

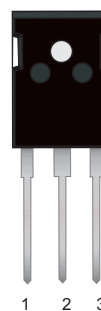
FEATURES

- New revolutionary high voltage technology
- Ultra Low gate charge
- Periodic avalanche rated
- Extreme dv/dt rated
- $R_{DS(ON)} < 75m\Omega @ V_{GS}=10V$
- RoHS compliant

PRODUCT SUMMARY

$V_{DS}(V)$	$R_{DS(on)}(m\Omega)_{Typ}$	$I_D(A)$
600	65@ $V_{GS}=10V$	47

TO-247



MECHANICAL DATA

- TO-247 package

Ordering Information

Part No.	Package Type	Package	Quality(box)
SJ47N60PR	TO-247	Tube	360

Pin Definition:

1. Gate
2. Drain
3. Source

Block Diagram

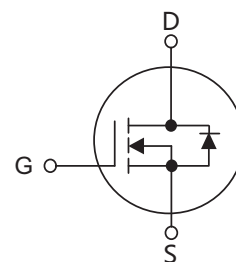


Table1 Absolute Maximum Ratings ($T_C=25^\circ C$, unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current	I_D	$T_C=25^\circ C$	47
		$T_C=100^\circ C$	29
Pulsed Drain Current (Note 1)	I_{DM}	140	A
Single Pulse Avalanche Energy(Note 2)	E_{AS}	1160	mJ
Avalanche Current(Note 1)	I_{AR}	10	A
Repetitive Avalanche Energy(Note 1)	E_{AR}	1.72	mJ
Peak Diode Recovery dv/dt(Note 3)	dv/dt	15	V/ns
Drain Source voltage slope($V_{ds}=480V$)	d V_{ds}/dt	50	V/ns
Power Dissipation $T_C=25^\circ C$	P_D	391	W
Operating Junction and Storage Temperature	T_J/T_{STG}	-55 ~ +150	$^\circ C$
Maximum Temperature for soldering	T_L	300	$^\circ C$

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Table 2. Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62	$^{\circ}C/W$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.32	$^{\circ}C/W$

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	600	--	--	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$	--	--	6	μA
Gate- Source Leakage Current	Forward	$V_{GS}=30V, V_{DS}=0V$	--	--	100	nA
	Reverse	$V_{GS}=-30V, V_{DS}=0V$	--	--	-100	nA
On Characteristics(Note 4)						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	--	4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=23A$	--	65	75	m Ω
Dynamic Characteristics(Note 5)						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	--	3100	--	pF
Output Capacitance	C_{OSS}		--	148	--	pF
Reverse Transfer Capacitance	C_{RSS}		--	5	--	pF
Switching Characteristics (Note 5)						
Turn-On Delay Time	$t_d(on)$	$V_{DD}=480V, I_D=23A,$ $R_G=20\Omega$	--	19	--	ns
Turn-On Rise Time	t_R		--	10	--	ns
Turn-Off Delay Time	$t_d(off)$		--	87	--	ns
Turn-Off Fall Time	t_f		--	5	--	ns
Total Gate Charge	Q_G	$V_{DS}=480V, I_D=23A,$ $V_{GS}=10V$	--	190	--	nC
Gate-Source Charge	Q_{GS}		--	30	--	nC
Gate-Drain Charge	Q_{GD}		--	95	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=23A$	--	0.9	1.5	V
Maximum Continuous Drain-Source Diode Forward Current	I_S		--	--	47	A
Reverse Recovery Time	t_{rr}	$V_{GS}=0V, I_S=23A$	--	210	--	ns
Reverse Recovery Charge	Q_{RR}	$di/dt=100A/\mu s$ (Note 1)	--	19	--	μC

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

2 Pulse width t_p limited by $T_{j,max}$

3 Identical low side and high side switch with identical R_G ; $V_{peak} < V(BR)_{DSS}$; $T_j < T_{j,max}$

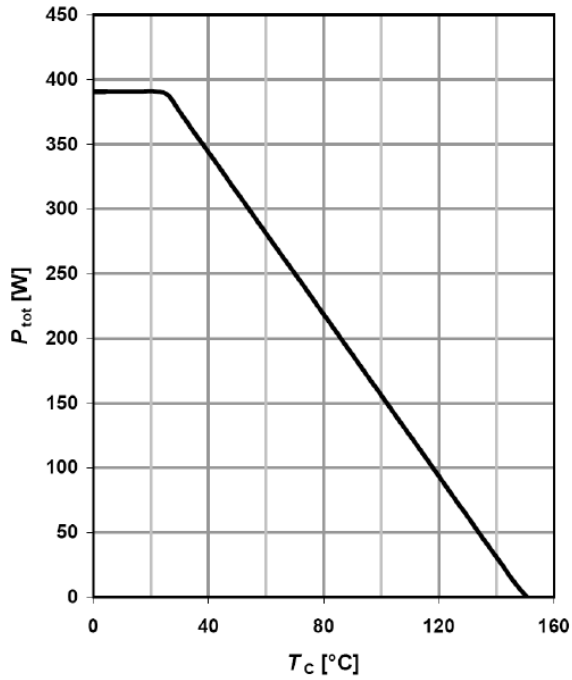
4 Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

