

N-Channel Power MOSFET 50A, 300Volts

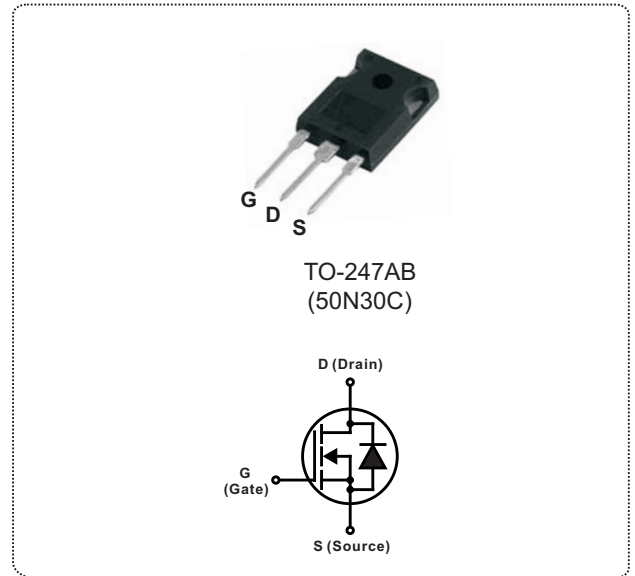
DESCRIPTION

The Nell **50N30** is a three-terminal silicon device with current conduction capability of 50A, fast switching speed, low on-state resistance, breakdown voltage rating of 300V, and max. threshold voltage of 6.5 volts.

They are designed for use in applications such as switched mode power supplies, DC to DC converters, **PWM** motor controls, bridge circuits, battery chargers, DC choppers, temperature and lighting controls and general purpose switching applications.

FEATURES

- $R_{DS(ON)} = 0.080\Omega @ V_{GS} = 10V$
- Ultra low gate charge(65nC typical)
- Low reverse transfer capacitance ($C_{RSS} = 60pF$ typical)
- Fast switching capability
- 100% avalanche energy specified
- Improved dv/dt capability
- 150°C operation temperature



PRODUCT SUMMARY

I_D (A)	50
V_{DSS} (V)	300
$R_{DS(ON)}$ (Ω)	0.080 @ $V_{GS} = 10V$
QG(nC) typical	65

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ C$ unless otherwise specified)

SYMBOL	PARAMETER	TEST CONDITIONS	VALUE	UNIT
V_{DSS}	Drain to Source voltage	$T_J = 25^\circ C$ to $150^\circ C$	300	V
V_{DGR}	Drain to Gate voltage	$R_{GS} = 20K\Omega$	300	
V_{GS}	Gate to Source voltage		± 20	
I_D	Continuous Drain Current	$T_C = 25^\circ C$	50	A
		$T_C = 100^\circ C$	35	
	Pulsed Drain current(Note 1)		150	
I_{AR}	Avalanche current(Note 1)		50	mJ
E_{AR}	Repetitive avalanche energy(Note 1)	$I_{AR} = 50A, R_{GS} = 50\Omega, V_{GS} = 10V$	50	
E_{AS}	Single pulse avalanche energy(Note 2)	$I_{AS} = 50A, L = 0.1mH$	1500	V/ns
dv/dt	Peak diode recovery dv/dt(Note 3)		50	
P_D	Total power dissipation	$T_C = 25^\circ C$	690	W
	Linear derating factor above $T_C = 25^\circ C$		5.8	$^\circ C/W$
T_J	Operation junction temperature		-55 to 150	$^\circ C$
T_{STG}	Storage temperature		-55 to 150	
T_L	Maximum soldering temperature, for 10 seconds	1.6mm from case	300	
	Mounting torque, #6-32 or M3 screw		10 (1.1)	lbf-in (N-m)

Note: 1. Repetitive rating: pulse width limited by junction temperature.
 2. $I_{AS} = 50A, L = 0.1mH, V_{DD} = 50V, R_{GS} = 25\Omega$, starting $T_J = 25^\circ C$.
 3. $I_{SD} \leq 50A, di/dt \leq 200A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ C$.

