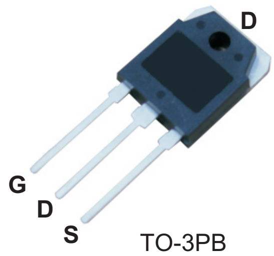
N-Channel Power MOSFET (20A, 500Volts)

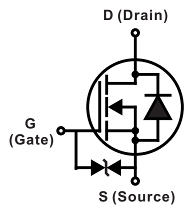
DESCRIPTION

The Nell **2SK2837** is a three-terminal silicon device with current conduction capability of 20A, fast switching speed, low on-state resistance, breakdown voltage rating of 500V, and max. threshold voltage of 4 volts.

They are designed for use in applications such as switched mode power supplies, DC to DC converters, motor control circuits, UPS and general purpose switching applications.



TO-3PB



FEATURES

- $R_{DS(ON)}$ = 0.21Ω @ V_{GS} = 10V
- Ultra low gate charge(80nC typical)
- Low reverse transfer capacitance (C_{RSS} = 340pF typical)
- Fast switching capability
- 100% avalanche energy specified
- Improved dv/dt capability
- 150°C operation temperature

PRODUCT SUMMARY	
I_D (A)	20
V_{DSS} (V)	500
$R_{DS(ON)}$ (Ω)	0.21 @ V_{GS} = 10V
Q_G(nC) max.	80

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	500	V
V_{DGR}	Drain to Gate voltage	R_{GS}=20KΩ	500	
V_{GS}	Gate to Source voltage		±30	
I_D	Continuous Drain Current (V_{GS} = 10V)	T_C=25°C	20	A
		T_C=100°C	12.4	
I_{DM}	Pulsed Drain current(Note 1)		80	
I_{AR}	Avalanche current(Note 1)		20	
E_{AR}	Repetitive avalanche energy(Note 1)	I_{AR}=20A, R_{GS}=50Ω, V_{GS}=10V	15	mJ
E_{AS}	Single pulse avalanche energy(Note 2)	I_{AS}=20A, L=4.08mH	960	mJ
dv/dt	Peak diode recovery dv/dt(Note 3)		3.5	V /ns
P_D	Total power dissipation	T_C=25°C, TO-3PB	150	W
	Derating factor above 25°C	TO-3PB	1.2	W /°C
T_J	Operation junction temperature		-55 to 150	°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}=20A, L=4.08mH, V_{DD} = 90V, R_G=25Ω, starting T_J =25°C.
3.I_{SD} ≤ 20A, di/dt ≤ 130A/μs, V_{DD} ≤ $V_{(BR)DSS}$, starting T_J =25°C.

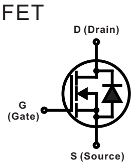
THERMAL RESISTANCE

SYMBOL	PARAMETER	Min.	Typ.	Max.	UNIT
$R_{th(j-c)}$	Thermal resistance, junction to case			0.83	°C/W
$R_{th(c-s)}$	Thermal resistance, case to heatsink		0.30		°C/W
$R_{th(j-a)}$	Thermal resistance, junction to ambient			50	°C/W

