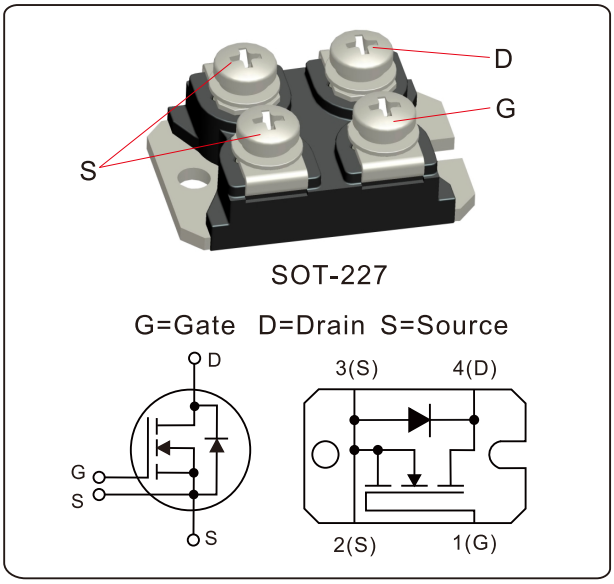
Super-Junction N-Channel Power MOSFET
60A / 600Volts

DESCRIPTION

The Nell NST60N60SJ is a SOT-227 silicon device with current conduction capability of 60A, fast switching speed, low on-state resistance, breakdown voltage rating of 600V, and max. threshold voltage of 5 volts.



FEATURES

- $R_{DS(ON)}$ = 50mΩ @ V_{GS} = 10V
- Ultra low gate charge(165nC Typ.)
- Low reverse transfer capacitance (C_{RSS} = 13nF typical)
- Fast switching capability
- Avalanche rated
- Fast intrinsic rectifier
- 150°C operation temperature
- Popular SOT-227 package

APPLICATIONS

- DC-DC converters
- Battery chargers
- Switching mode power supplies
- Resonant mode power supplies
- High speed power switching applications
- AC motor drives
- Temperature and light controls
- UPS
- DC choppers

PRODUCT SUMMARY	
I_D (A)	60
V_{DSS} (V)	600
$R_{DS(ON)}$ (mΩ)	50 @ V_{GS} = 10V
Q_G(nC) typ.	165

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C unless otherwise specified)

SYMBOL	PARAMETER	TEST CONDITIONS		VALUE	UNIT
V_{DSS}	Drain to Source voltage	T_J=25°C to 150°C		600	V
V_{DGR}	Drain to Gate voltage	R_{GS}=1MΩ		600	
V_{GS}	Gate to Source voltage			±30	
I_D	Continuous Drain Current	T_C=25°C		60	A
		T_C=100°C		36	
I_{DM}	Pulsed Drain current(Note 1)			240	
E_{AS}	Single pulse avalanche energy(Note 2)	I_{AS}=22A, L=5.15mH		1250	mJ
dv/dt	Peak diode recovery dv/dt(Note 3)			50	V /ns
P_D	Total power dissipation (derate above 25°C)	T_C=25°C		830 (6.70)	W(W /°C)
T_J	Operation junction temperature			-55 to 150	°C
T_{STG}	Storage temperature			-55 to 150	
V_{Ins}	Maximum RMS insulation voltage	50/60Hz,I_{Ins}≤1mA	t=60S	2500	V
			t=1S	3000	
	Mounting torque, M4	for base plate		1.1 (10)	lbf·in (N·m)
		for terminals		1.1 (10)	

Note: 1.Repetitive rating: pulse width limited by junction temperature.
2.I_{AS}=22A, L=5.15mH, V_{DD}=50V, R_{GS}=25Ω, starting T_J =25°C.
3.I_{SD} ≤ 240A, V_{DD} ≤ $V_{(BR)DSS}$, starting T_J = 25°C.