THERMAL RESISTANCE					
SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
$R_{th(j-c)}$	Thermal resistance, junction to case			0.18	°C/W
$R_{th(j-a)}$	Thermal resistance, junction to ambient			50	

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise specified)

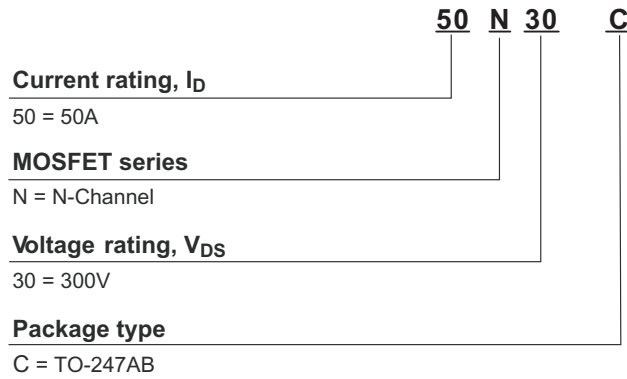
SYMBOL	PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
⊙ OFF CHARACTERISTICS						
$V_{(BR)DSS}$	Drain to source breakdown voltage	$I_D = 1\text{mA}, V_{GS} = 0\text{V}$	300			V
$V_{(BR)DSS}/T_J$	Breakdown voltage temperature coefficient	$I_D = 1\text{mA}, V_{DS} = V_{GS}$		0.35		V/°C
I_{DSS}	Drain to source leakage current	$V_{DS} = 300\text{V}, V_{GS} = 0\text{V}$ $T_C = 25^\circ\text{C}$			10	μA
		$V_{DS} = 240\text{V}, V_{GS} = 0\text{V}$ $T_C = 125^\circ\text{C}$			100	
I_{GSS}	Gate to source forward leakage current	$V_{GS} = 20\text{V}, V_{DS} = 0\text{V}$			100	nA
	Gate to source reverse leakage current	$V_{GS} = -20\text{V}, V_{DS} = 0\text{V}$			-100	
⊙ ON CHARACTERISTICS						
$R_{DS(ON)}$	Static drain to source on-state resistance	$V_{GS} = 10\text{V}, I_D = 25\text{A}$			0.080	Ω
$V_{GS(TH)}$	Gate threshold voltage	$V_{GS} = V_{DS}, I_D = 4\text{mA}$	3.5		6.5	V
g_{fs}	Forward transconductance	$V_{DS} = 20\text{V}, I_D = 25\text{A}$	19	29		S
⊙ DYNAMIC CHARACTERISTICS						
C_{ISS}	Input capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$		3160		pF
C_{OSS}	Output capacitance			600		
C_{RSS}	Reverse transfer capacitance			60		
R_G	Gate input resistance			0.17		
⊙ SWITCHING CHARACTERISTICS						
$t_{d(ON)}$	Turn-on delay time	$V_{DD} = 150\text{V}, V_{GS} = 10\text{V}$ $I_D = 25\text{A}, R_{GS} = 2\Omega$ (Note 1,2)		14		ns
t_r	Rise time			15		
$t_{d(OFF)}$	Turn-off delay time			24		
t_f	Fall time			9		
Q_G	Total gate charge	$V_{DD} = 150\text{V}, V_{GS} = 10\text{V}$ $I_D = 25\text{A},$ (Note 1,2)		65		nC
Q_{GS}	Gate to source charge			22		
Q_{GD}	Gate to drain charge (Miller charge)			32		

SOURCE TO DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise specified)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{SD}	Diode forward voltage	$I_{SD} = 50\text{A}, V_{GS} = 0\text{V}$			1.4	V
I_S (ISD)	Continuous source to drain current	Integral reverse P-N junction diode in the MOSFET			50	A
I_{SM}	Pulsed source current				200	
t_{rr}	Reverse recovery time	$I_{SD} = 25\text{A}, V_{GS} = 0\text{V},$ $dI_F/dt = 100\text{A}/\mu\text{s}$			250	ns
Q_{rr}	Reverse recovery charge			0.95		μC

Note: 1. Pulse test: Pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
2. Essentially independent of operating temperature.

