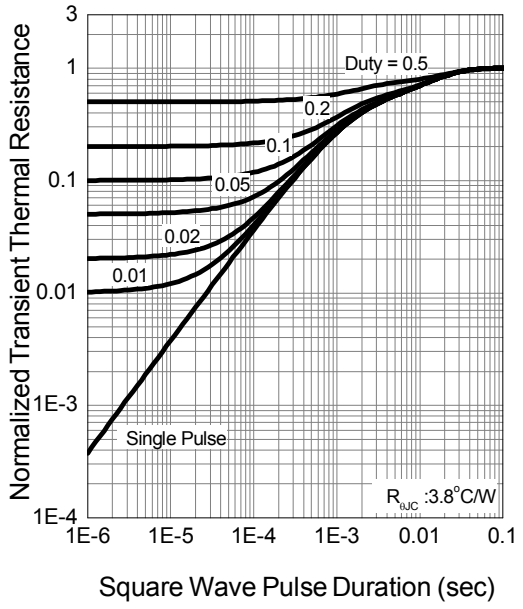
Drain Current



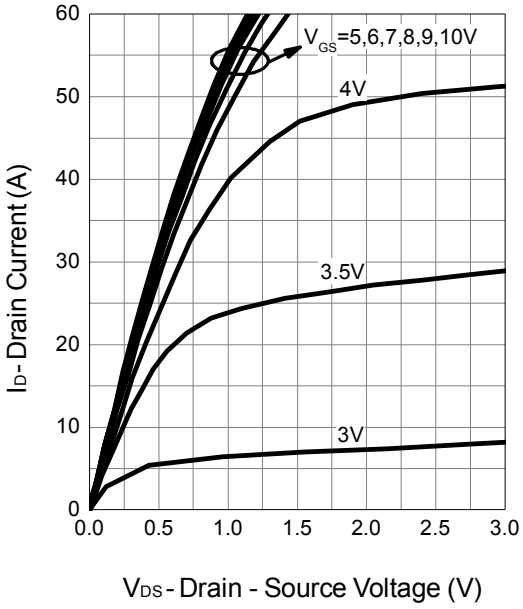
Safe Operation Area



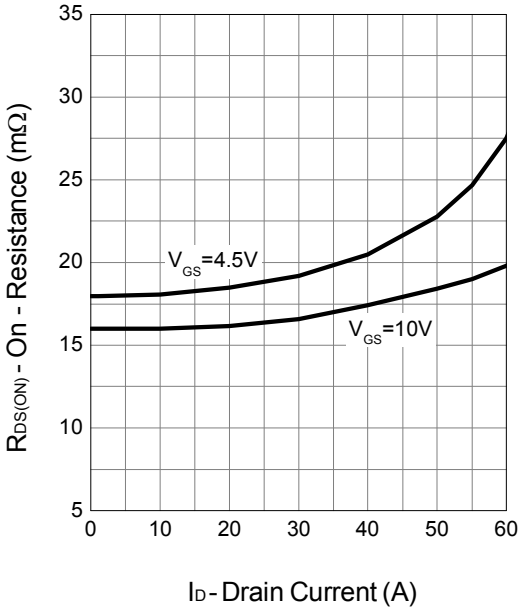
Thermal Transient Impedance



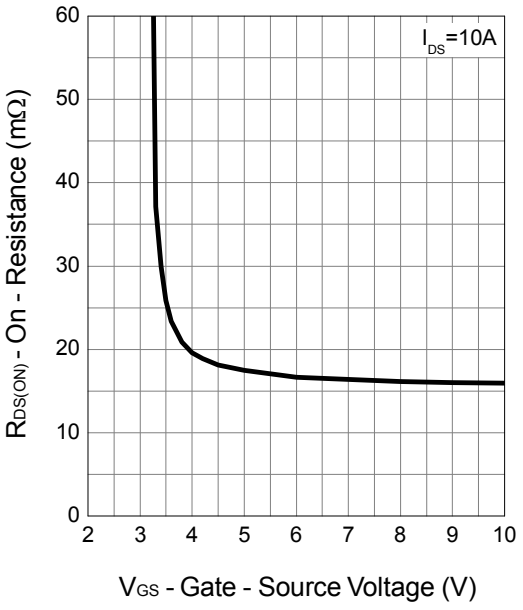
Output Characteristics



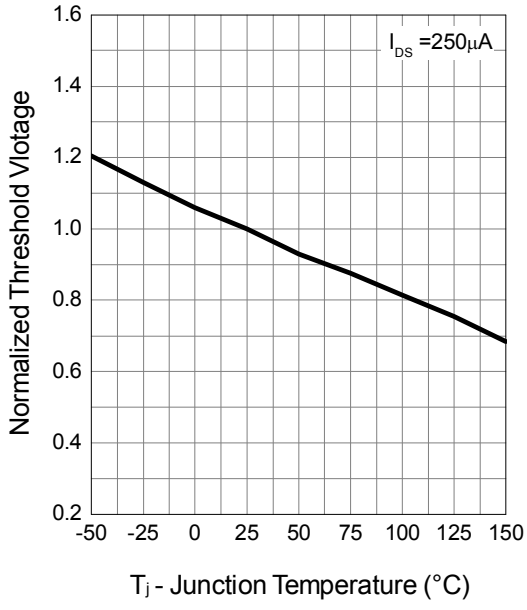