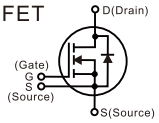
THERMAL RESISTANCE

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
$R_{th(j-c)}$	Thermal resistance, junction to case			0.15	°C/W
$R_{th(c-s)}$	Thermal resistance, case to heat sink		0.05		

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise specified)

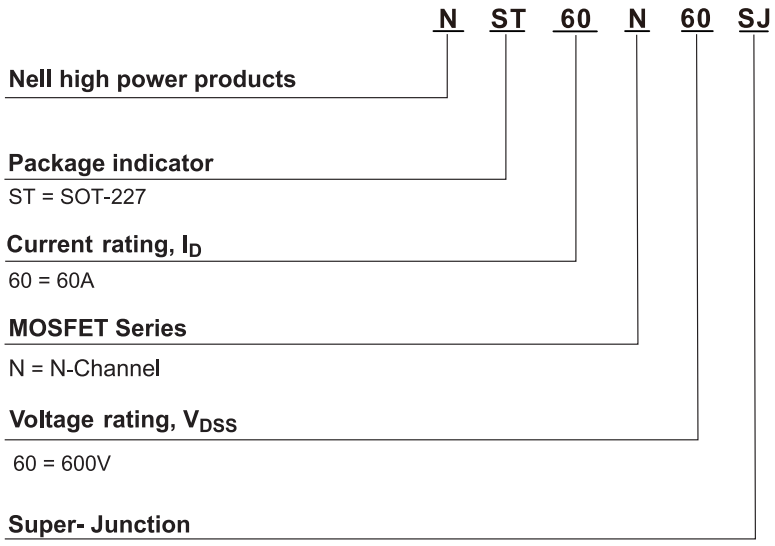
SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
◎ OFF CHARACTERISTICS							
$V_{(BR)DSS}$	Drain to source breakdown voltage	I_D = 250μA, V_{GS} = 0V		600	-	-	V
I_{DSS}	Drain to source leakage current	V_{DS}=600V, V_{GS}=0V	T_C = 25°C	-	-	10	μA
		V_{DS}=600V, V_{GS}=0V	T_C=125°C	-	-	2500	
I_{GSS}	Gate to source forward leakage current	V_{GS} = 30V, V_{DS} = 0V		-	-	100	nA
	Gate to source reverse leakage current	V_{GS} = -30V, V_{DS} = 0V		-	-	-100	
◎ ON CHARACTERISTICS							
$R_{DS(ON)}$	Static drain to source on-state resistance	V_{GS} = 10V, I_D = 36A		-	38	50	mΩ
$V_{GS(TH)}$	Gate threshold voltage	V_{GS}=V_{DS}, I_D=250μA		3	-	5	V
g_{fs}	Forward transconductance	V_{DS} = 30V, I_D = 36A (Note 1)		35	45	-	S
◎ DYNAMIC CHARACTERISTICS							
C_{ISS}	Input capacitance	V_{DS} = 100V, V_{GS} = 0V, f =1MHz		-	8	-	nF
C_{OSS}	Output capacitance			-	220	-	pF
C_{RSS}	Reverse transfer capacitance			-	13	-	
◎ SWITCHING CHARACTERISTICS							
$t_{d(ON)}$	Turn-on delay time	V_{DD} = 400V, V_{GS} = 10V I_D = 50A, R_{GS} = 25Ω (Note1,2)		-	100	-	ns
t_r	Rise time			-	80	-	
$t_{d(OFF)}$	Turn-off delay time			-	540	-	
t_f	Fall time			-	90	-	
Q_G	Total gate charge	V_{DD} = 520V, V_{GS} = 10V I_D = 50A, (Note1,2)		-	165	-	nC
Q_{GS}	Gate to source charge			-	50	-	
Q_{GD}	Gate to drain charge (Miller charge)			-	70	-	

SOURCE TO DRAIN DIODE RATINGS AND CHARACTERISTICS (T_C = 25°C unless otherwise specified)