ORDERING INFORMATION SCHEME



■ TEST CIRCUITS

Fig.1A Peak diode recovery dv/dt test circuit

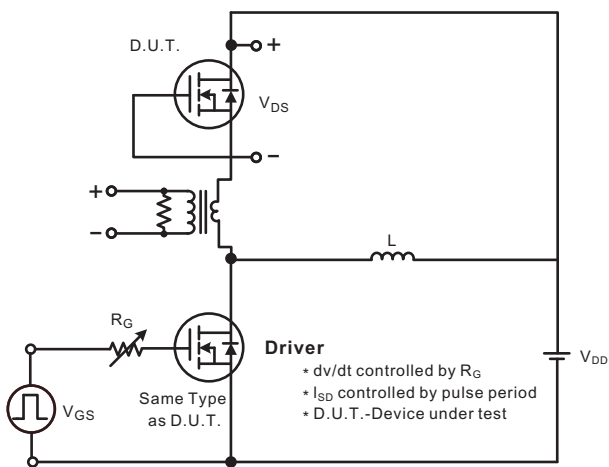
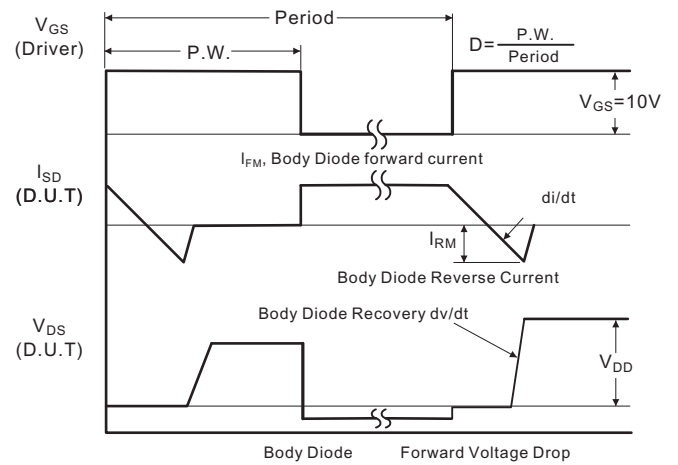


Fig.1B Peak diode recovery dv/dt waveforms



■ TEST CIRCUIT(Cont.)