Drain-Source On Resistance



Gate-Source On Resistance



Gate Threshold Voltage



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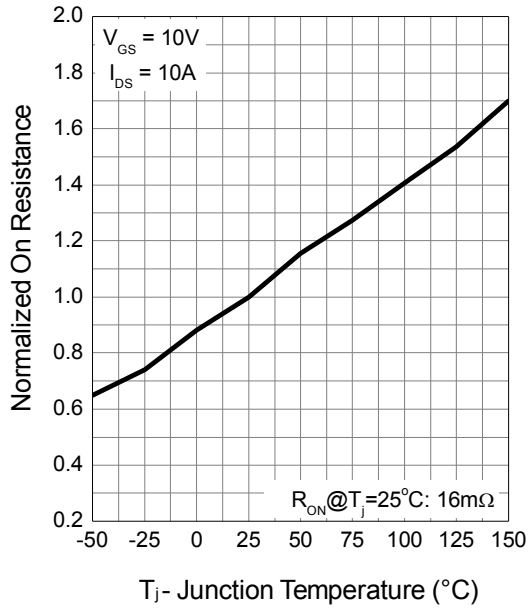
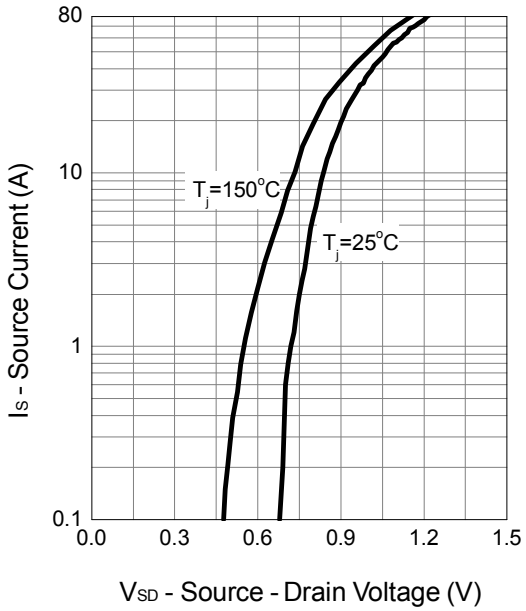
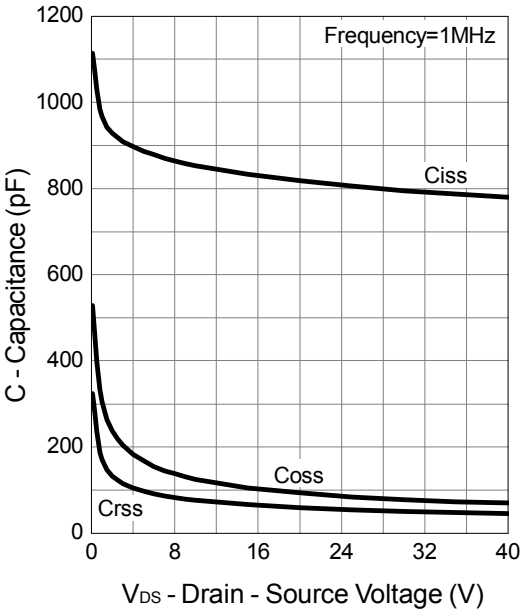
Drain-Source On Resistance



