

- ★ Super Low Gate Charge
- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Excellent CdV/dt effect decline
- ★ Advanced trench gate super junction technology

650V Super Junction Power MOSFET

Product Summary



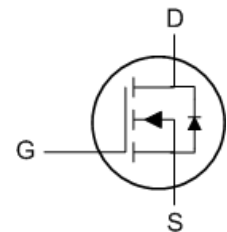
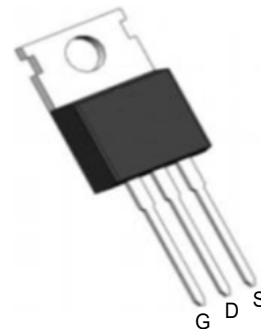
BVDSS	RDS(on)	ID
650V	0.19Ω	20A

Description

The UD650SJ24T use super junction technology and design to provide excellent RDS(ON) with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

The UD650SJ24T meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

TO220 Pin Configuration



Absolute Maximum Ratings (unless otherwise specified, T_J=25°C)

Parameter	Symbol	Test conditions	Parameter values			Unit
			Min	Typ	Max	
Drain-source voltage	V _{DS}	--	650	--	--	V
Gate-source voltage	V _{GS}	--	-20	--	20	V
Continuous drain current	I _D	T _C =25°C	--	--	20	A
		T _C =100°C	--	--	12	A
Pulsed drain current (note1)	I _{DM}	T _C =25°C	--	--	80	A
Power dissipation (note2)	P _D	T _C =25°C	--	--	25	W
Single Pulsed Avalanche Energy	E _{AS}	L=79mH, V _{DD} =100V, R _G =25Ω, T _J =25°C	--	--	409	mJ
Avalanche Current	I _{AS}	--	--	--	3.0	A
Body diode	dv/dt	V _{DS} =0~400V, I _{SD} ≤I _S , T _J =25°C	--	--	15	V/ns
MOS transistor dv/dt durability	dv/dt	V _{DS} =0~480V	--	--	50	V/ns
Operating Junction Temperature Range	T _J	--	-55	--	150	°C
Storage Temperature Range	T _{stg}	--	-55	--	150	°C
Continuous diode forward current	I _S	T _C =25°C, Maximum Continuous Drain to Source Diode Forward Current	--	--	20	A
Diode pulse current	I _{S,pulse}		--	--	80	A
Maximum diode rectification speed	di/dt	V _{DS} =0~400V, I _{SD} ≤I _S , T _J =25°C	--	--	500	A/μs

Note:

1. Pulse time:5μs;
2. The dissipated power value will vary with temperature changes, When the temperature exceeds 25 °C, the dissipated power value decreases with every 1 degree increase in temperature: 0.20W/°C ;
3. Pulse test: pulse width≤300μs, Duty cycle≤2%;
4. Basically unaffected by operating temperature.

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Thermal Characteristics

Parameter	Symbol	Test conditions	Parameter values			Unit
			Min	Typ	Max	
Thermal Resistance Junction-ambient	$R_{\theta JC}$	--	--	--	5.0	$^{\circ}\text{C/W}$
Thermal Resistance Junction-Case	$R_{\theta JA}$	--	--	--	62.5	$^{\circ}\text{C/W}$
welding temperature	T_{sold}	15^{+2}_{-0} sec, 1time	--	--	260	$^{\circ}\text{C}$

Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise specified)

Static Characteristics

Parameter	Symbol	Test conditions	Parameter values			Unit
			Min	Typ	Max	
Drain-Source Breakdown Voltage	BV_{DS}	$V_{GS}=0V$, $I_D=250\mu A$	650	--	--	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=650V$, $V_{GS}=0V$, $T_J=25^{\circ}\text{C}$	--	--	1.0	μA
		$V_{DS}=650V$, $V_{GS}=0V$, $T_J=150^{\circ}\text{C}$	--	10	--	
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V$, $V_{DS}=0V$	--	--	± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}$, $I_D=250\mu A$	2.0	--	4.0	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V$, $I_D=10A$, $T_J=25^{\circ}\text{C}$	--	0.19	0.24	Ω
		$V_{GS}=10V$, $I_D=10A$, $T_J=150^{\circ}\text{C}$	--	0.42	--	
Gate Resistance	R_G	$f=1\text{MHz}$	--	4.7	--	Ω