Fig.2A Switching test circuit

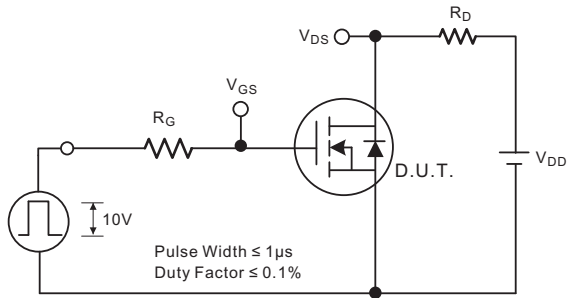


Fig.2B Switching Waveforms

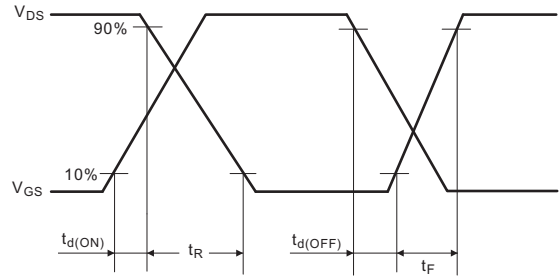


Fig.3A Gate charge test circuit

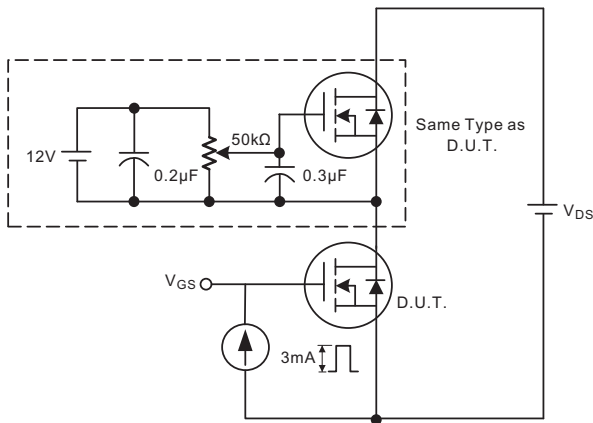


Fig.3B Gate charge waveform

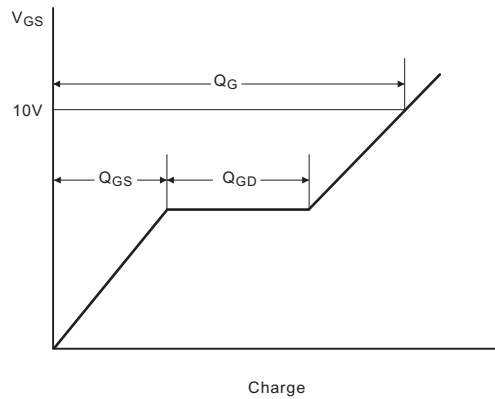


Fig.4A Unclamped Inductive switching test circuit

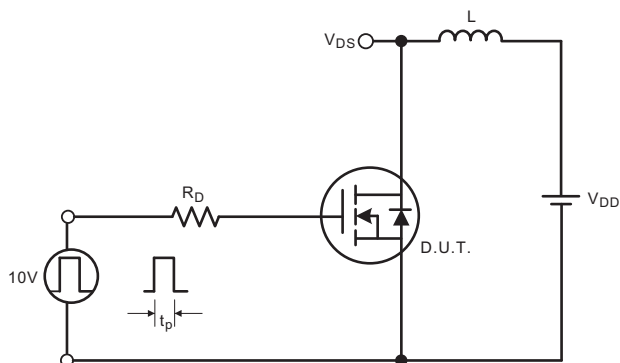