5 Guaranteed by design, not subject to production

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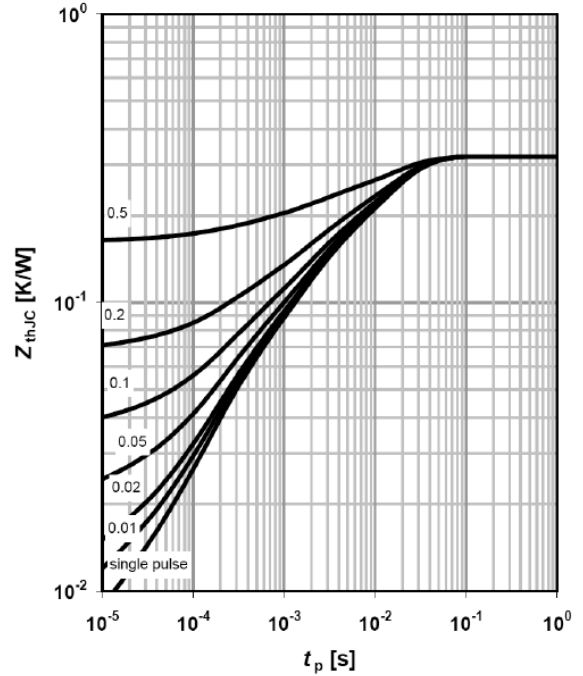
Typical characteristics Diagrams

Power dissipation



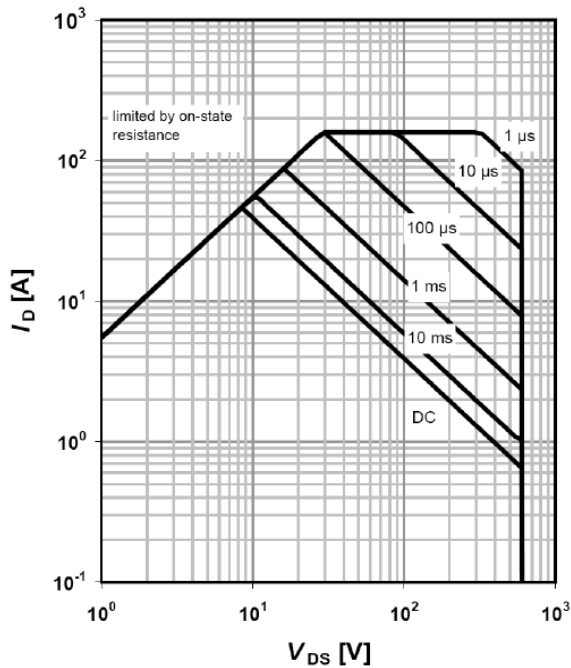
$$P_{tot} = f(T_c)$$

Max. transient thermal impedance



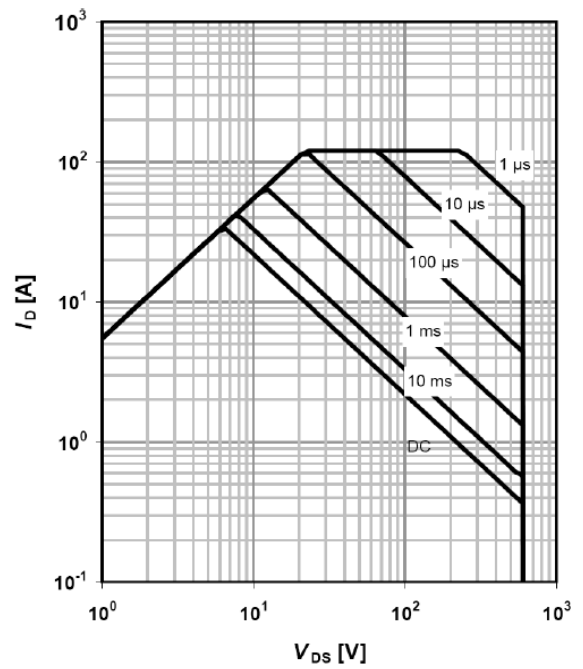
$$Z_{th(jc)} = f(t_p); \text{ parameter: } D = t_p / T$$

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



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

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

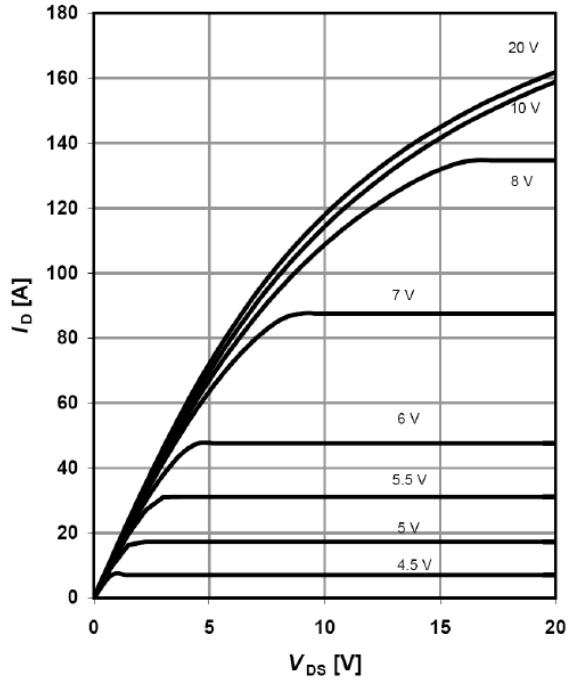


$$I_D = f(V_{DS}); T_c = 80^\circ\text{C}; V_{GS} > 7\text{V}; D = 0; \text{ parameter } t_p$$