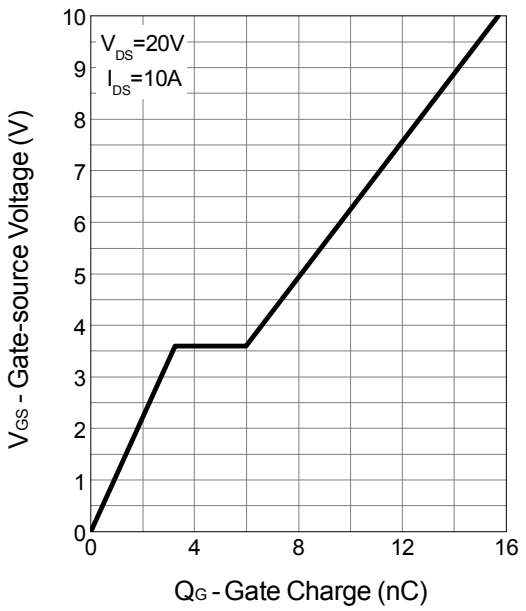
Source-Drain Diode Forward



Capacitance



Gate Charge

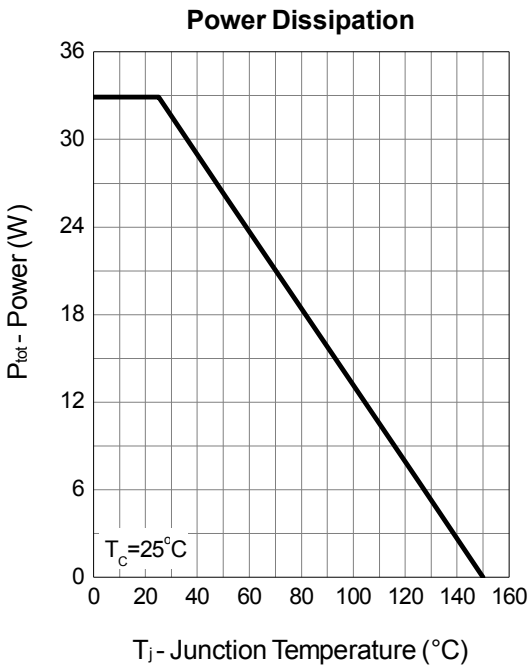


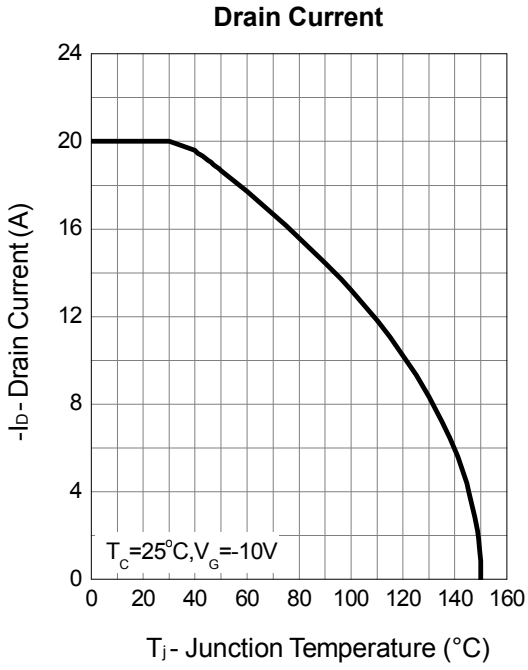
P Channel Electrical Characteristics (T_A = 25°C unless otherwise noted)

