

FEATURES

- $R_{DS(ON)} < 0.38\Omega @ V_{GS} = 10V$
- 100% avalanche tested
- RoHS compliant

Product Summary			
V_{DS}	$R_{DS(on)}$ (Ω) Typ	I_D (A)	Q_g (Typ)
650V	0.34@10V	13	34nc

MECHANICAL DATA

- Case: TO-247 package

TO-247
SJ13N65P



Ordering Information

Part No.	Package Type	Package	Quantity(box)
SJ13N65P	TO-220	Tube	360

Pin Definition:

1. Gate
2. Drain
3. Source

Block Diagram

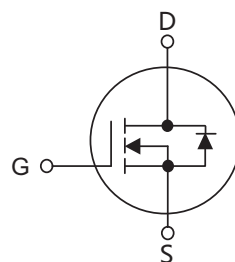


Table1 Absolute Maximum Ratings ($T_C = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current	I_D	$T_C = 25^\circ\text{C}$	A
		$T_C = 100^\circ\text{C}$	
Pulsed Drain Current (Note 1)	I_{DM}	46	A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	280	mJ
Avalanche Current (Note 1)	I_{AR}	2.3	A
Repetitive Avalanche Energy (Note 1)	E_{AR}	1.2	mJ
Peak Diode Recovery dv/dt (Note 3)	dv/dt	15	V/ns
Drain Source voltage slope ($V_{DS} = 480V$)	dV_{DS}/dt	50	V/ns
Power Dissipation $T_C = 25^\circ\text{C}$	P_D	152	W
Operating Junction and Storage Temperature	T_J/T_{STG}	$-55 \sim +150$	$^\circ\text{C}$
Maximum Temperature for soldering	T_L	300	$^\circ\text{C}$

Table 2. Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62	$^{\circ}\text{C/W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.82	$^{\circ}\text{C/W}$

 Table 3. Electrical Characteristics ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V,I _D =250μA	650	--	--	V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =650V,V _{GS} =0V	--	--	1	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =30V,V _{DS} =0V	--	--	100	nA
	Reverse		V _{GS} =-30V,V _{DS} =0V	--	--	-100	nA
On Characteristics(Note 4)							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} ,I _D =250μA	2.5	--	4.5	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V,I _D =6.5A	--	0.34	0.38	Ω
Dynamic Characteristics(Note 5)							
Input Capacitance		C _{ISS}	V _{DS} =25V,V _{GS} =0V,f=1MHz	--	780	--	pF
Output Capacitance		C _{OSS}		--	23	--	pF
Reverse Transfer Capacitance		C _{RSS}		--	1.9	--	pF
Switching Characteristics (Note 5)							
Turn-On Delay Time		t _{d(on)}	V _{DD} =400V,I _D =6.5A, R _G =20Ω	--	17	--	ns
Turn-On Rise Time		t _r		--	12	--	ns
Turn-Off Delay Time		t _{d(off)}		--	130	--	ns
Turn-Off Fall Time		t _f		--	10	--	ns
Total Gate Charge		Q _G	V _{DS} =400V,I _D =6.5A, V _{GS} =10V	--	34	--	nC
Gate-Source Charge		Q _{GS}		--	4.5	--	nC
Gate-Drain Charge		Q _{GD}		--	19	--	nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _S =6. 5A	--	--	1.5	V
Maximum Continuous Drain-Source Diode Forward Current		I _S		--	--	10	A
Reverse Recovery Time		t _{rr}	V _{GS} =0V, I _F =6. 5A dI _F /dt=100A/μs (Note 1)	--	300	--	ns
Reverse Recovery Charge		Q _{RR}		--	3500	--	nC