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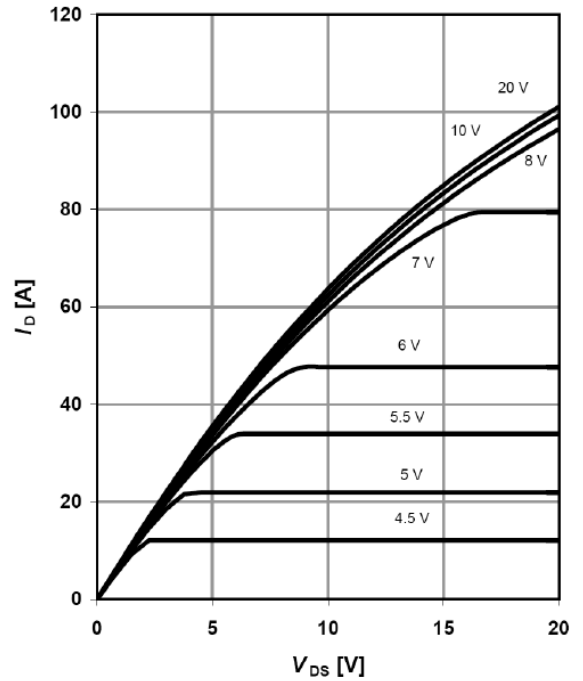
Typical characteristics Diagrams

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



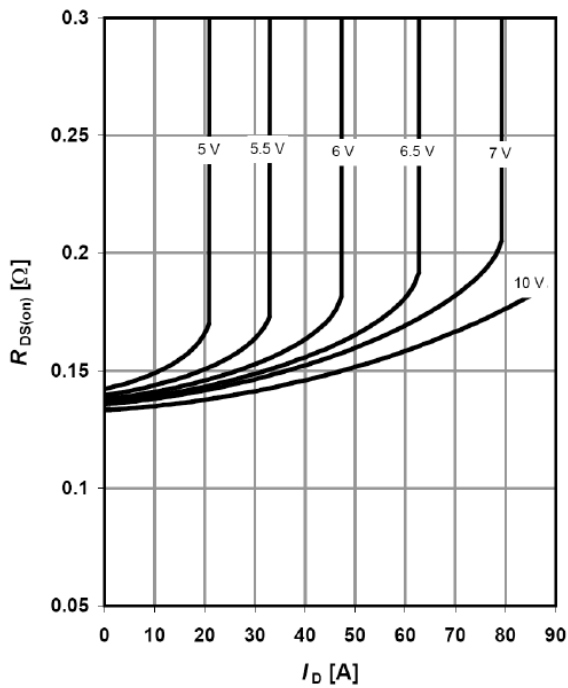
$I_D=f(V_{DS}); T_j=25\text{ }^\circ\text{C};$ parameter: V_{GS}

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



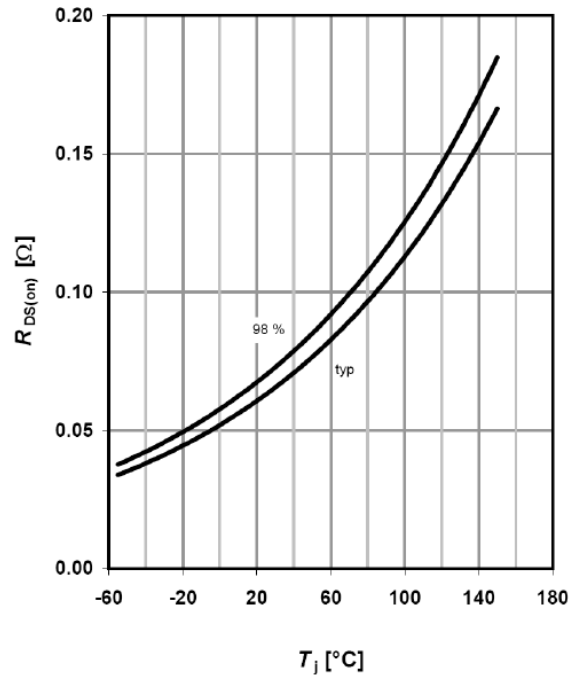
$I_D=f(V_{DS}); T_j=125\text{ }^\circ\text{C};$ parameter: V_{GS}