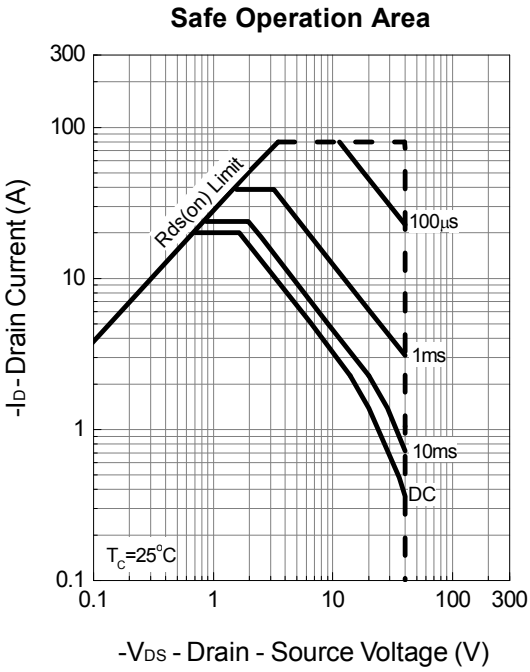
Symbol	Parameter	Test Conditions	P Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=-250μA	-40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-32V, V_{GS}=0V	-	-	-1	μA
		T_J=85°C	-	-	-30	mA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=-250μA	-1.5	-2	-2.5	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}=-10A	-	35	46	mΩ
		V_{GS}=-4.5V, I_{DS}=-5A	-	47	57	
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}=-10A, dI_{SD}/dt=100A/μs	-	15	-	ns
Q_{rr}	Reverse Recovery Charge		-	8	-	nC
Dynamic Characteristics [e]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz	-	8	-	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-20V, Frequency=1.0MHz	-	668	-	pF
C_{oss}	Output Capacitance		-	98	-	
C_{rss}	Reverse Transfer Capacitance		-	72	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=-20V, R_L=20Ω, I_{DS}=-1A, V_{GEN}=-10V, R_G=6Ω	-	8.7	-	ns
t_r	Turn-on Rise Time		-	7	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	31	-	
t_f	Turn-off Fall Time		-	17	-	
Gate Charge Characteristics [e]						
Q_g	Total Gate Charge	V_{DS}=-20V, V_{GS}=-10V, I_{DS}=-10A	-	15	-	nC
Q_g	Total Gate Charge	V_{DS}=-20V, V_{GS}=-4.5V, I_{DS}=-10A	-	7.5	-	
Q_{gth}	Threshold Gate Charge		-	1.4	-	
Q_{gs}	Gate-Source Charge		-	2.4	-	
Q_{gd}	Gate-Drain Charge		-	3.5	-	

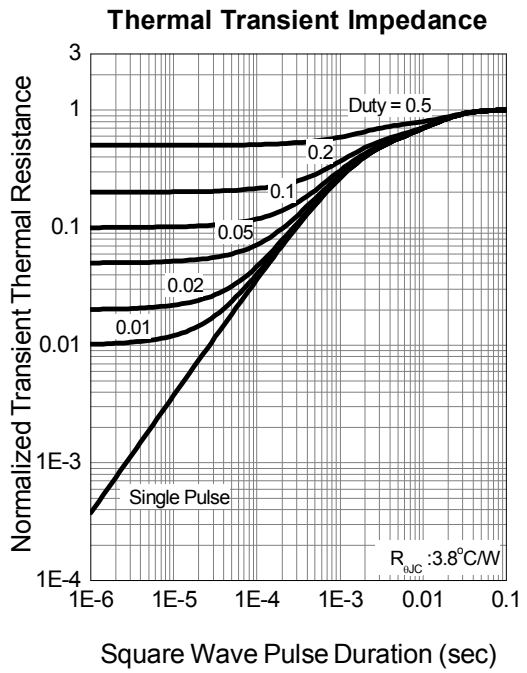
Note d：Pulse test; pulse width≤300μs, duty cycle≤2%.
Note e：Guaranteed by design, not subject to production testing.