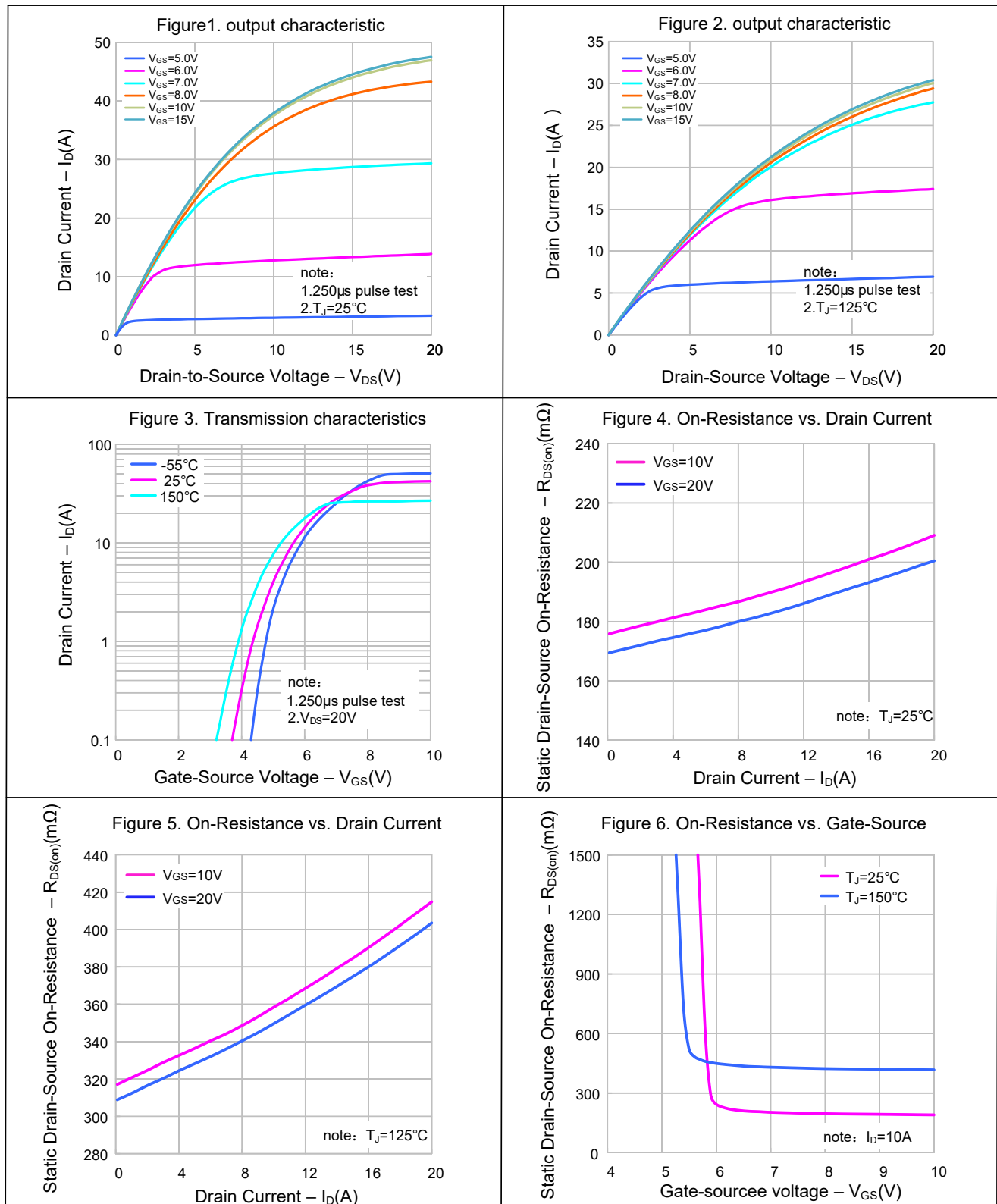
Dynamic Characteristics

Parameter	Symbol	Test conditions	Parameter values			Unit
			Min	Typ	Max	
Input Capacitance	C_{iss}	$f=1\text{MHz}$, $V_{GS}=0V$, $V_{DS}=100V$	--	1153	--	pF
Output Capacitance	C_{oss}		--	51	--	
Reverse Transfer Capacitance	C_{rss}		--	1.1	--	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=325V$, $V_{GS}=10V$, $R_G=24\Omega$, $I_D=20A$ (note 3, 4)	--	22	--	ns
Rise Time	t_r		--	54	--	
Turn-Off Delay Time	$t_{d(off)}$		--	81	--	
Fall Time	t_f		--	42	--	
Total Gate Charge	Q_g	$V_{DD}=520V$, $V_{GS}=10V$, $I_D=20A$ (note 3, 4)	--	31	--	nC
Gate-Source Charge	Q_{gs}		--	9.2	--	
Gate-Drain Charge	Q_{gd}		--	14	--	
Gate Platform Voltage	V_{plateau}		--	7.0	--	V