Fig.4B Unclamped Inductive switching waveforms

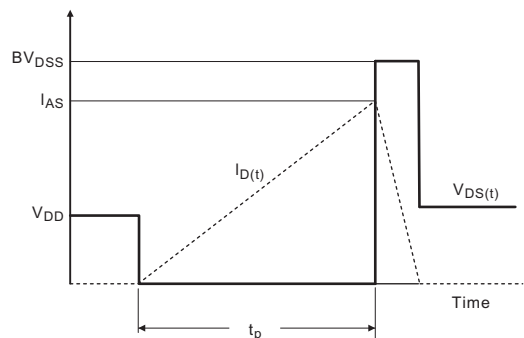


Fig.1 Output characteristics

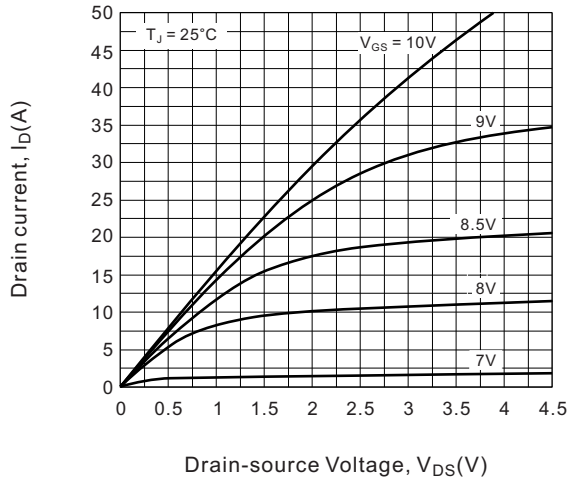


Fig.2 Extended output characteristics

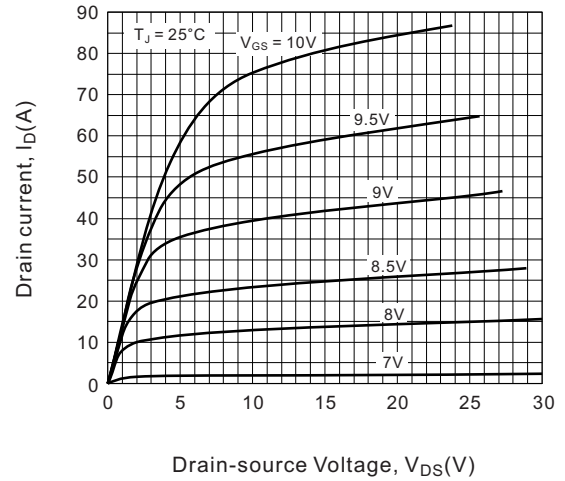


Fig.3 Output characteristics

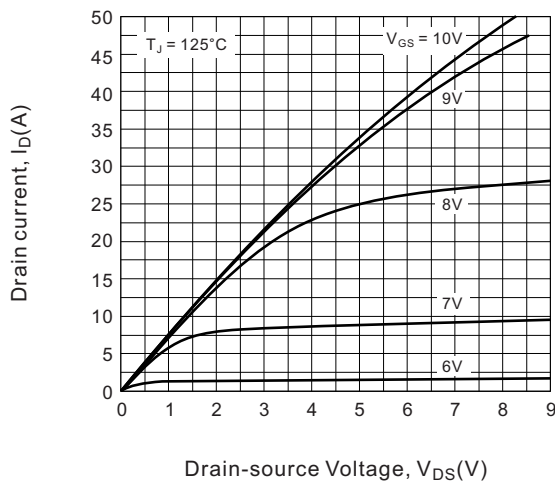


Fig.4 $R_{DS(on)}$ Normalized to $I_D = 25\text{A}$ value vs. Junction temperature