Notes : 1 Repetitive Rating:Pulse width limited by maximum junction temperature

 2 $L=60\text{mH}, I_{AS}=3A, V_{DD}=150V$, Starting $T_J=25^{\circ}\text{C}$

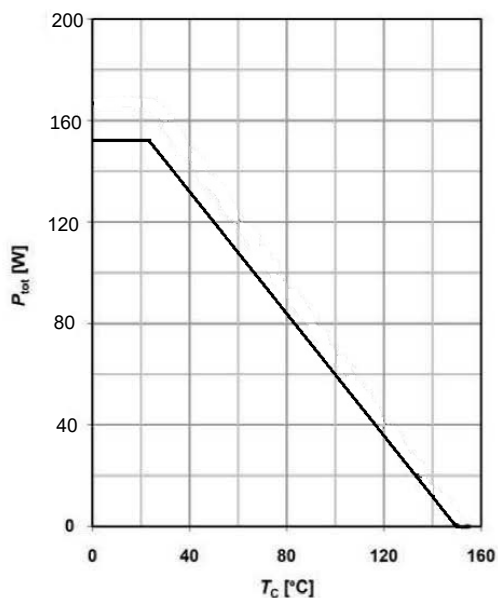
 3 $I_{SD}\leq 4.5A, di/dt\leq 200A/\mu s, V_{DD}\leq BV_{DSS}$, Starting $T_J=25^{\circ}\text{C}$

 4 Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

5 Guaranteed by design, not subject to production

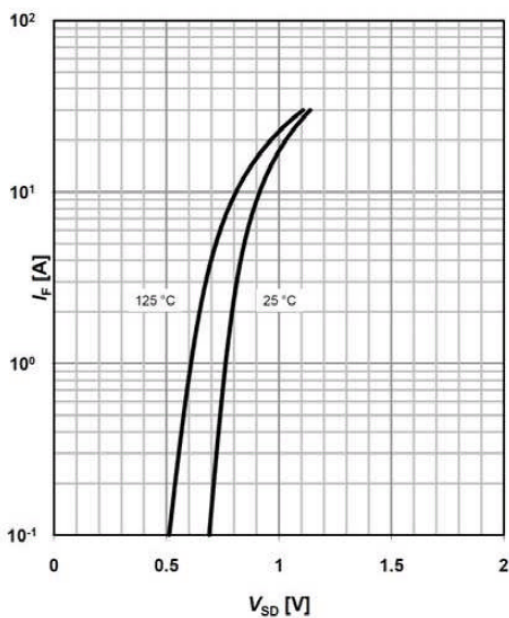
Typical characteristics Diagrams

Power dissipation



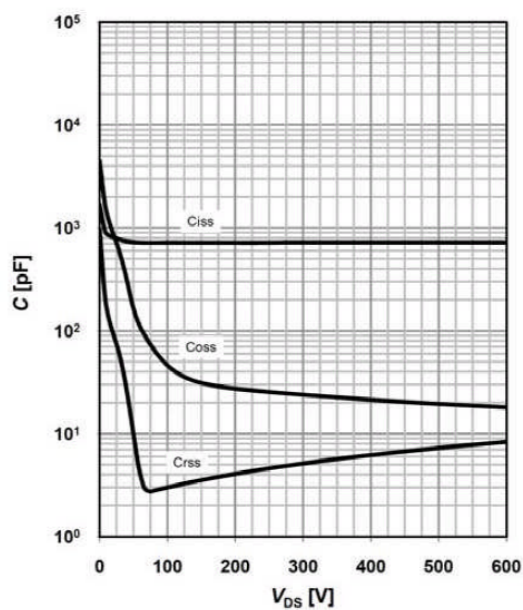
$$P_{tot} = f(T_c)$$

Forward characteristics of reverse diode



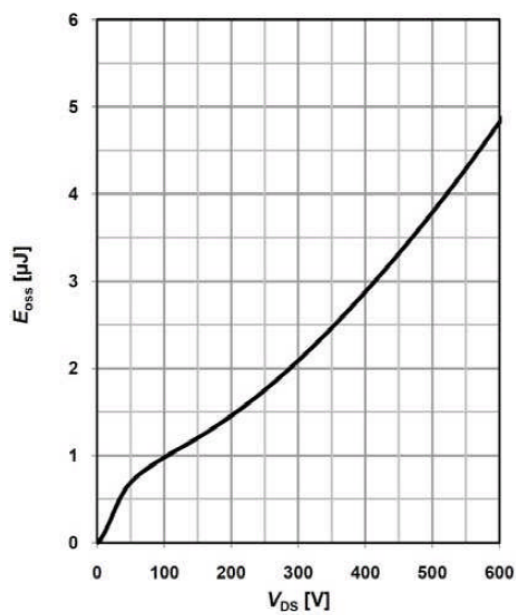
$$I_F = f(V_{SD}); \text{ parameter: } T_j$$