Diode Characteristics

Parameter	Symbol	Test conditions	Parameter values			Unit
			Min	Typ	Max	
Diode Forward Voltage	V_{SD}	$I_S=20A$, $V_{GS}=0V$	--	--	1.4	V
Body Diode Reverse Recovery Time	T_{rr}	$I_S=20A$, $V_{GS}=0V$, $V_R=50V$,	--	294	--	ns
Body Diode Reverse Recovery Charge	Q_{rr}	$di_F/dt=100A/\mu s$ (note 3)	--	4.3	--	μC

Typical Characteristics



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Typical Characteristics

Figure 7. Normalized $V_{GS(th)}$ vs. T_J

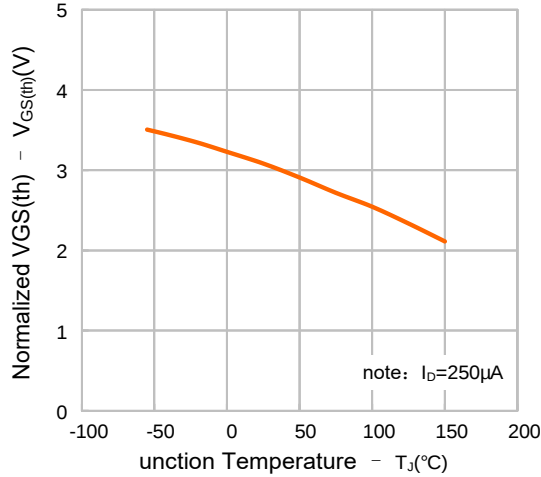


Figure 8. Forward Characteristics Of Reverse

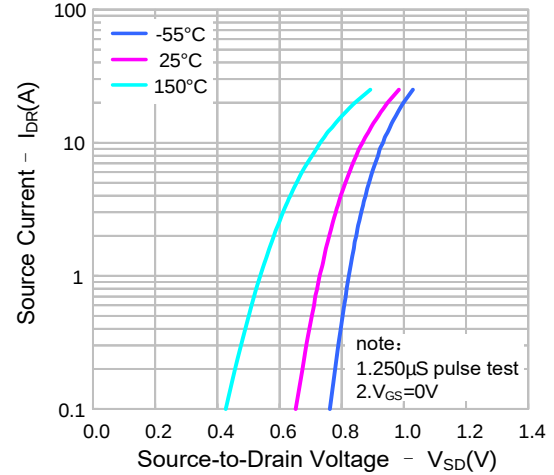


Figure 9. Capacitance Characteristic

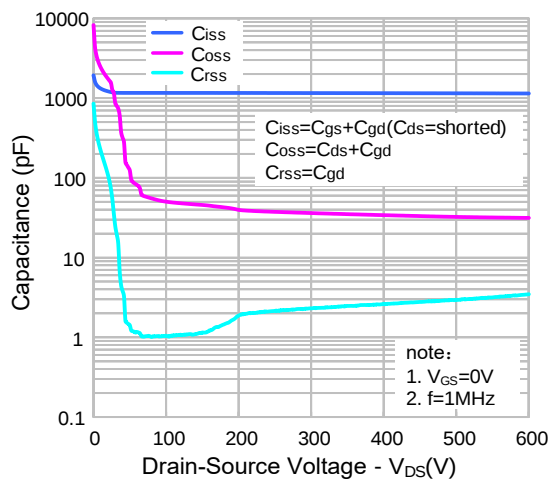


Figure 10. Gate Charge Characteristic

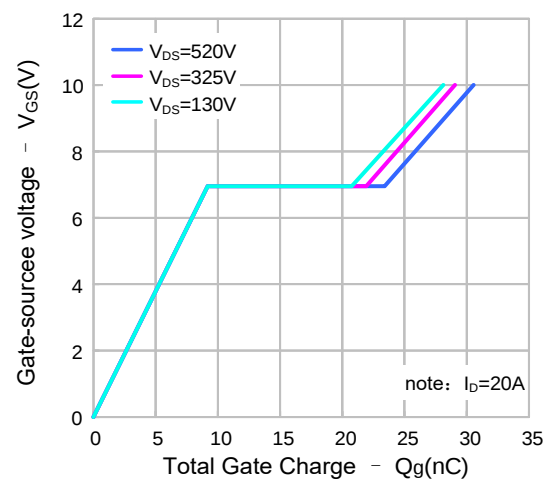


Figure 11. Normalized BVDSS vs. Temperature

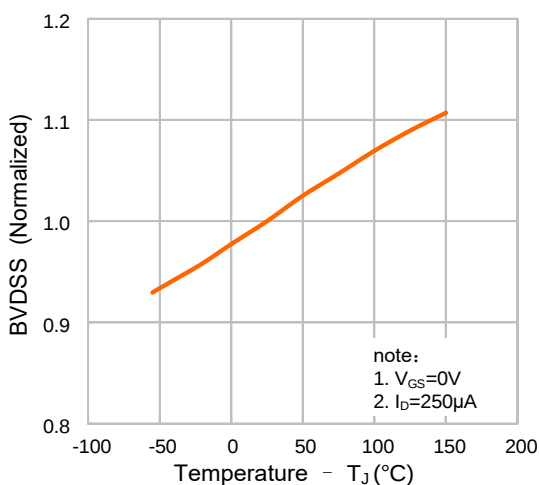
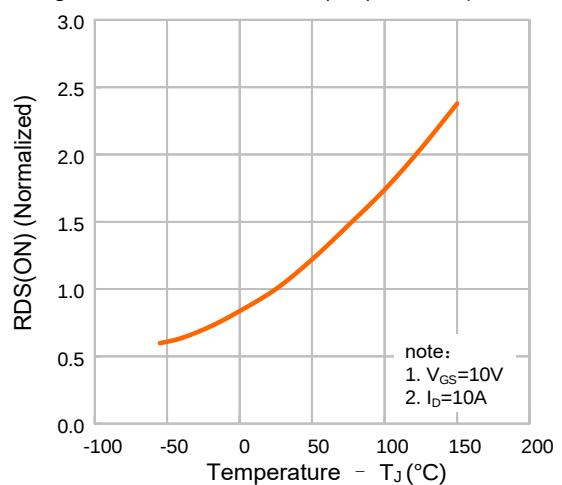
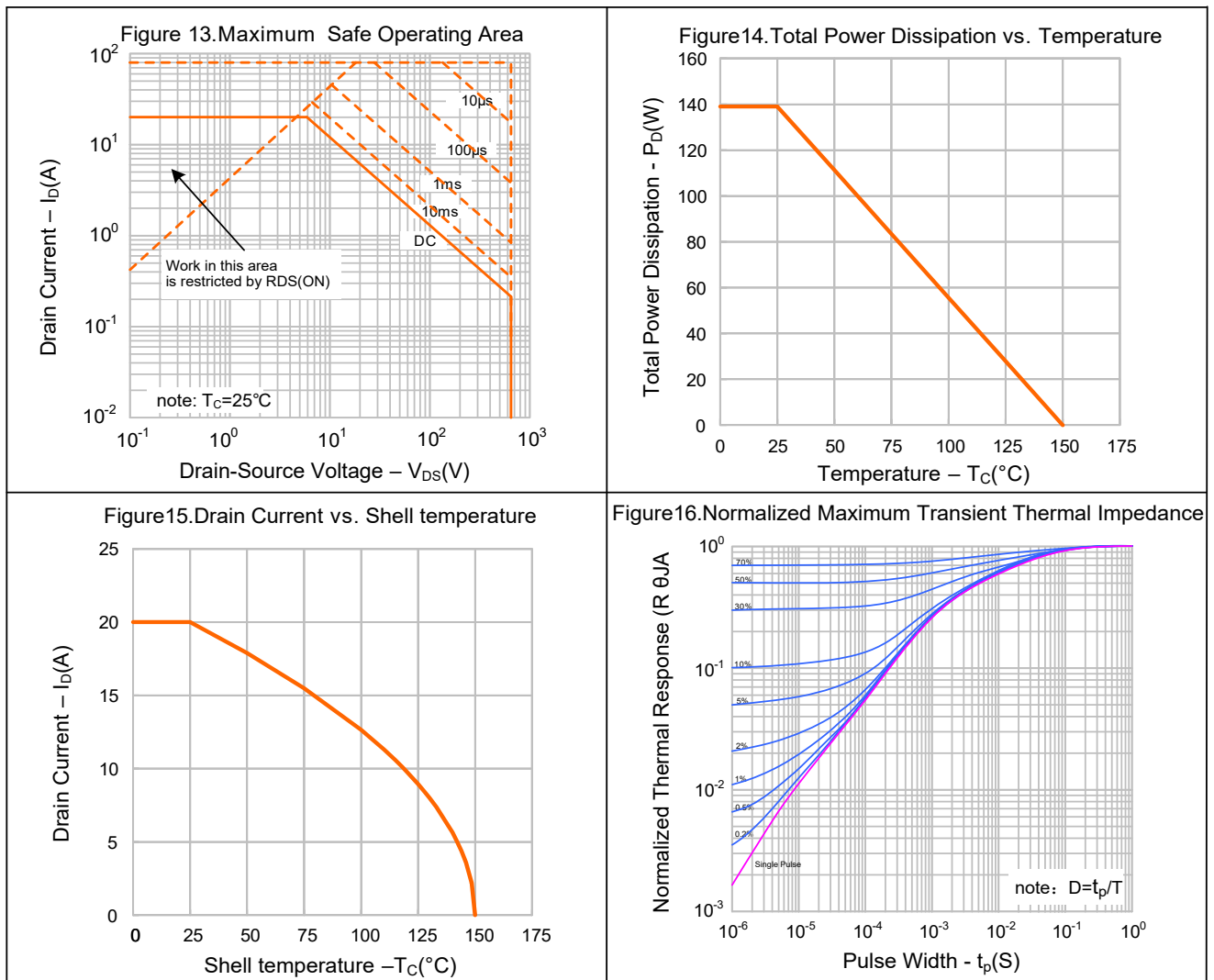