Typ. drain-source on-state resistance



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

Drain-source on-state resistance

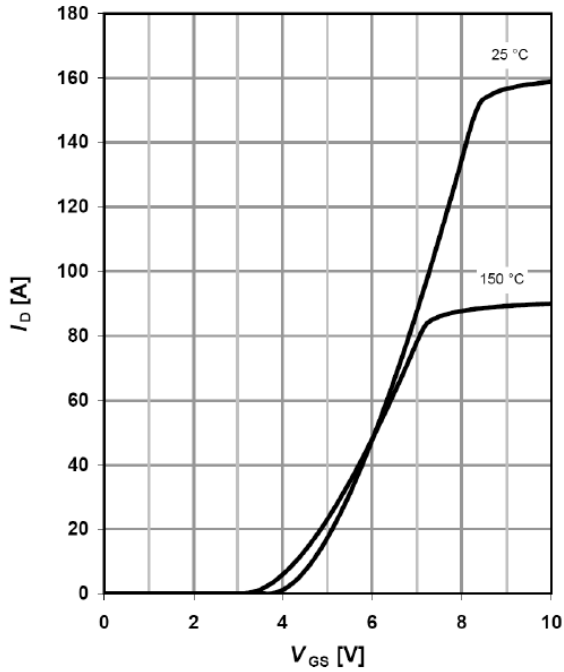


$R_{DS(on)}=f(T_j); I_D=17.6\text{ A}; V_{GS}=10\text{ V}$

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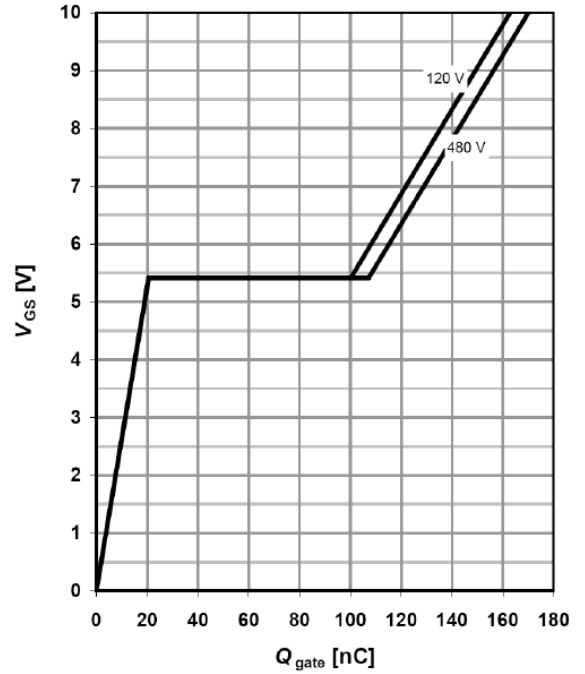
Typical characteristics Diagrams

Typ. transfer characteristics



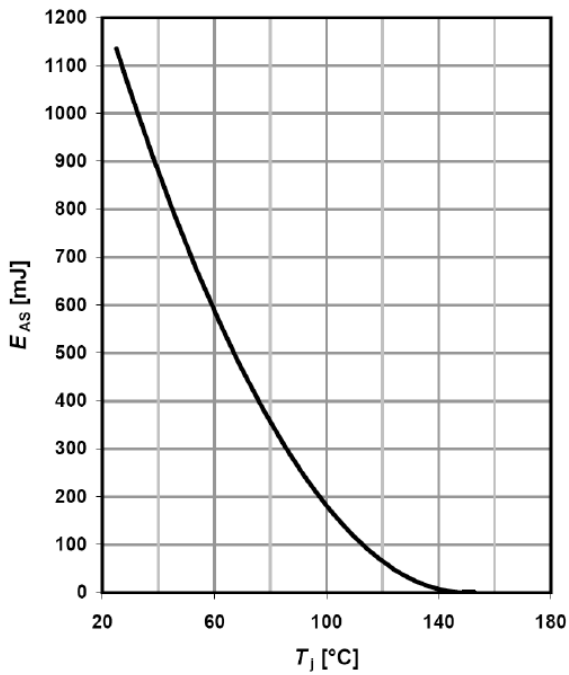
$I_D = f(V_{GS}); V_{DS} = 20V$

Typ. gate charge



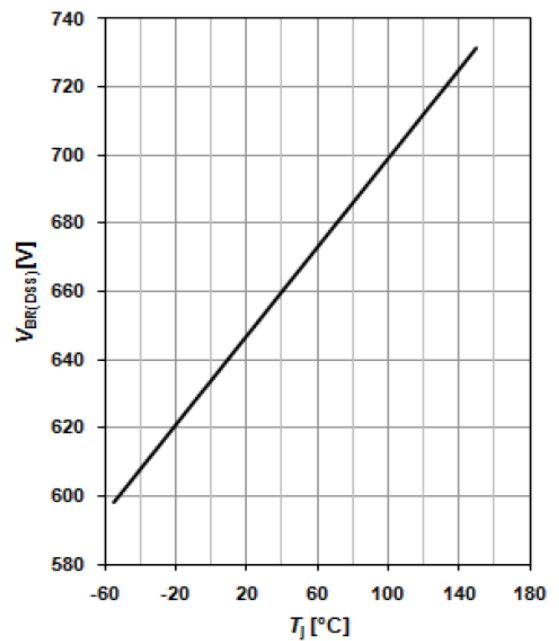
$V_{GS} = f(Q_{gate}), I_D = 26.3 A$ pulsed