Typ. capacitances



$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$

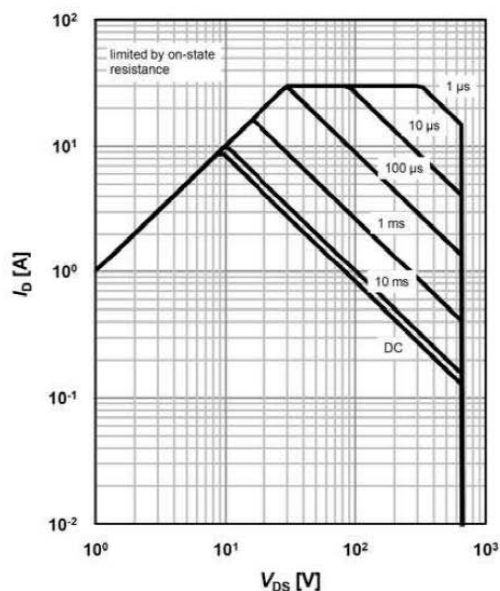
Typ. C_{oss} stored energy



$$E_{oss} = f(V_{DS})$$

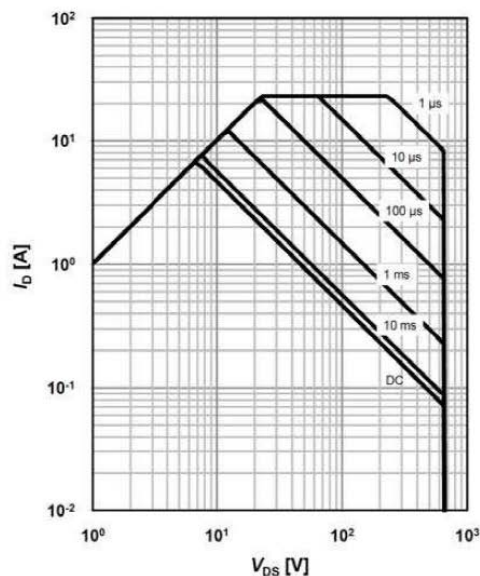
Typical characteristics Diagrams

Safe operating area $T_C=25\text{ }^{\circ}\text{C}$



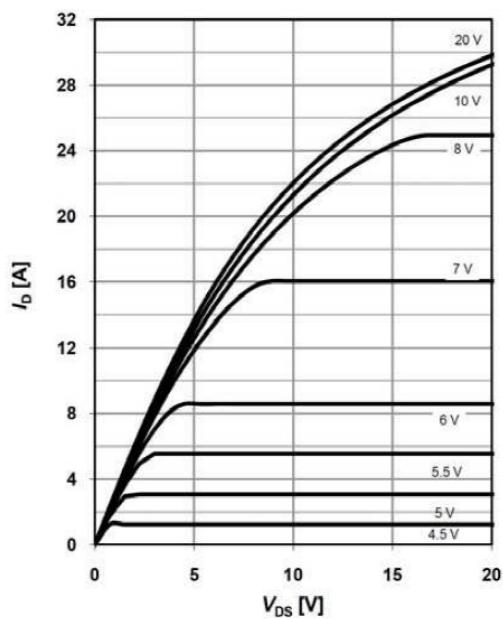
$I_D=f(V_{DS})$; $T_C=25\text{ }^{\circ}\text{C}$; $V_{GS} > 7\text{ V}$; $D=0$; parameter t_p