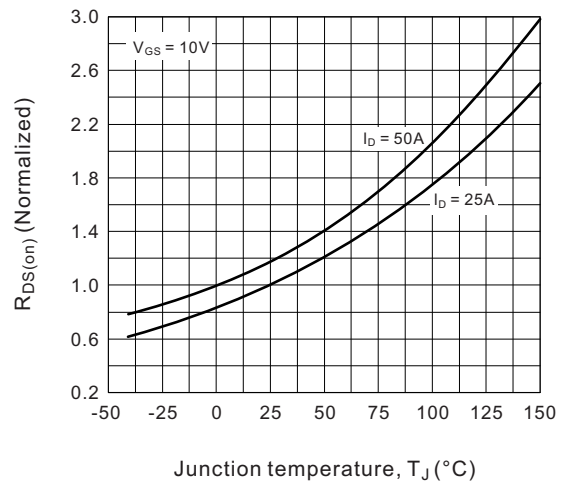


Fig.5 $R_{DS(on)}$ Normalized to $I_D = 25\text{A}$ value vs. Drain current

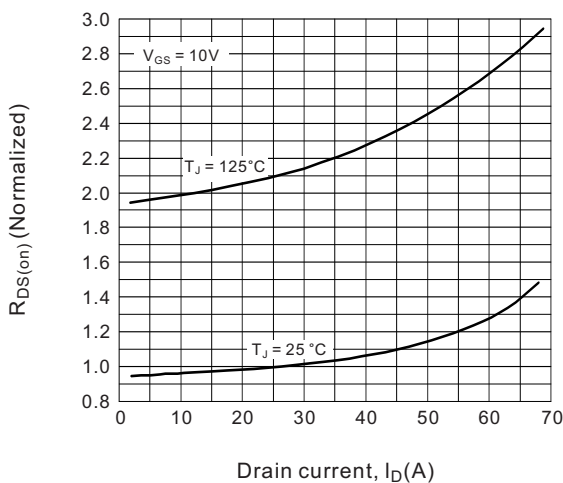


Fig.6 Maximum drain current vs. Case temperature

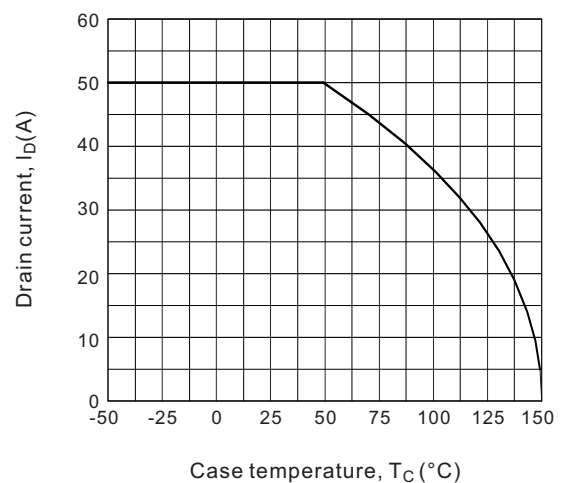


Fig.7 Transfer characteristics

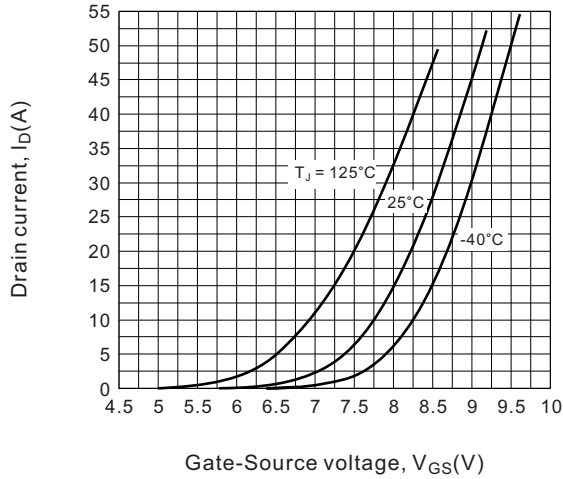


Fig.8 Transconductance

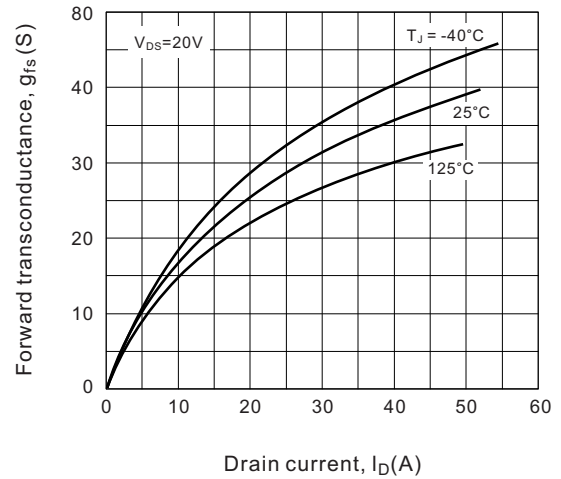