Avalanche energy



$E_{AS} = f(T_j); I_D = 9.3 A; V_{DD} = 50 V$

Drain-source breakdown voltage

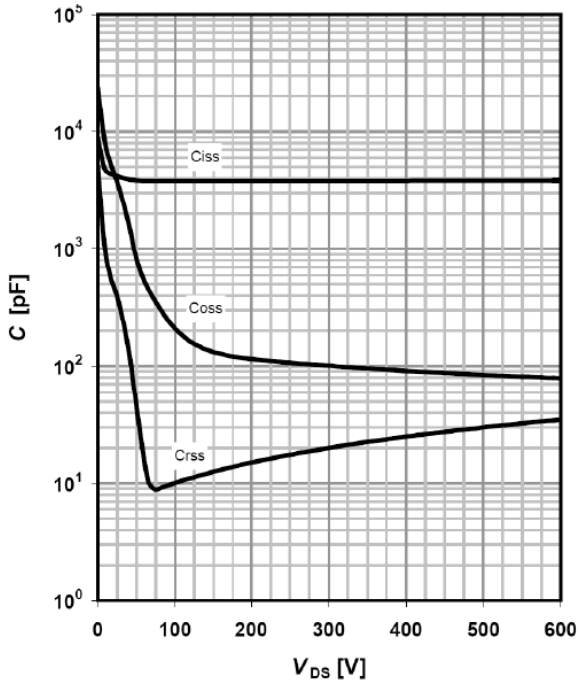


$V_{BR(DSS)} = f(T_j); I_D = 1.0 mA$

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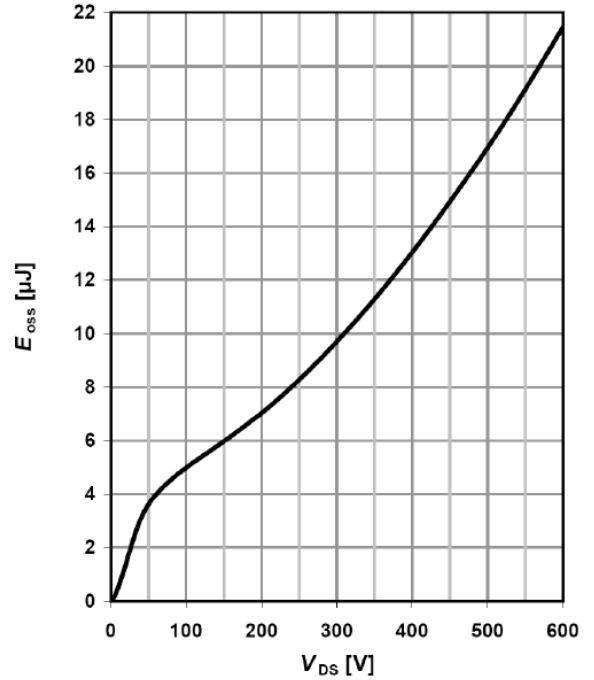
Typical characteristics Diagrams

Typ. capacitances



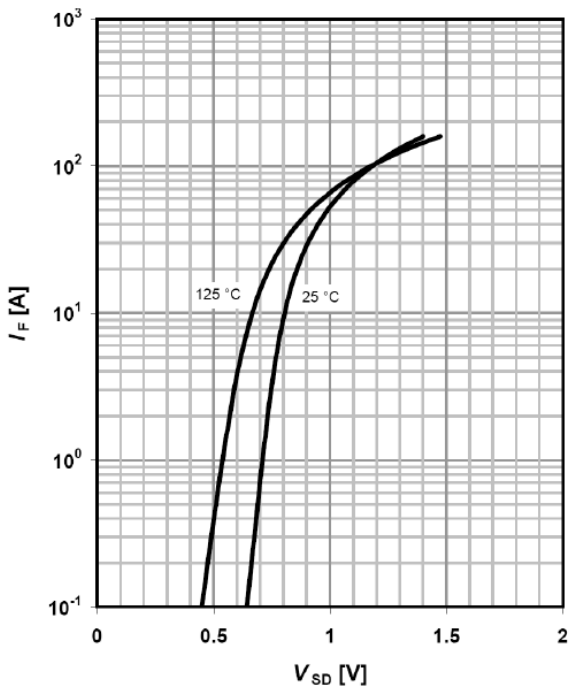
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$