Safe operating area $T_C=80\text{ }^{\circ}\text{C}$



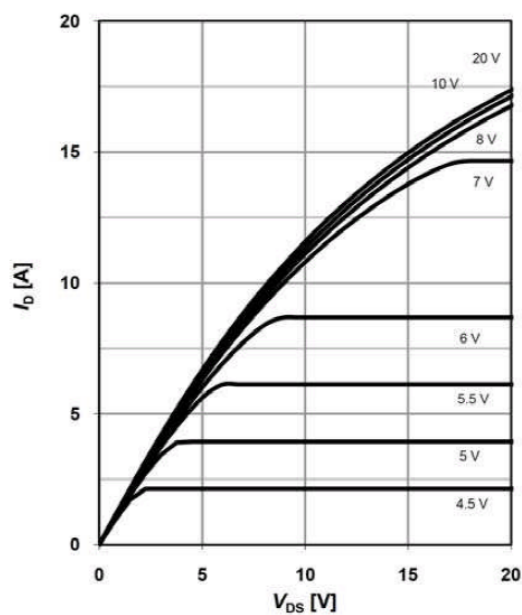
$I_D=f(V_{DS})$; $T_C=80\text{ }^{\circ}\text{C}$; $V_{GS} > 7\text{ V}$; $D=0$; parameter t_p