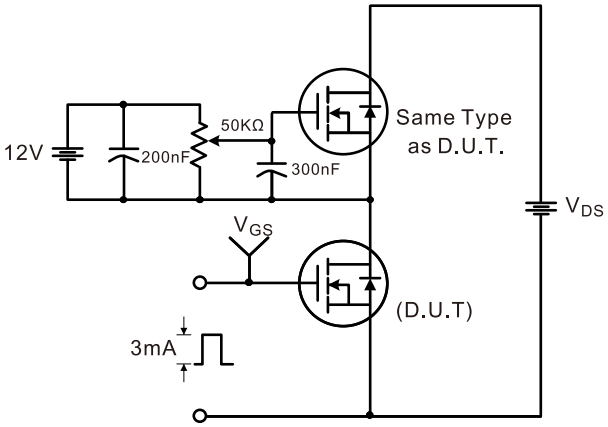
SYMBOL	PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{SD}	Diode forward voltage	I_{SD} = 60A, V_{GS} = 0V	-	-	1.1	V
Is (I_{SD})	Continuous source to drain current	Integral reverse P-N junction diode in the MOSFET 	-	-	60	A
I_{SM}	Pulsed source current		-	-	240	
t_{rr}	Reverse recovery time	I_F = 0.5A, I_R =1.0A, I_{RR} = 0.25A	-	750	-	ns
		I_{SD} = 36A, V_{GS} = 0V, V_R =400V dI_F/dt = 100A/μs	-	240	-	
Q_{rr}	Reverse recovery charge		-	1.44	-	μC
I_{rrm}	Peak reverse recovery current		-	12	-	A

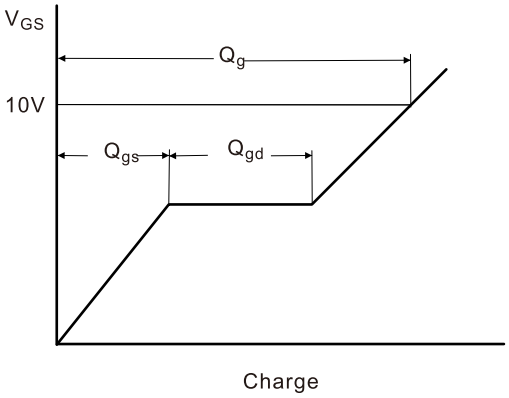
Note: 1. Pulse test: Pulse width ≤ 300μs, duty cycle ≤ 2%.
2. Essentially independent of operating temperature.

ORDERING INFORMATION SCHEME

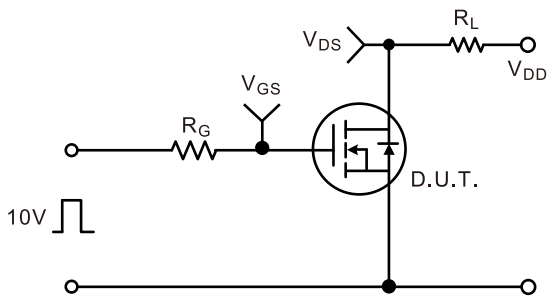


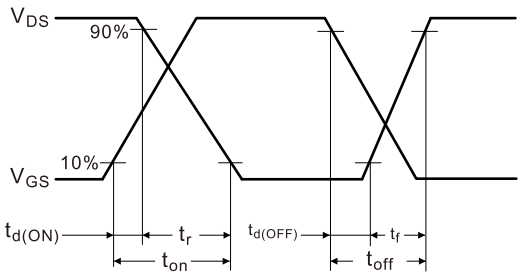
■ Gate charge test circuit & waveform



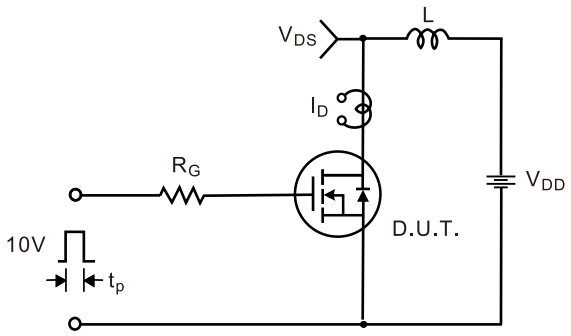


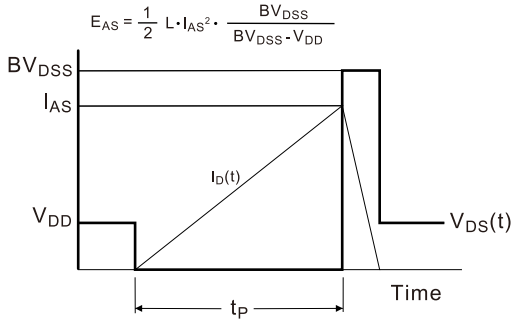
■ Resistive switching test circuit & Waveforms