P Channel Typical Operating Characteristics









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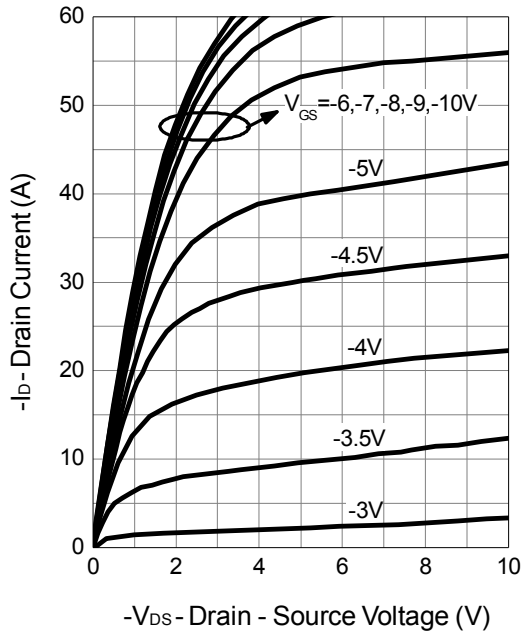
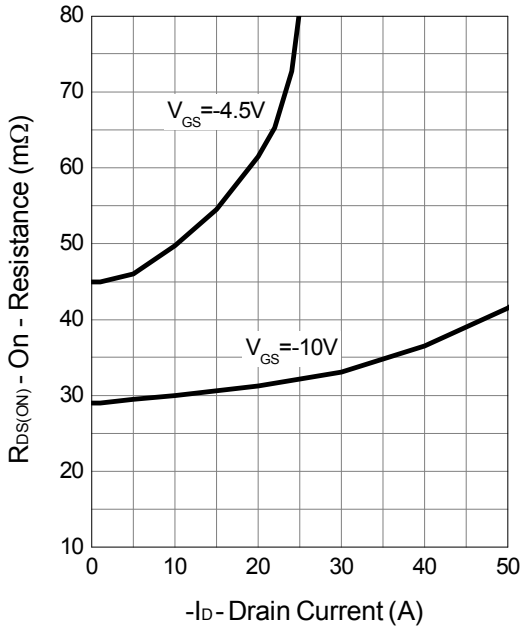
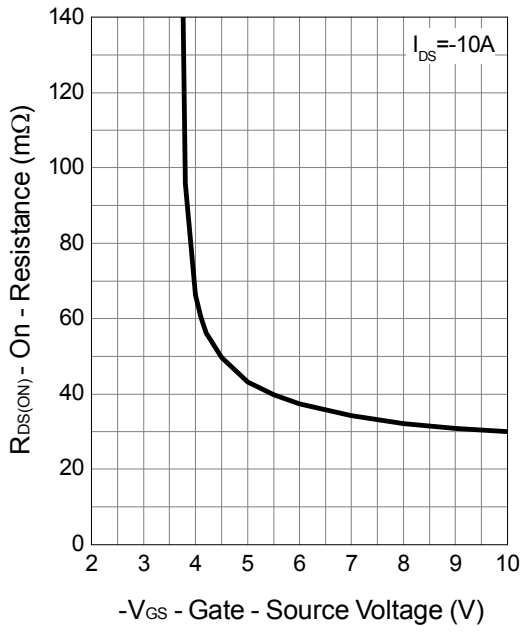
Output Characteristics