Figure 12. Normalized $R_{DS(ON)}$ vs. Temperature

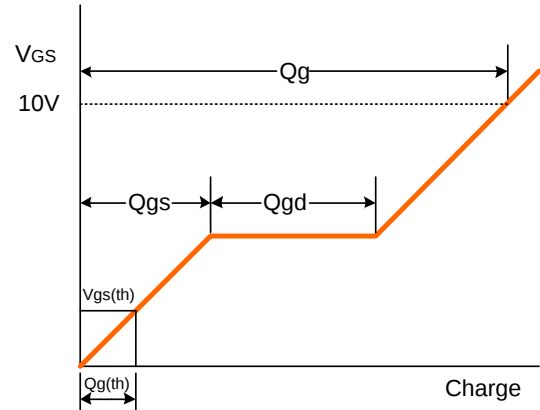
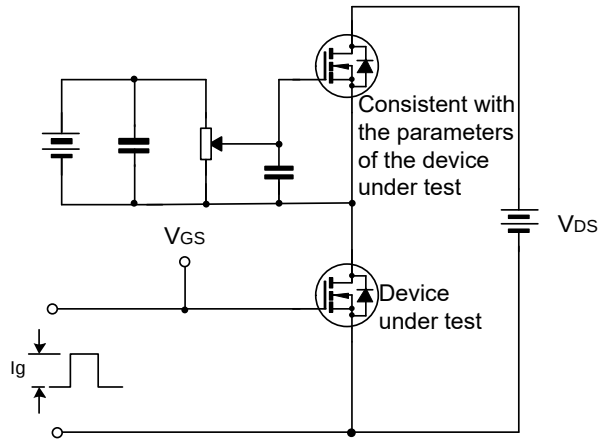