Typ. C_{oss} stored energy



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

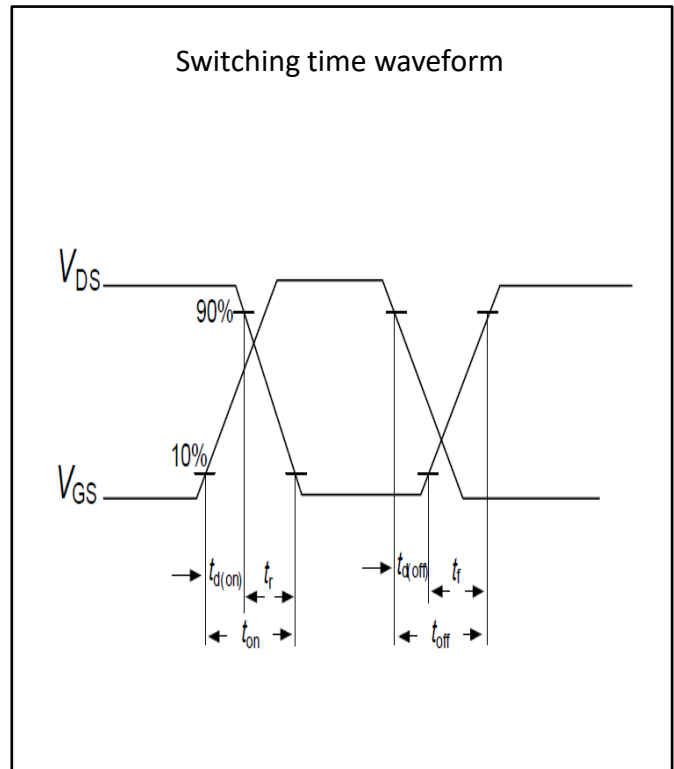
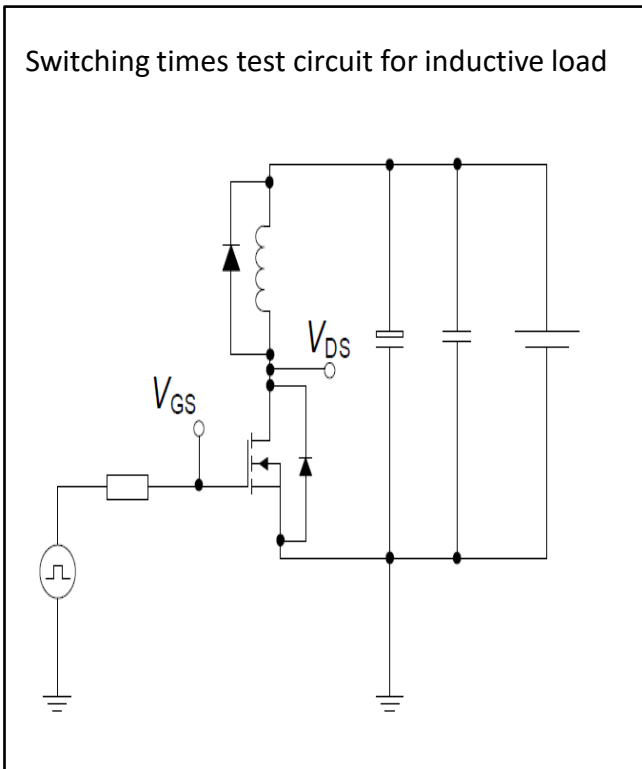
Forward characteristics of reverse diode



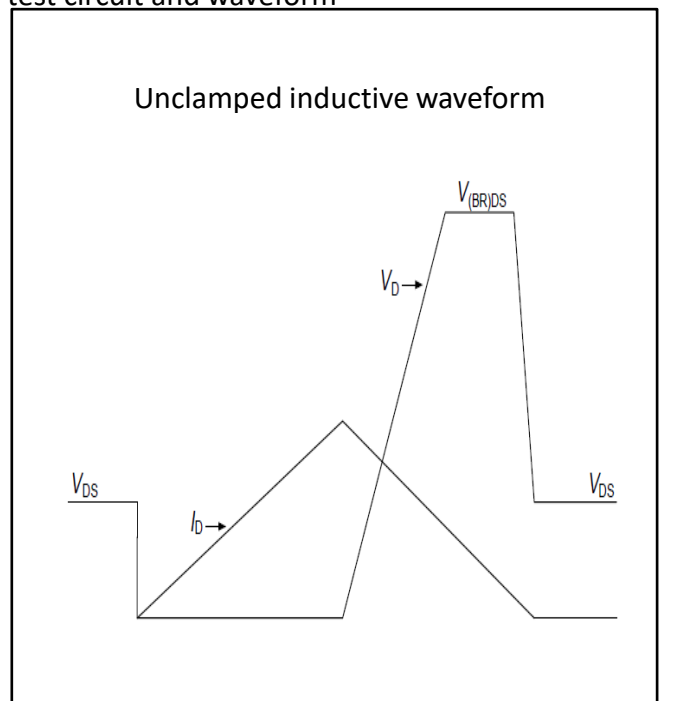
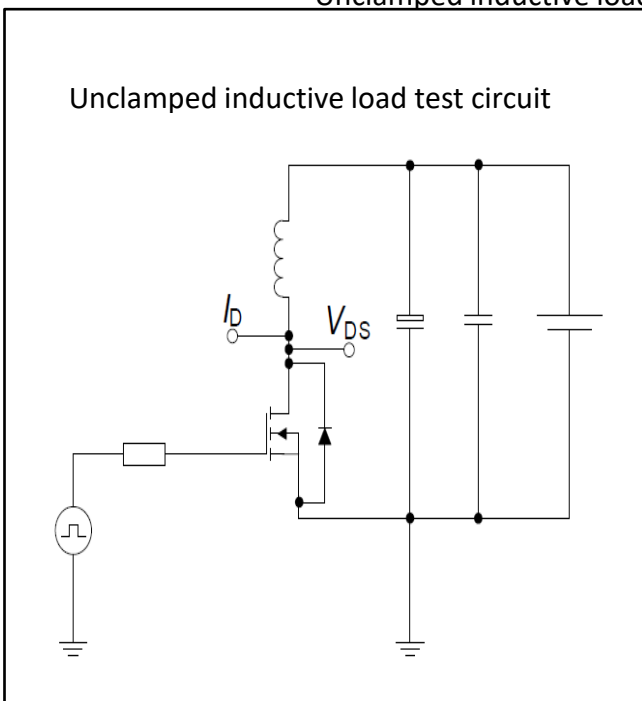
$I_F=f(V_{SD}); \text{parameter: } T_j$