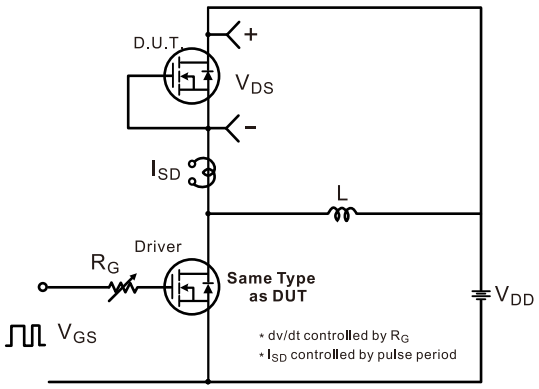


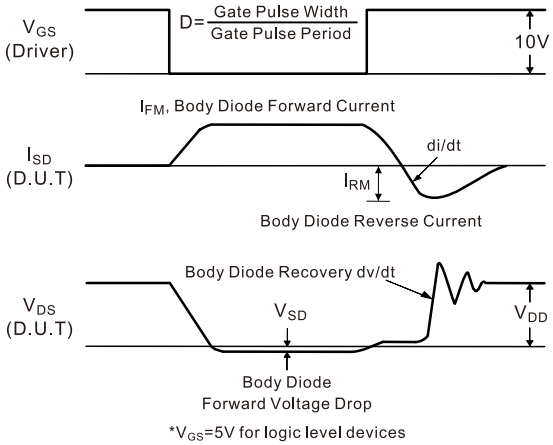
■ Unclamped Inductive switching test circuit & Waveforms