Typ. output characteristics $T_C=25\text{ }^{\circ}\text{C}$



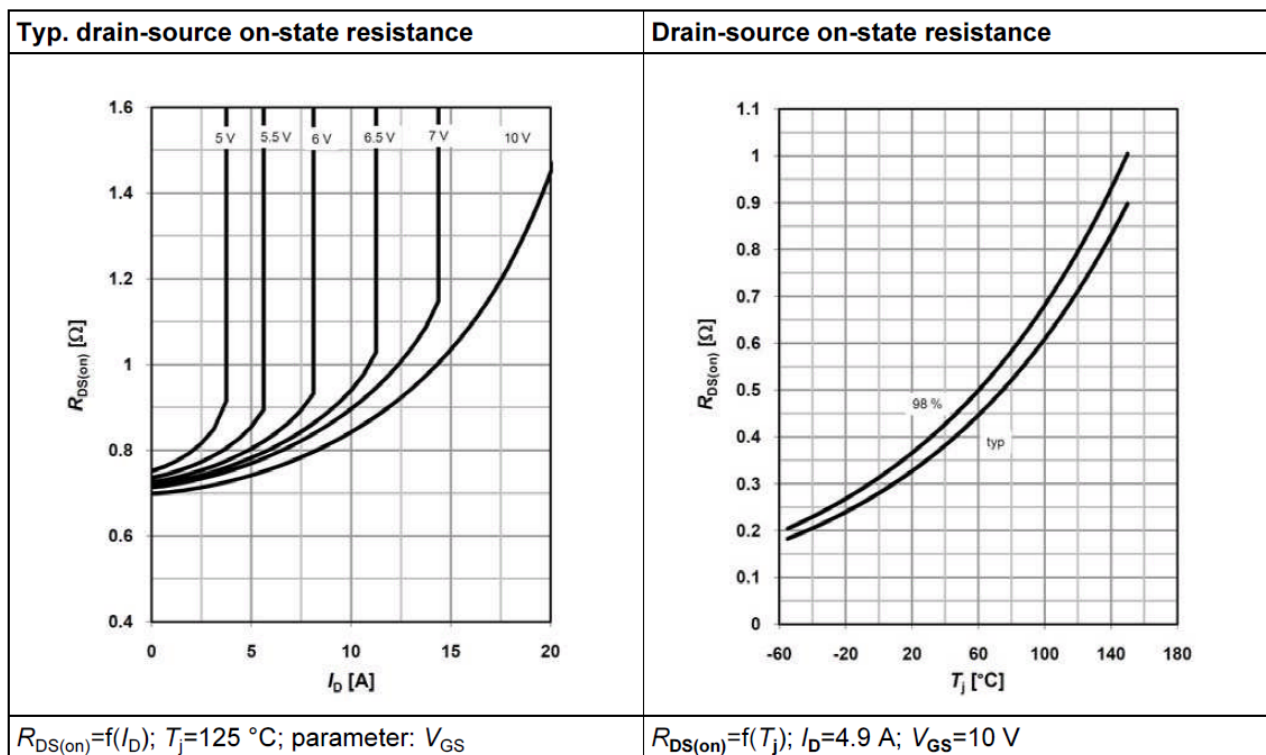
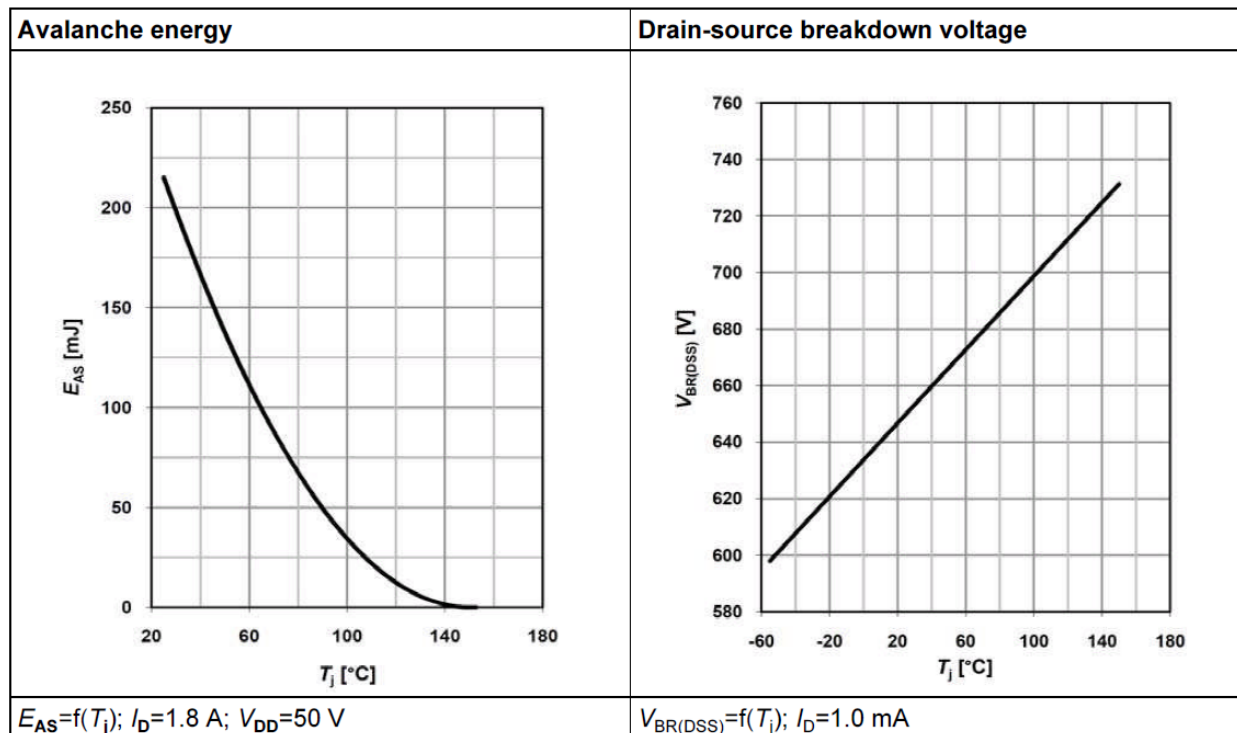
$I_D=f(V_{DS})$; $T_j=25\text{ }^{\circ}\text{C}$; parameter: V_{GS}