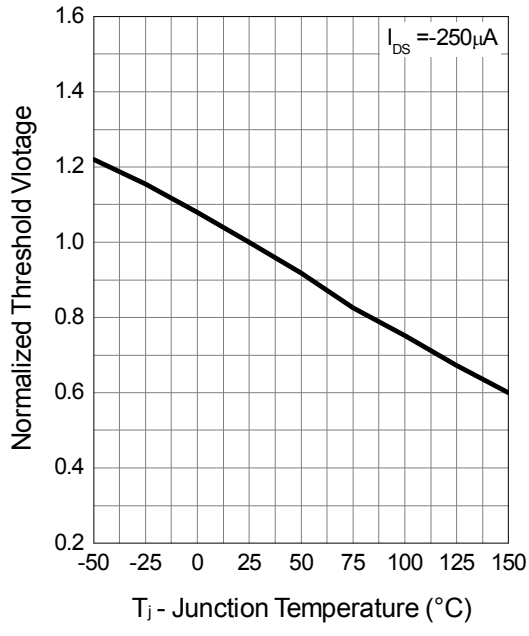
Drain-Source On Resistance



Gate-Source On Resistance



Gate Threshold Voltage



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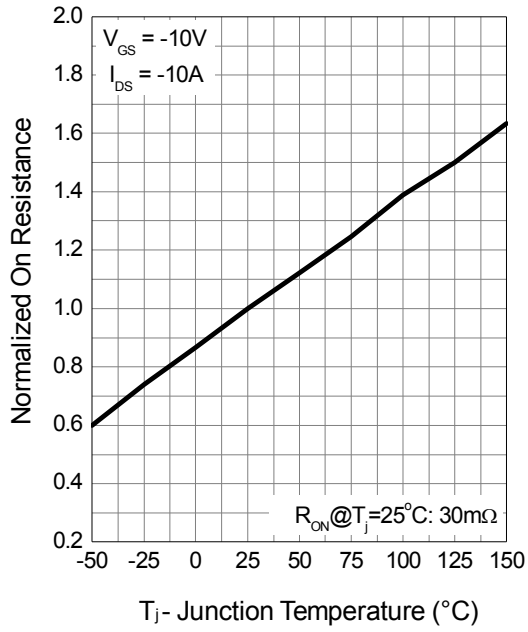
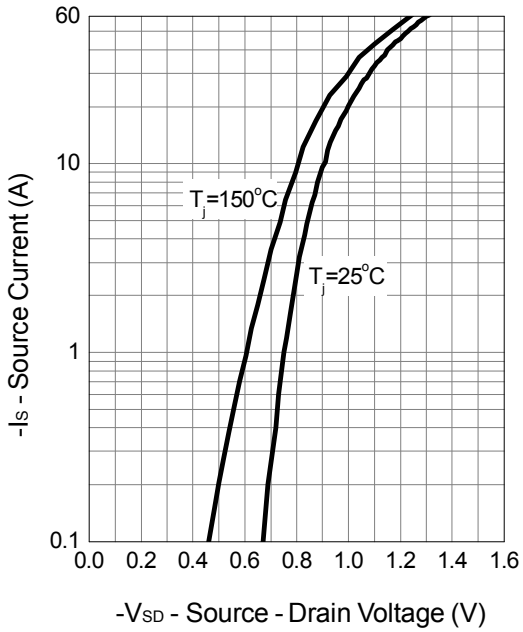
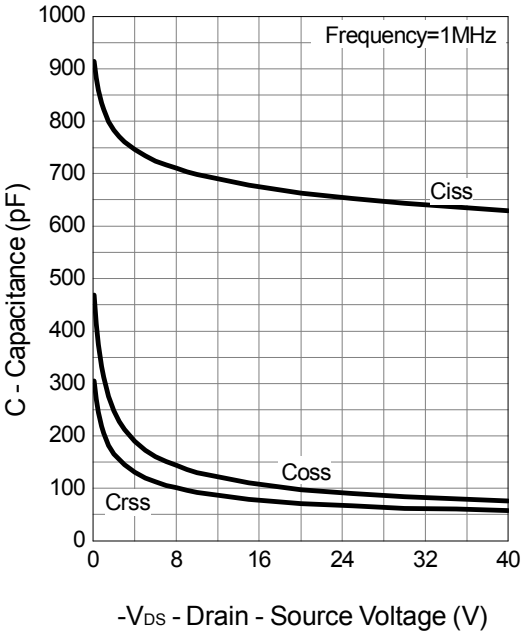
Drain-Source On Resistance