■ Peak diode recovery dv/dt test circuit & Waveforms





■ TYPICAL CHARACTERISTICS

Fig.1 Output characteristics

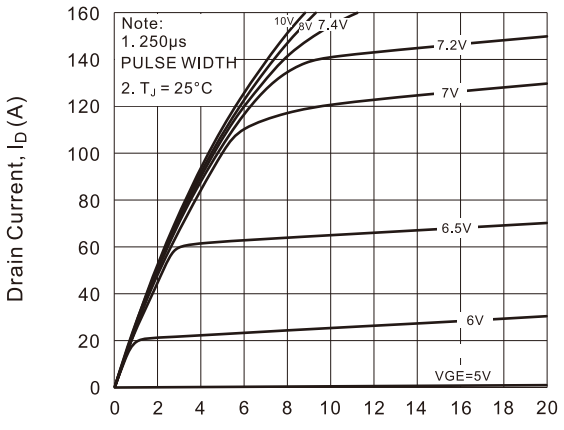


Fig.2 Transfer characteristics

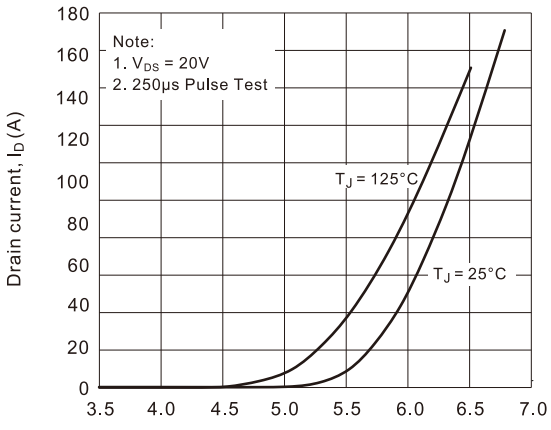


Fig.3 Output characteristics

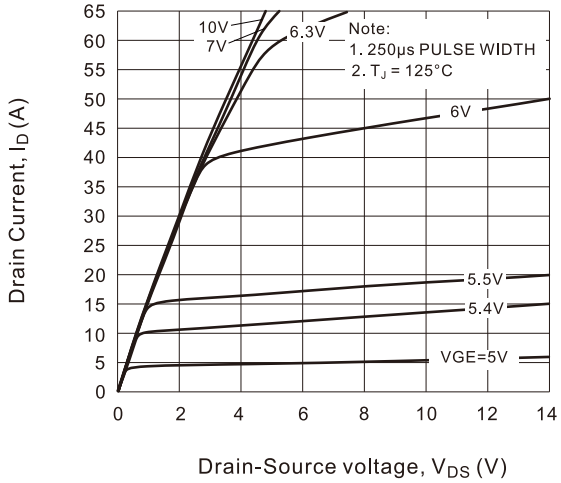


Fig.4 Forward voltage drop of intrinsic diode