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Switching times test circuit and waveform for inductive load

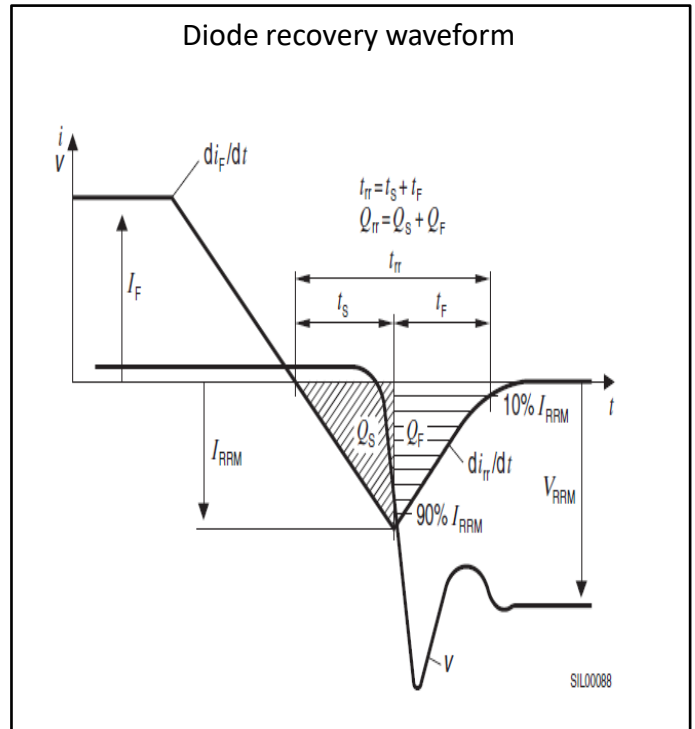
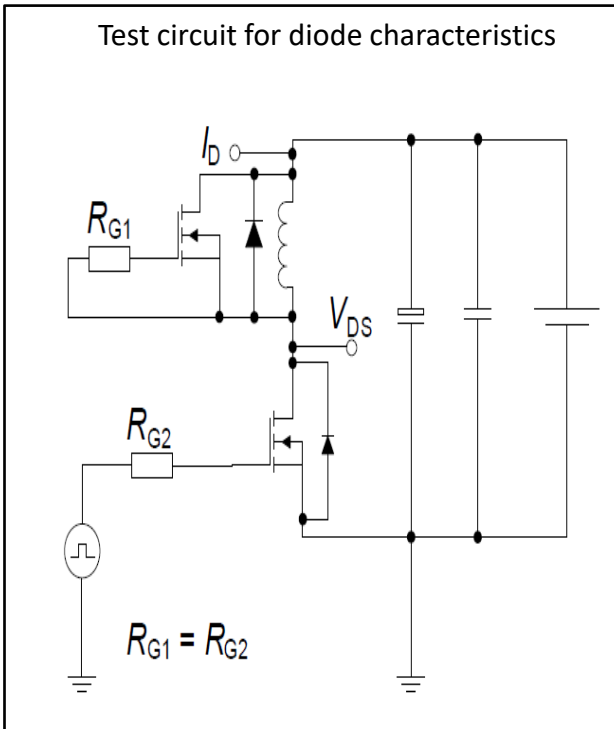