Fig.9 Forward voltage drop of Intrinsic diode

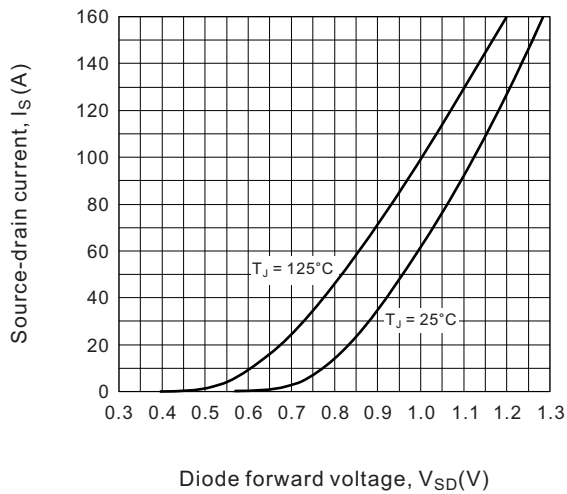


Fig.10 Gate charge characteristics

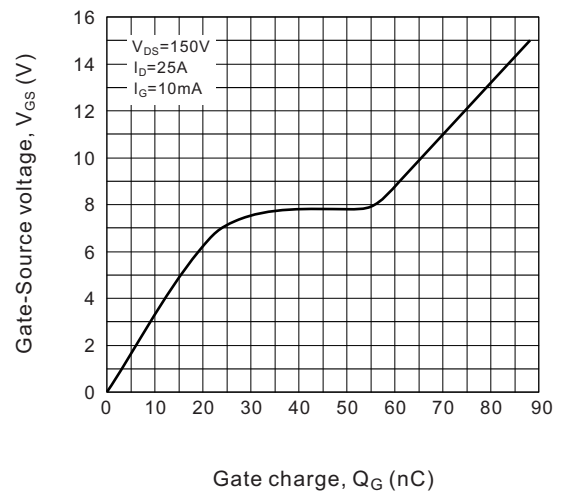


Fig.11 Capacitance characteristics

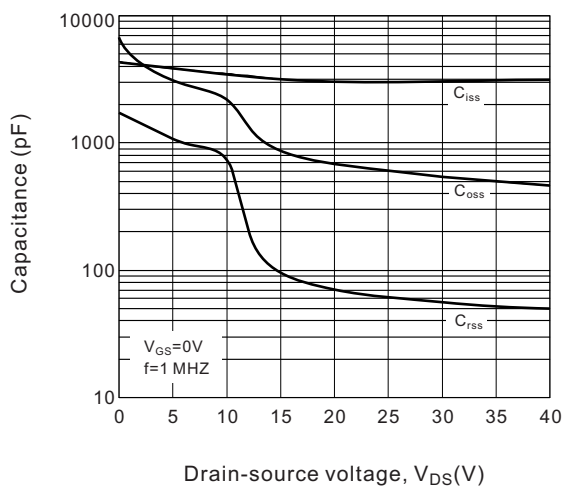


Fig.12 Forward-Bias safe operating area

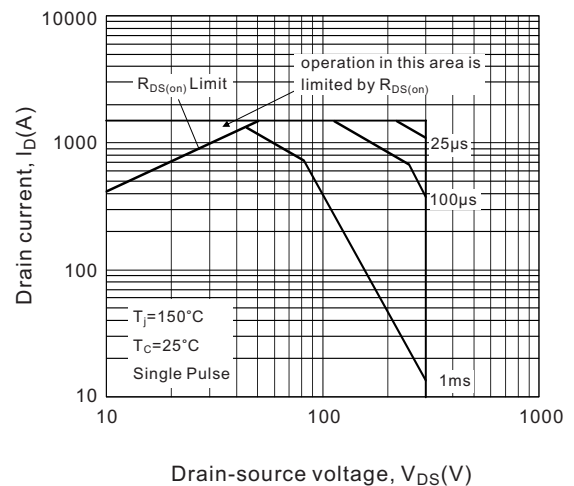
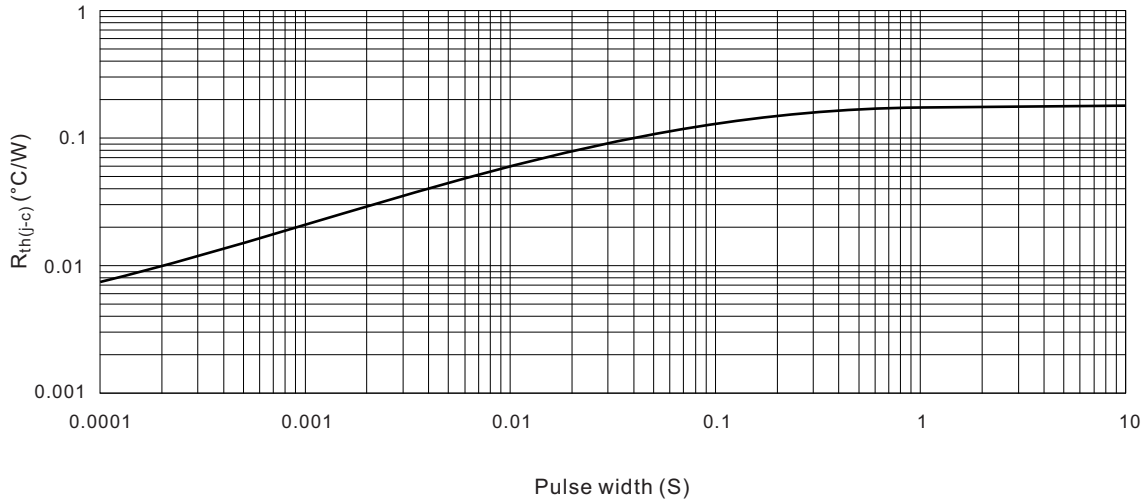


Fig.13 Maximum transient thermal Impedance



Case Style