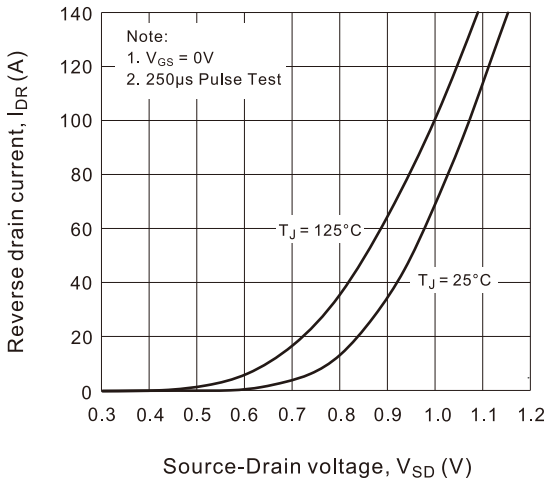


Fig.5 Capacitance characteristics

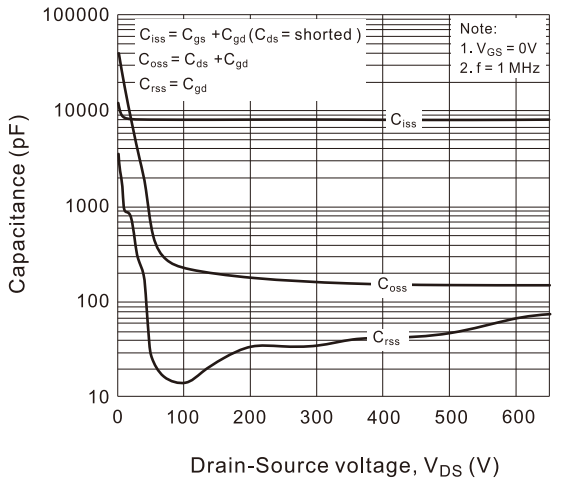


Fig.6 Gate charge characteristics

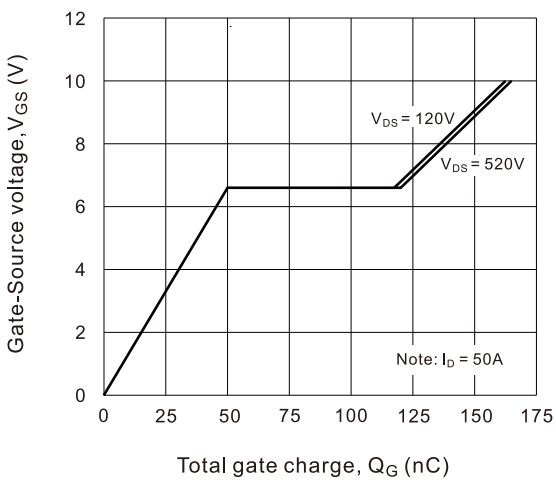


Fig.7 Breakdown voltage variation vs. Temperature

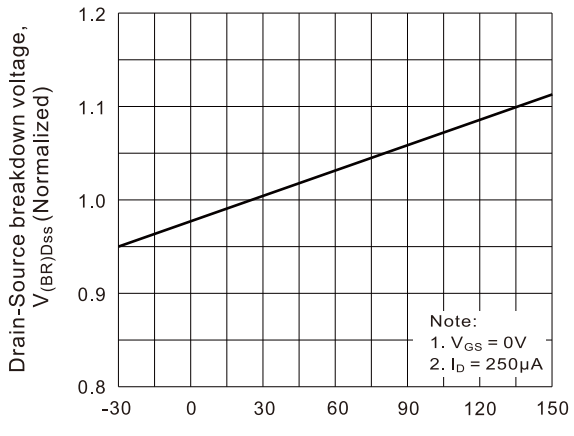


Fig.8 On-Resistance variation vs. Drain current

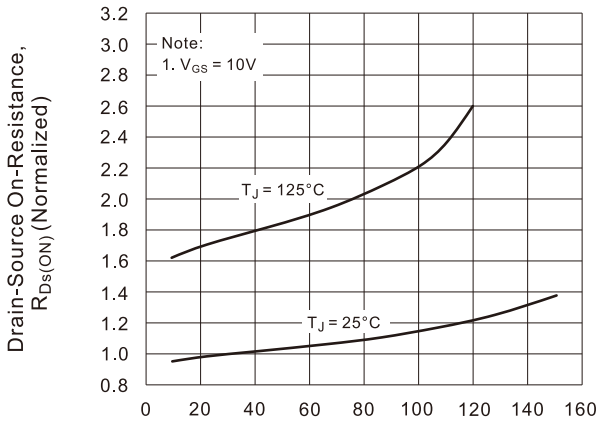