Unclamped inductive load test circuit and waveform



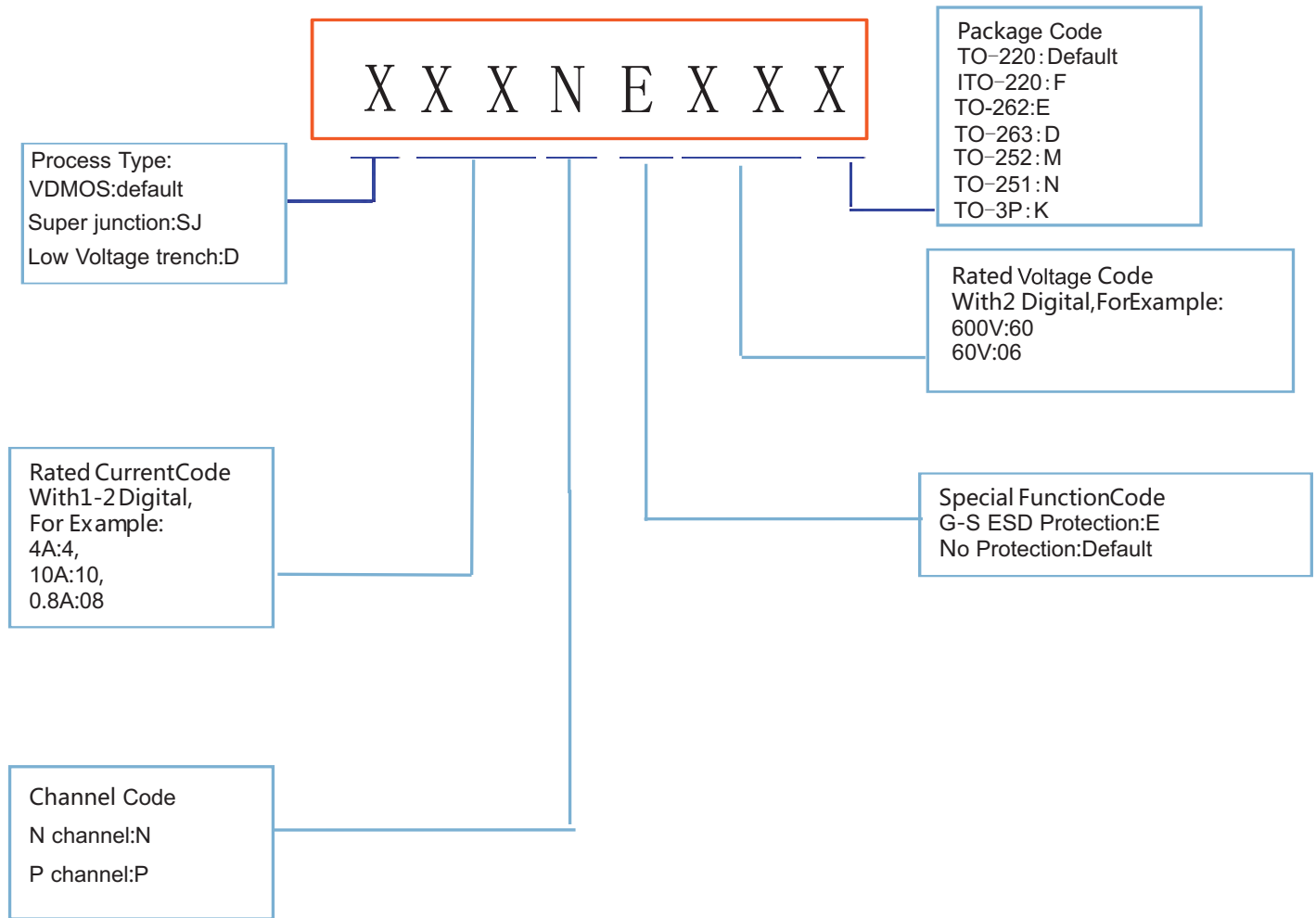
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Test circuit and waveform for diode characteristics



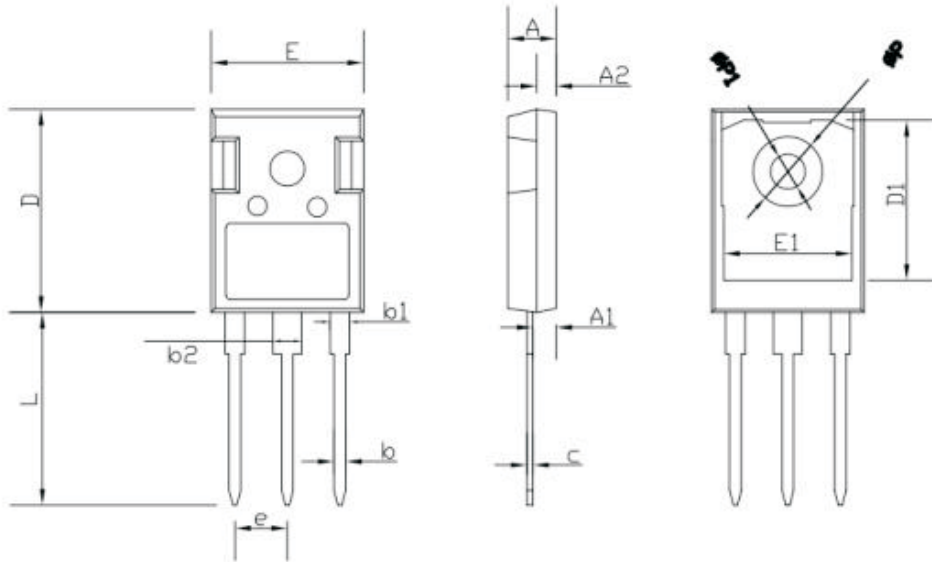
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Product Names Rules



SJ47N60PR

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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