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

SYMBOL	PARAMETER	TEST CONDITIONS	Min.	Typ.	Max.	UNIT
◎ **STATIC**						
$V_{(BR)DSS}$	Drain to source breakdown voltage	I_D = 10mA, V_{GS} = 0V	500			V
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown voltage temperature coefficient	I_D = 10mA, V_{DS} = V_{GS}		0.63		V/ºC
I_{DSS}	Drain to source leakage current	V_{DS}=500V, V_{GS}=0V, T_C = 25°C			50.0	μA
		V_{DS}=400V, V_{GS}=0V, T_C=125°C			500	
I_{GSS}	Gate to source forward leakage current	V_{GS} = 30V, V_{DS} = 0V			10	μA
	Gate to source reverse leakage current	V_{GS} = -30V, V_{DS} = 0V			-10	
$R_{DS(ON)}$	Static drain to source on-state resistance	I_D = 10.0A, V_{GS} = 10V		0.21	0.27	Ω
$V_{GS(TH)}$	Gate threshold voltage	V_{GS}=V_{DS}=10V, I_D=1mA	2.0		4.0	V
g_{fS}	Forward transconductance	V_{DS}=10V, I_D=10A	10.0	17.0		S
◎ **DYNAMIC**						
C_{ISS}	Input capacitance	V_{DS} = 10V, V_{GS} = 0V, f =1MHz		3720		pF
C_{OSS}	Output capacitance			1165		
C_{RSS}	Reverse transfer capacitance			340		
$t_{d(ON)}$	Turn-on delay time	V_{DD} = 200V, V_{GS} = 10V I_D = 10A, R_G=50Ω, R_D = 20Ω, (Note 1,2)		30		ns
t_r	Rise time			70		
$t_{d(OFF)}$	Turn-off delay time			50		
t_f	Fall time			290		
Q_G	Total gate charge	V_{DD} = 400V, V_{GS} = 10V, I_D =6A (Note 1,2)		80		nC
Q_{GS}	Gate to source charge			48		
Q_{GD}	Gate to drain charge (Miller charge)			32		
L_D	Internal drain inductance	Between lead, 6mm(0.25") from package and center of die contact		5		nH
L_S	Internal source inductance			13		

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} = 20A, V_{GS} = 0V			1.7	V
$I_S(I_{SD})$	Continuous source to drain current	Integral reverse P-N junction diode in the MOSFET			20	A
I_{SM}	Pulsed source current				80	
t_{rr}	Reverse recovery time	I_{SD} = 20A, V_{GS} = 0V, dI_F/dt = 100A/μs		540		ns
Q_{rr}	Reverse recovery charge			5.4		μC

Note: 1. Pulse test: Pulse width ≤ 10μs, duty cycle ≤ 1%.

2. Essentially independent of operating temperature.

ORDERING INFORMATION SCHEME

2SK 2837

MOSFET series (2SK)

N-Channel, Toshiba series

Current & Voltage rating, I_D & V_{DS} (2837)