Typ. output characteristics $T_j=125\text{ }^{\circ}\text{C}$



$I_D=f(V_{DS})$; $T_j=125\text{ }^{\circ}\text{C}$; parameter: V_{GS}

Typical characteristics Diagrams



Typical characteristics Diagrams

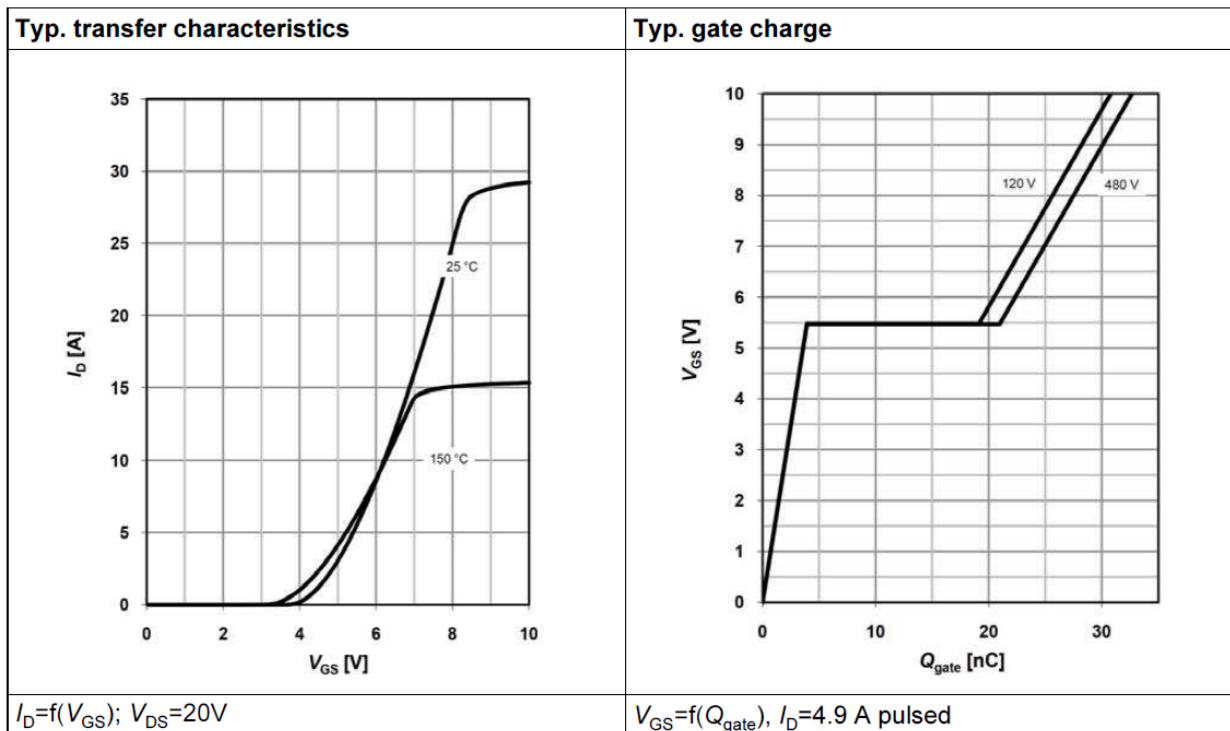


Table 20 Switching times test circuit and waveform for inductive load

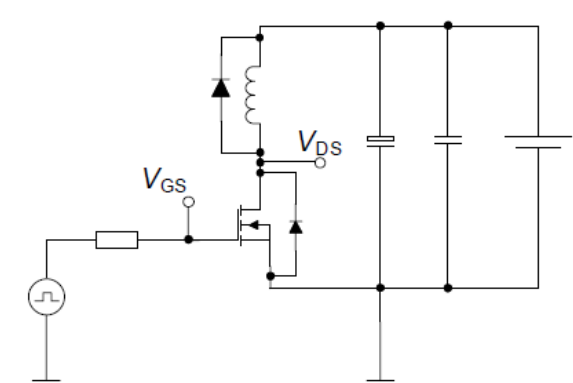
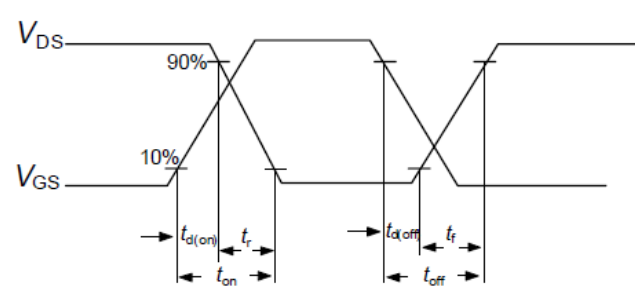
Switching times test circuit for inductive load	Switching time waveform
	