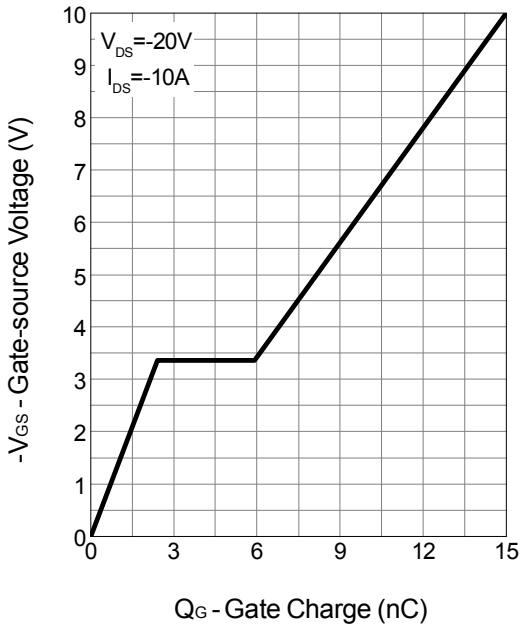
Source-Drain Diode Forward



Capacitance

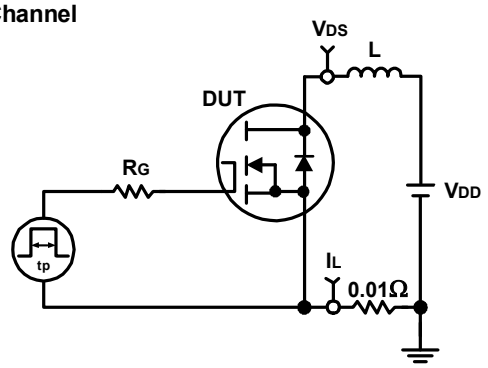


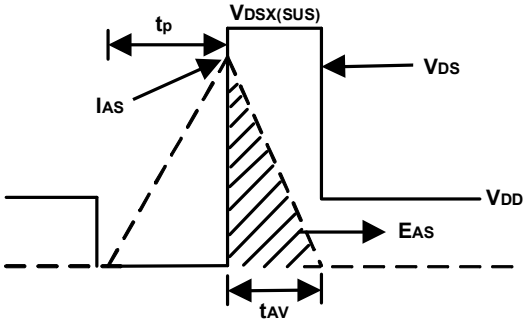
Gate Charge



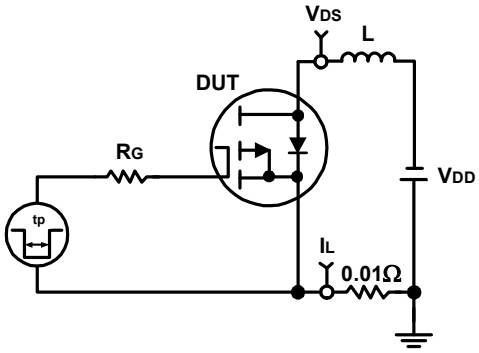
Avalanche Test Circuit and Waveforms

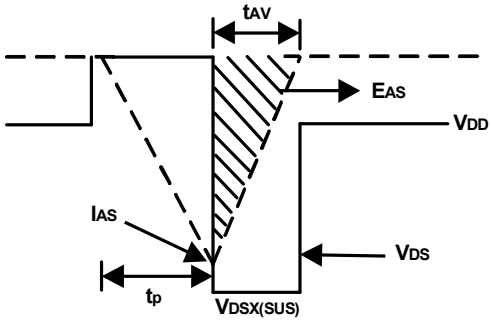
N Channel





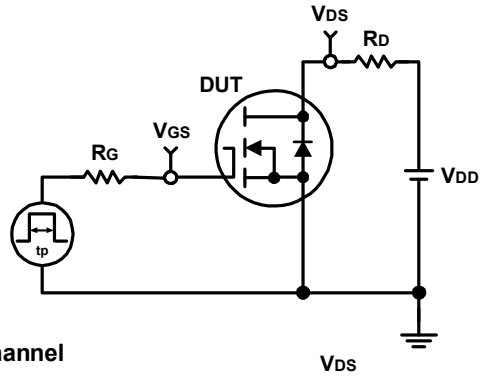
P Channel

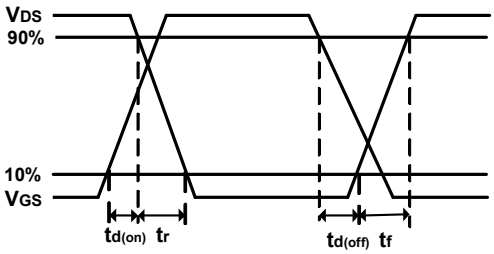




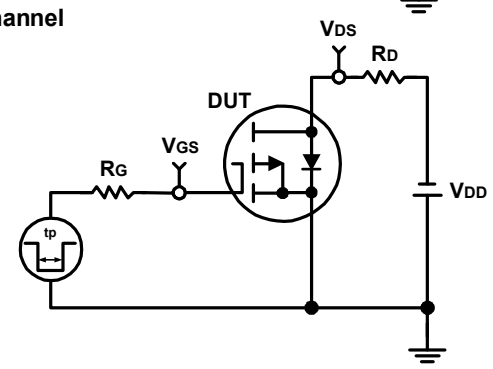
Switching Time Test Circuit and Waveforms