20A / 500V

Fig.1 Typical output characteristics, T_C=25°C

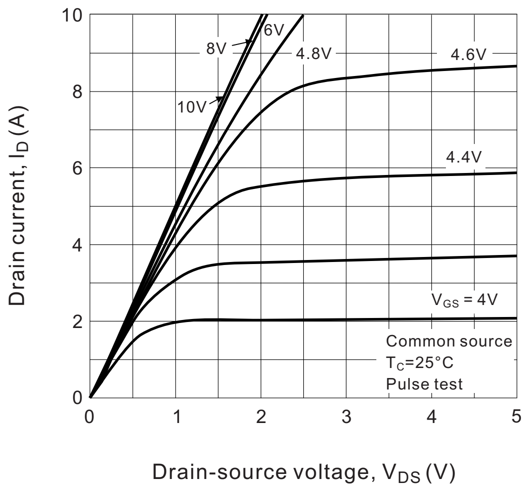


Fig.2 Typical output characteristics, T_C=25°C

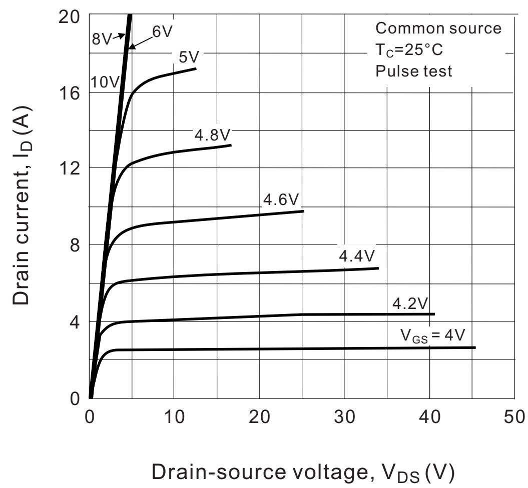


Fig.3 Typical transfer characteristics

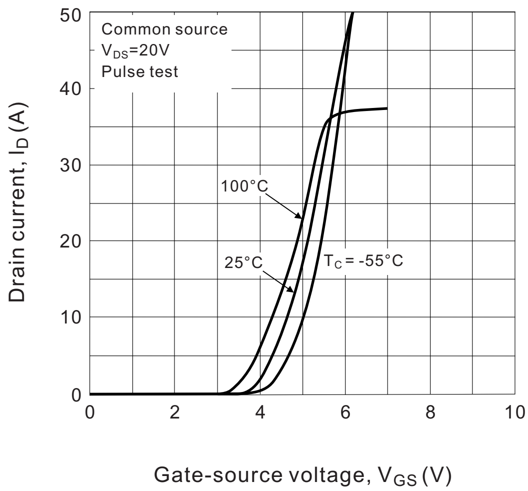


Fig.4 Drain-source voltage vs. gate-source voltage and drain voltage

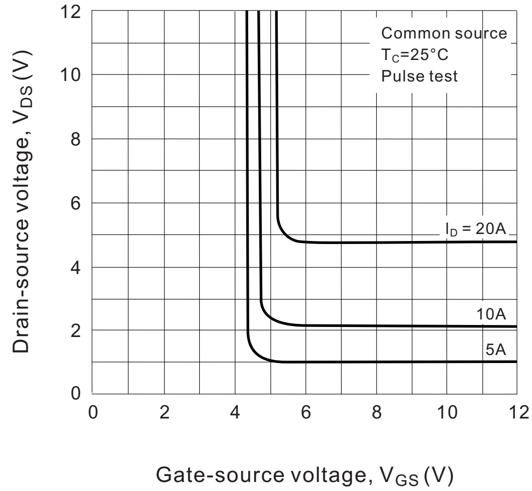


Fig.5 Forward transconductance characteristics