Table 21 Unclamped inductive load test circuit and waveform

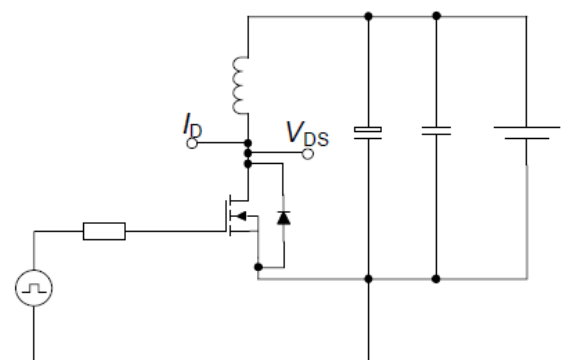
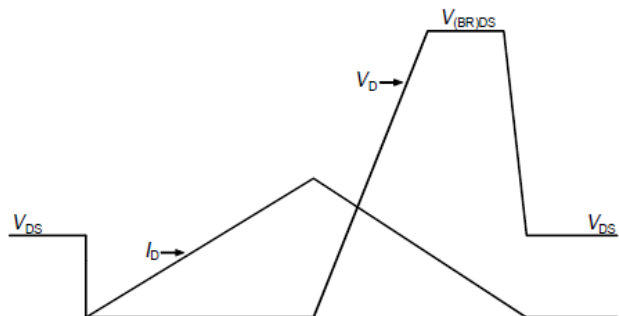
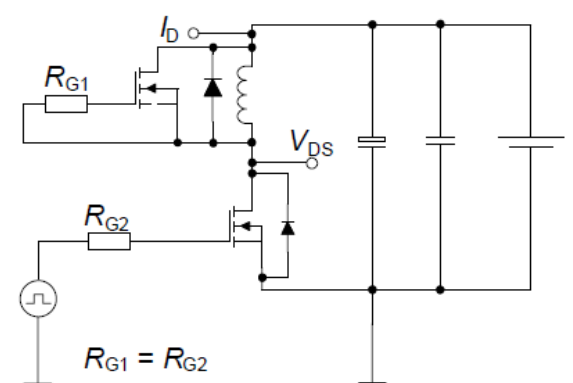
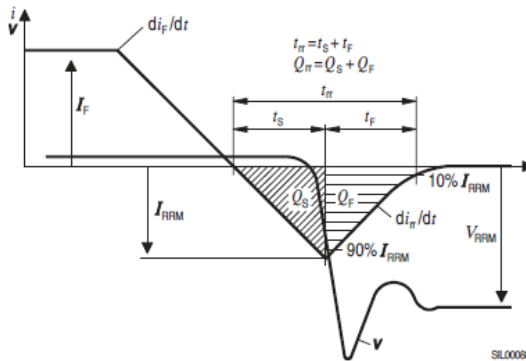
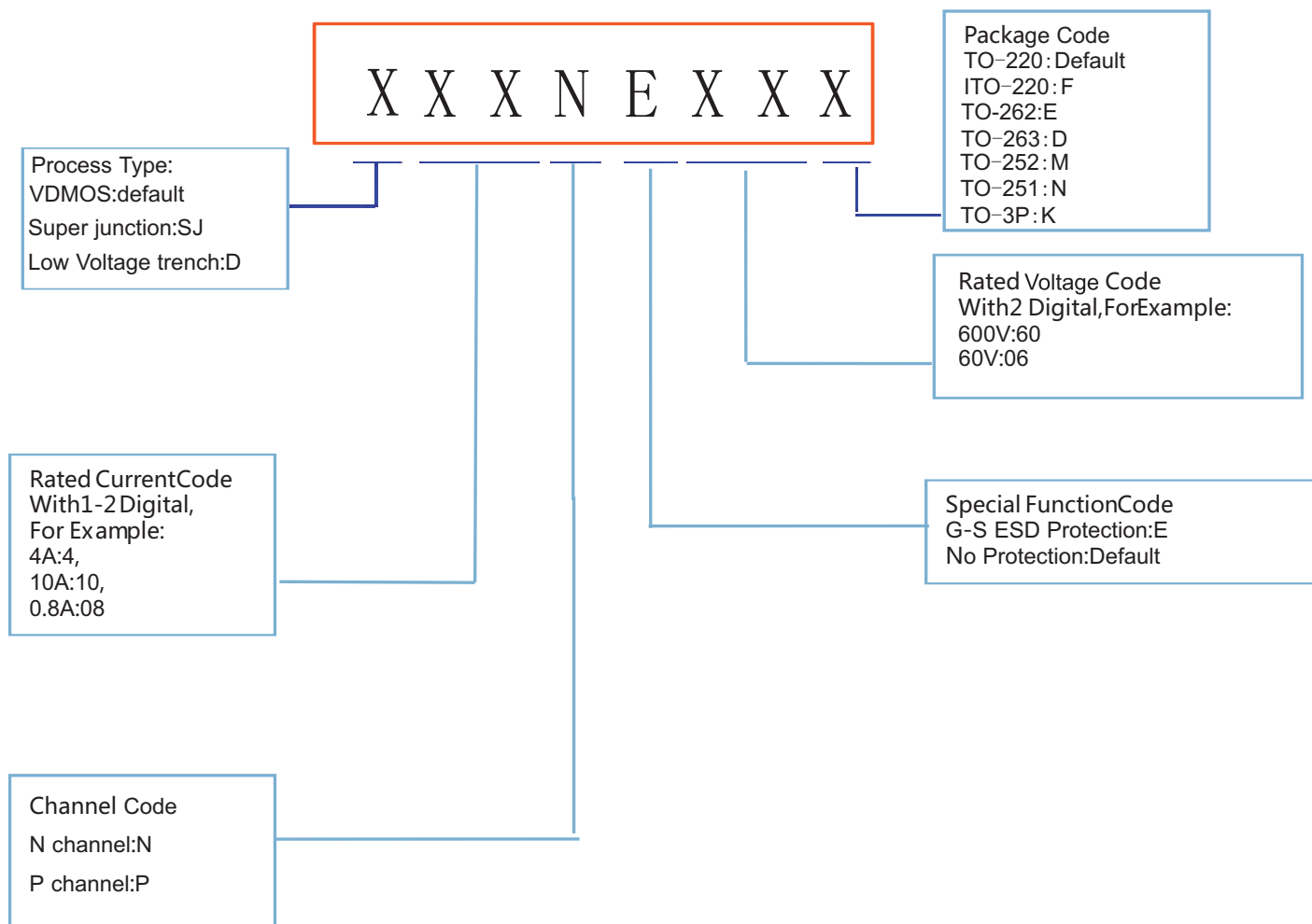
Unclamped inductive load test circuit	Unclamped inductive waveform
	