Fig.9 Maximum safe operating area

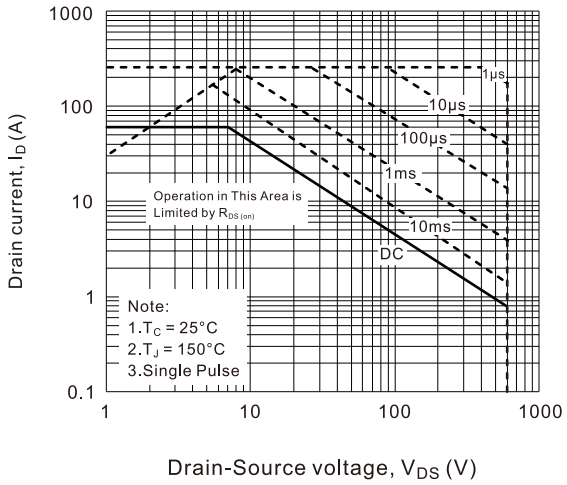


Fig.10 Maximum drain current vs. Case temperature

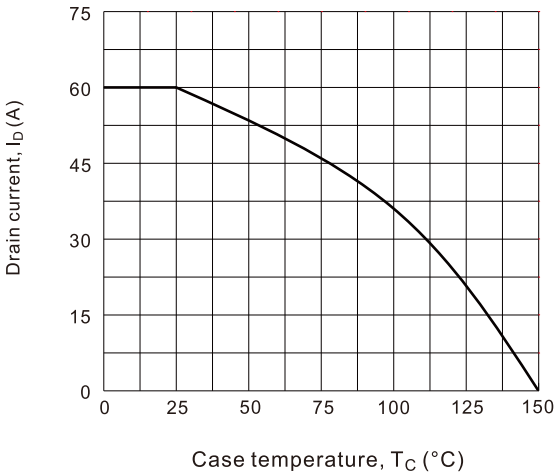


Fig.11 Maximum Transient thermal impedance

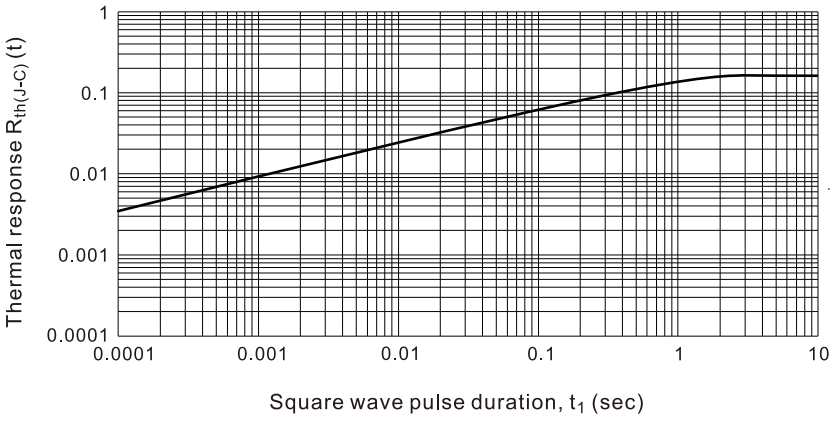
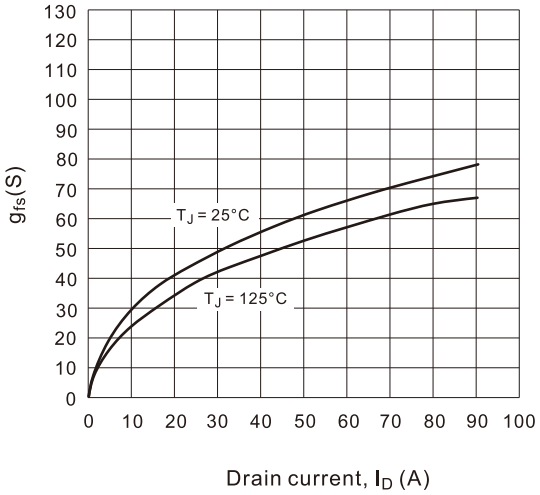
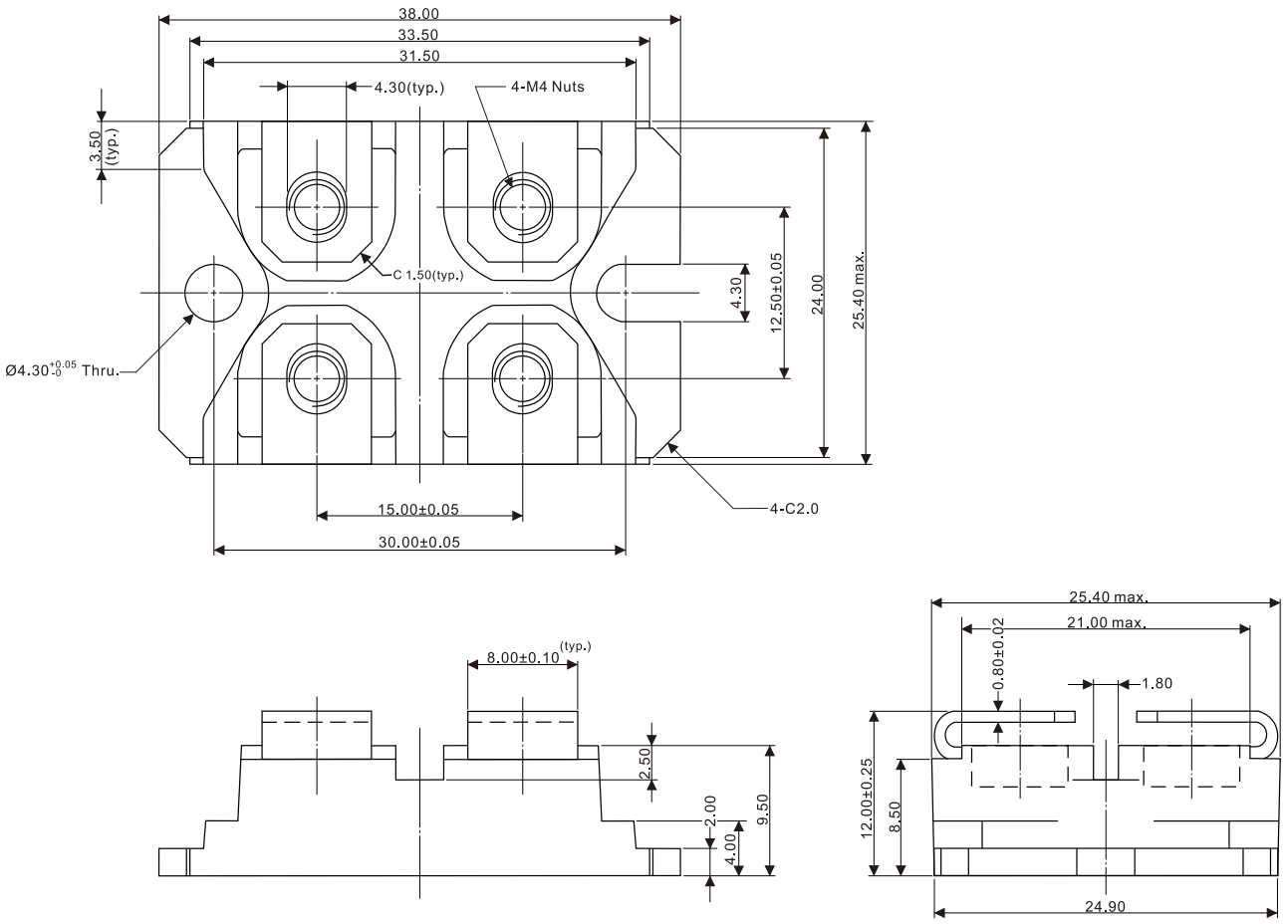


Fig.12 Transconductance



SOT-227 Module