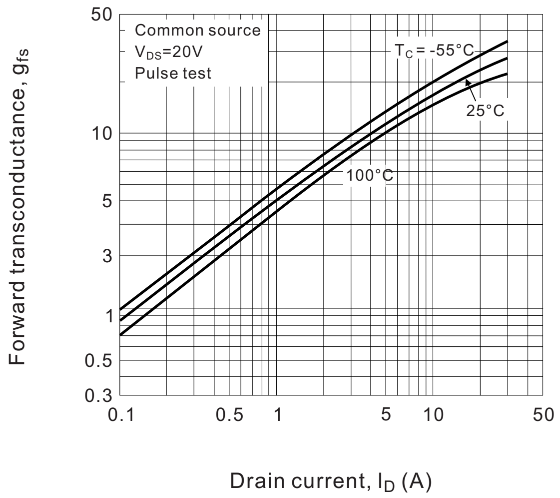


Fig.6 On-Resistance variation vs. Drain current and gate voltage

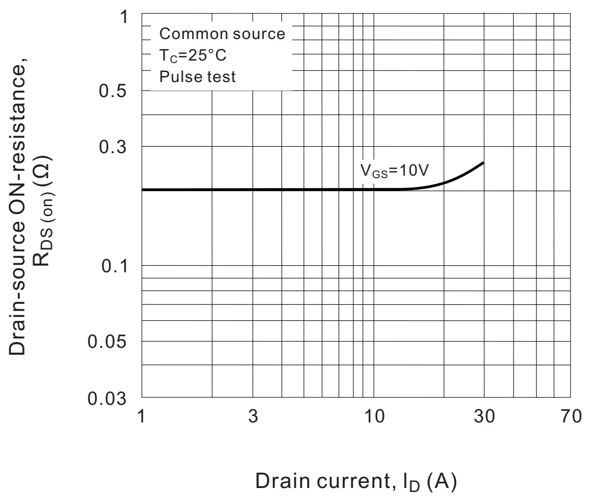


Fig.7 On-Resistance variation vs. case temperature

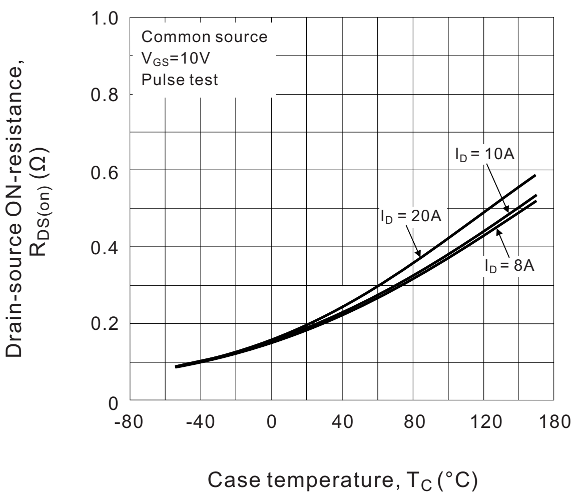


Fig.8 Drain reverse current vs. Drain-Source voltage

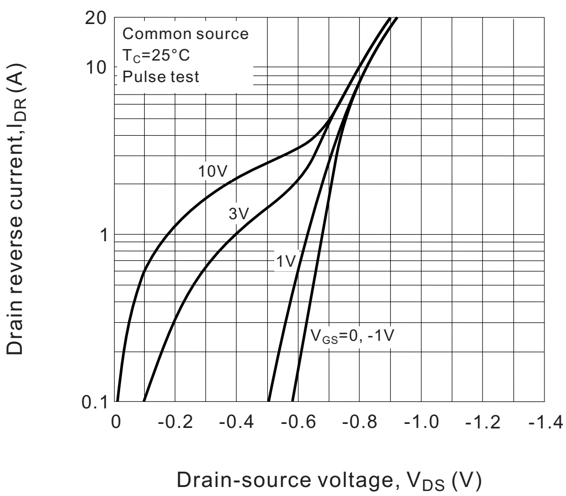


Fig.9 Capacitance characteristics

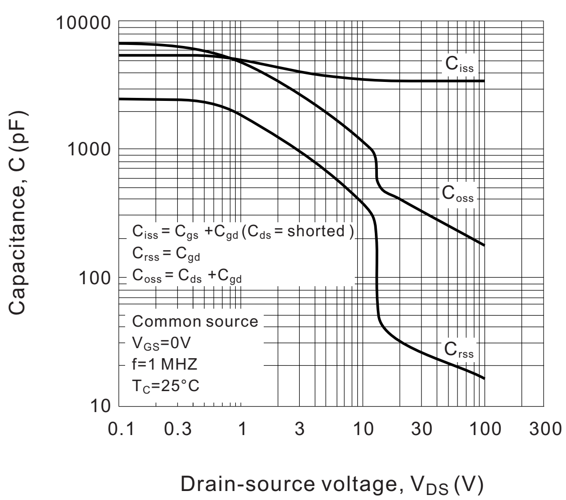


Fig.10 Gate threshold voltage vs. case temperature