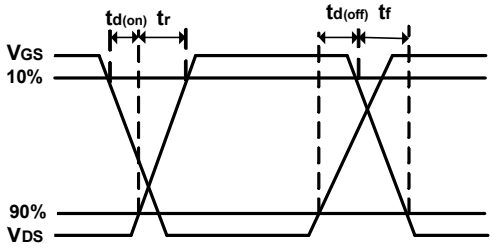
N Channel



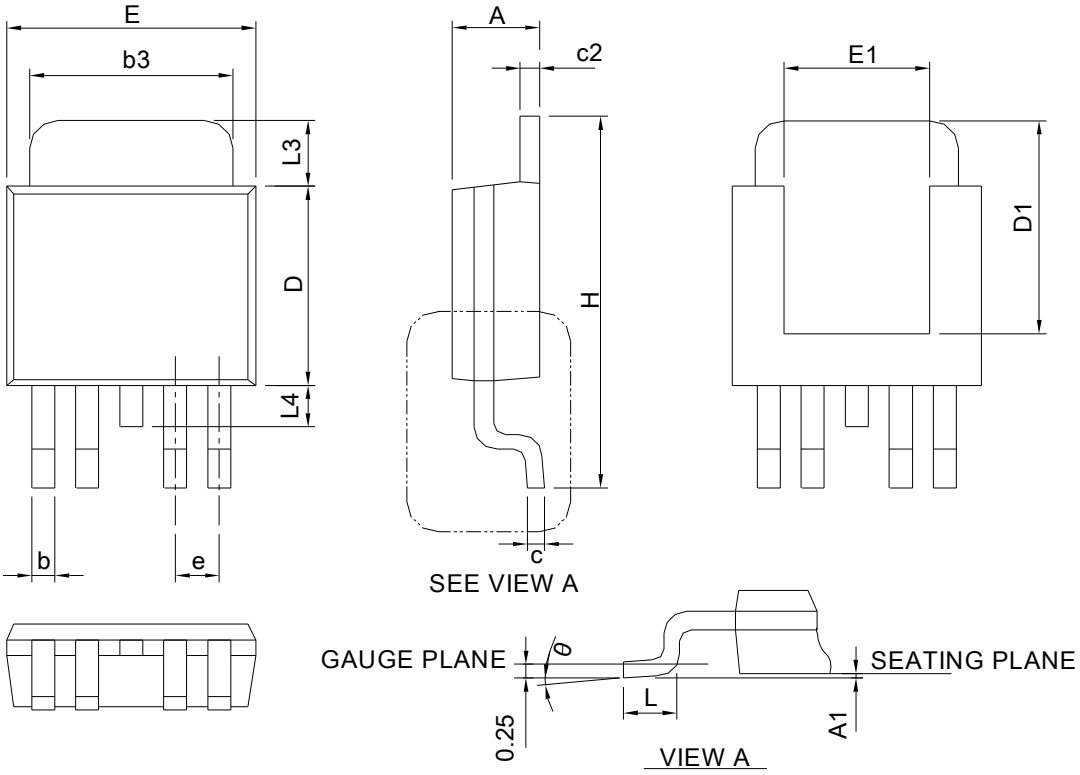


P Channel



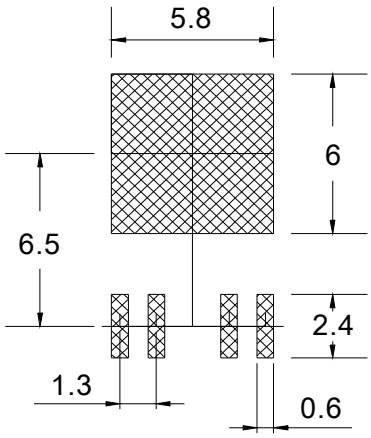


Package Mechanical Data:TO-252-4L



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