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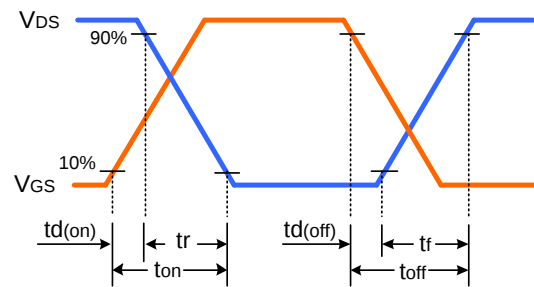
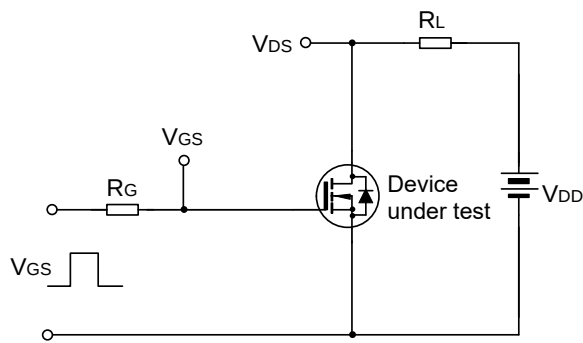
Typical Characteristics



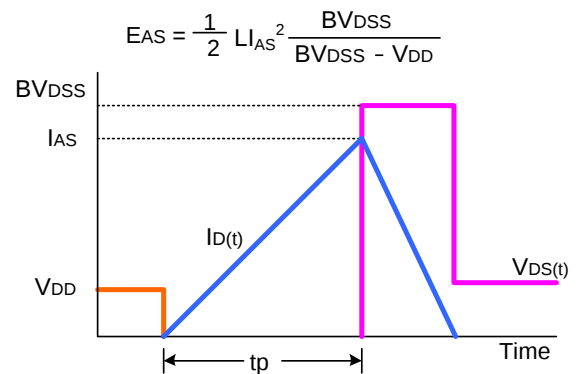
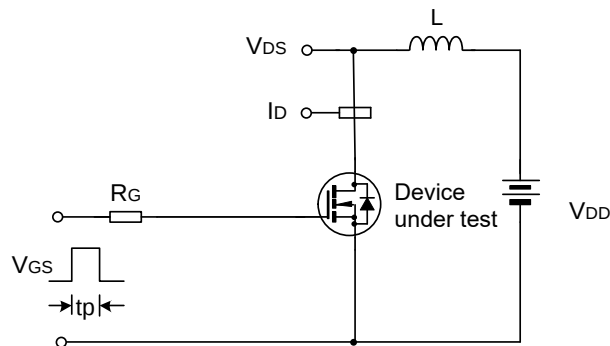
Gate Charge Test Circuit & Waveform



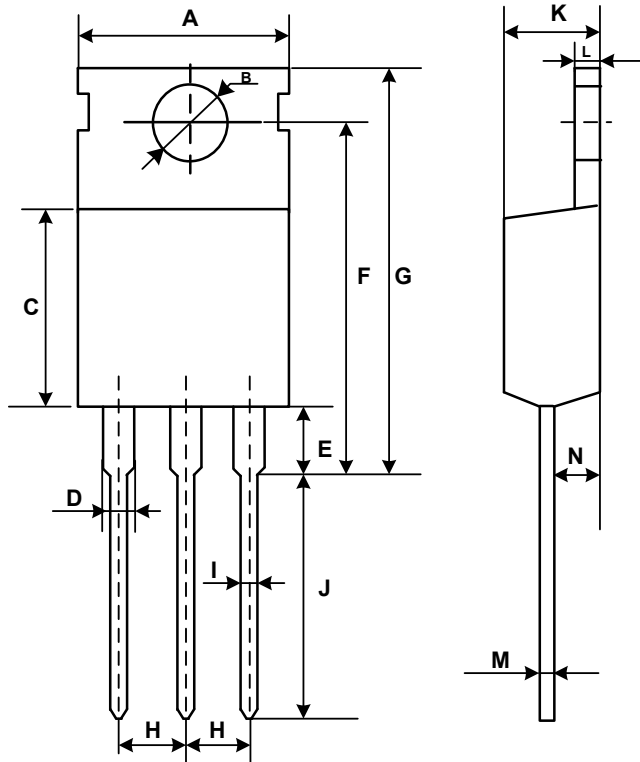
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions for TO-220



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	9.70	10.30
B	3.40	3.80
C	8.80	9.40
D	1.17	1.47
E	2.60	3.50
F	15.10	16.70
G	19.55MAX	
H	2.54REF	
I	0.70	0.95
J	9.35	11.00
K	4.30	4.77
L	1.20	1.45
M	0.40	0.65
N	2.20	2.60