Table 22 Test circuit and waveform for diode characteristics

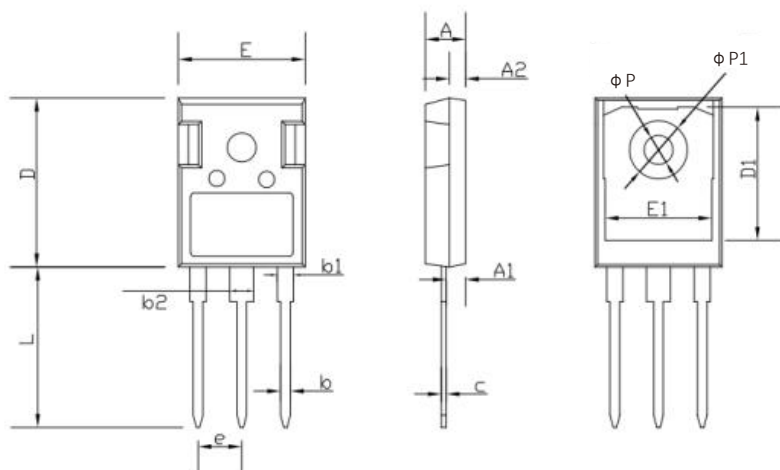
Test circuit for diode characteristics	Diode recovery waveform
 $R_{G1} = R_{G2}$	 SL00088

Product Names Rules



Dimensions

TO-247 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	4.90	5.10	0.193	0.201
A1	2.31	2.51	0.091	0.099
A2	1.90	2.10	0.075	0.083
b	1.16	1.26	0.046	0.050
b1	1.96	2.06	0.0772	0.0812
b2	2.96	3.06	0.117	0.121
c	0.59	0.66	0.0232	0.0260
D	20.90	21.10	0.8235	0.8313
D1	16.25	16.85	0.6403	0.6639
E	15.70	15.90	0.6186	0.6265
E1	13.10	13.50	0.5161	0.5319
e	5.44		0.2143	
L	19.80	20.10	0.7801	0.7919
ΦP	3.50	3.70	0.1379	0.1458
ΦP1	0	7.30	0	0.2876

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