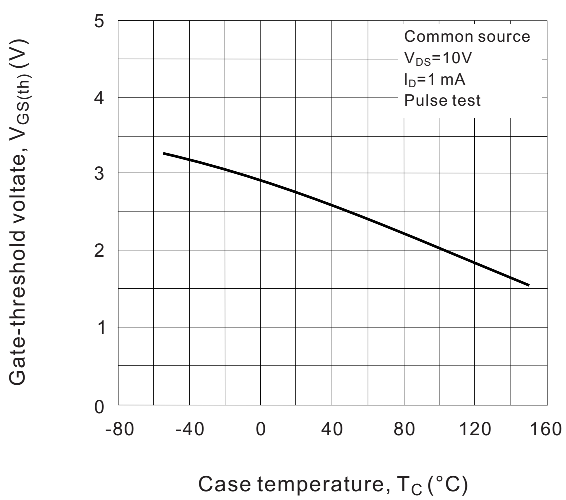


Fig.11 Drain power dissipation vs. case temperature

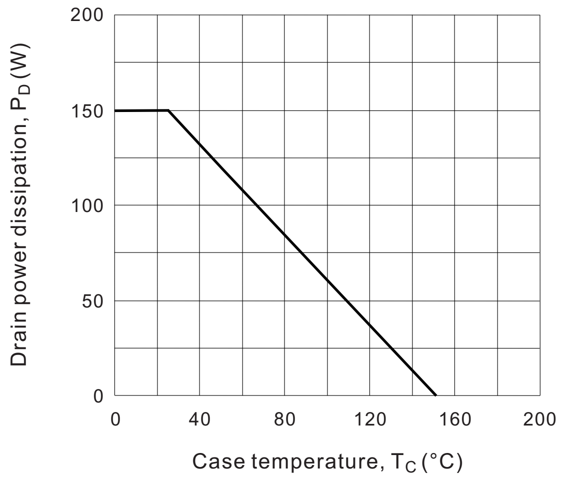


Fig.12 Dynamic input/output characteristics

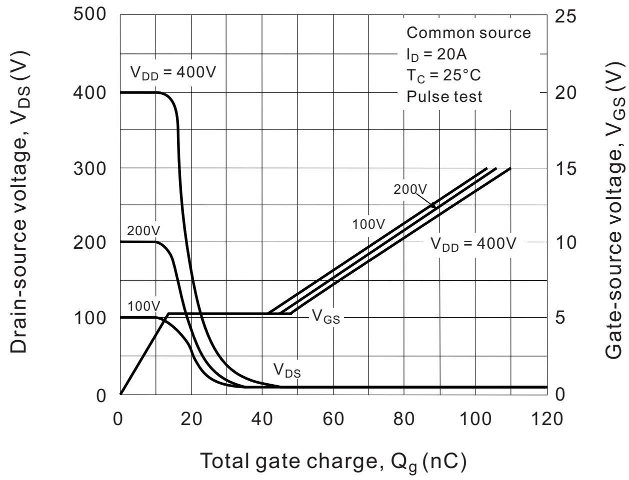


Fig.13 Transient thermal response curve

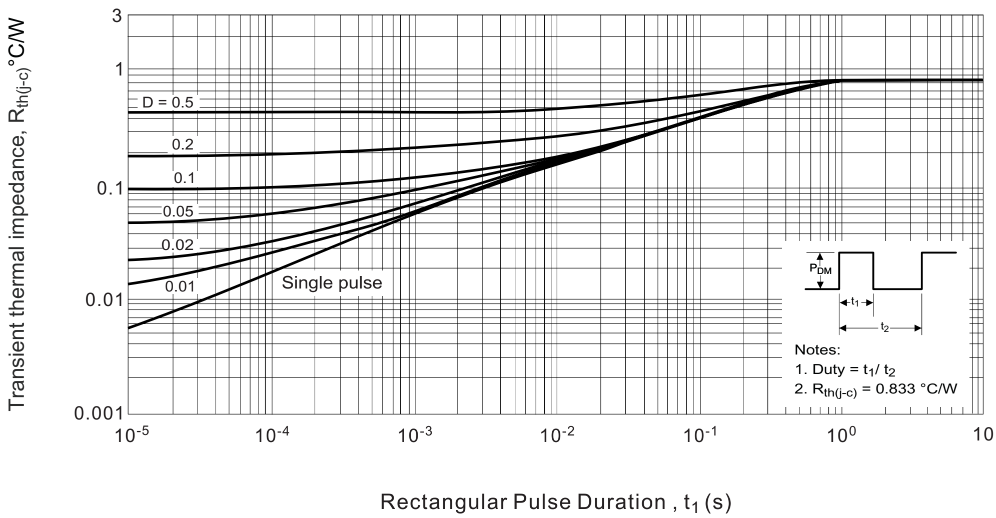


Fig.14 Maximum safe operating area

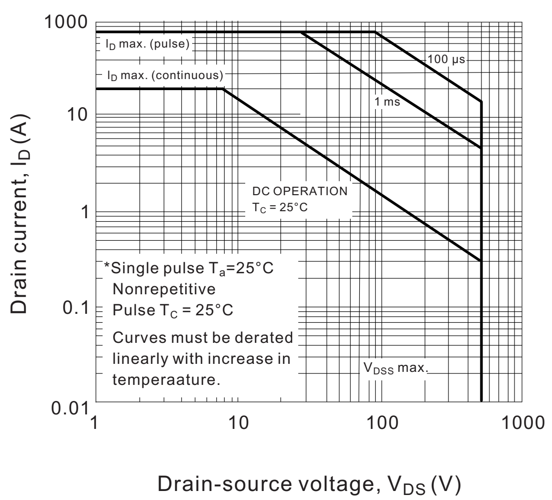


Fig.15 Single pulse avalanche energy vs. Junction temperature

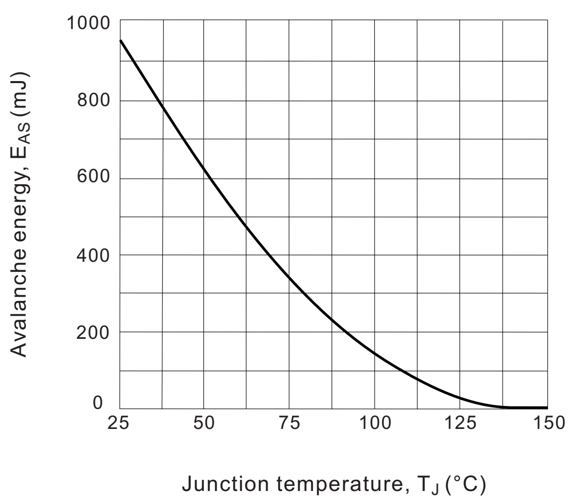
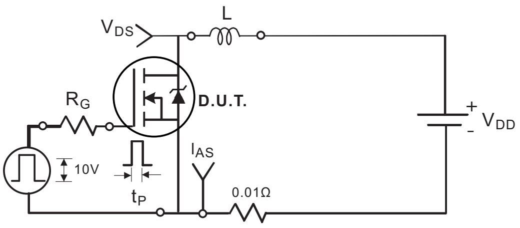
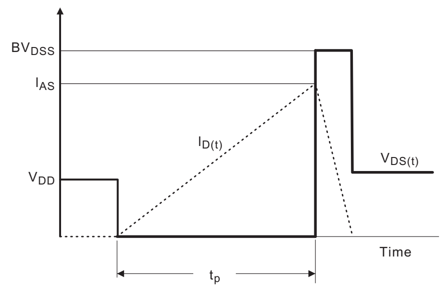


Fig.16 Unclamped inductive test circuit and waveforms



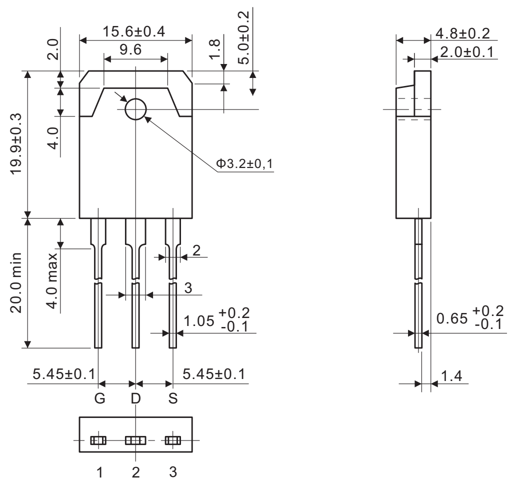


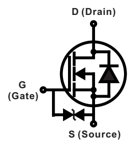
$R_G = 25\Omega$

$V_{DD} = 90V$, $L = 4.08mH$

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \frac{B_{VDSS}}{B_{VDSS} - V_{DD}}$$

TO-3PB





All dimensions in millimeters(inches)