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OptiMOS™ Power-Transistor

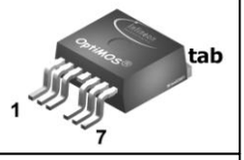
Features

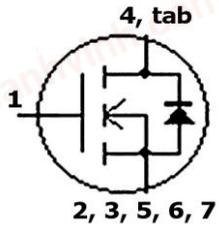
- Optimized for synchronous rectification
- 100% avalanche tested
- Superior thermal resistance
- N-channel, normal level
- Qualified according to JEDEC[1] for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

RoHS Halogen-Free Pb-Free

Product Summary

V_{DS}	60	V
$R_{DS(on),max}$	1.4	mΩ
I_D	180	A
Q_{OSS}	119	nC
Q_G(0V..10V)	106	nC

Type	IPB014N06N
	
Package	TO263-7
Marking	014N06N



Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	V_{GS}=10 V, T_C=25 °C	180	A
		V_{GS}=10 V, T_C=100 °C	180	
		V_{GS}=10 V, T_C=25 °C, R_{thJA} =50K/W	34	
Pulsed drain current[2]	$I_{D,pulse}$	T_C=25 °C	720	
Avalanche energy, single pulse[3]	E_{AS}	I_D=100 A, R_{GS}=25 Ω	420	mJ
Gate source voltage	V_{GS}		±20	V

[1] J-STD20 and JESD22

[2] See figure 3 for more detailed information

[3] See figure 13 for more detailed information

[4] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm^2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

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Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Power dissipation	P_{tot}	T_C=25 °C	214	W
		T_A=25 °C, R_{thJA}=50 K/W	3.0	
Operating and storage temperature	T_j, T_{stg}		-55 ... 175	°C
IEC climatic category; DIN IEC 68-1			55/175/56	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}		-	-	0.7	K/W
Device on PCB	R_{thJA}	minimal footprint	-	-	62	
		6 cm² cooling area[4)]	-	-	40	
Electrical characteristics, at T_j=25 °C, unless otherwise specified						
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0 V, I_D=1 mA	60	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=143 µA	2.1	2.8	3.3	
Zero gate voltage drain current	I_{DSS}	V_{DS}=60 V, V_{GS}=0 V, T_j=25 °C	-	0.5	1	µA
		V_{DS}=60 V, V_{GS}=0 V, T_j=125 °C	-	10	100	
Gate-source leakage current	I_{GSS}	V_{GS}=20 V, V_{DS}=60 V	-	10	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=100 A	-	1.2	1.4	mΩ
		V_{GS}=6 V, I_D=25 A	-	1.5	2.1	
Gate resistance	R_G		-	1.6	2.4	Ω
Transconductance	g_{fs}	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=100 A	120	230	-	S

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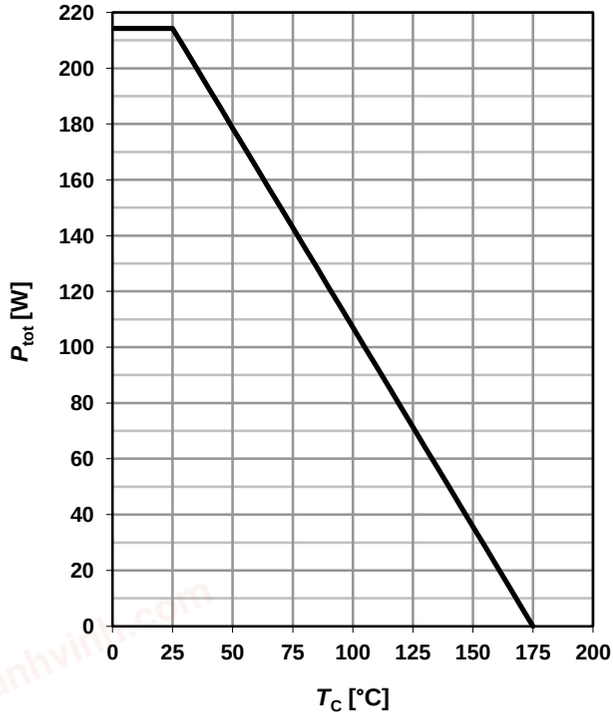
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=30 V, f=1 MHz	-	7800	9750	pF
Output capacitance	C_{oss}		-	1800	2250	
Reverse transfer capacitance	C_{rss}		-	69	138	
Turn-on delay time	$t_{d(on)}$	V_{DD}=30 V, V_{GS}=10 V, I_D=100 A, $R_{G,ext}$,ext=1.6 Ω	-	22	-	ns
Rise time	t_r		-	18	-	
Turn-off delay time	$t_{d(off)}$		-	47	-	
Fall time	t_f		-	14	-	
Gate Charge Characteristics[5)]						
Gate to source charge	Q_{gs}	V_{DD}=30 V, I_D=100 A, V_{GS}=0 to 10 V	-	35	-	nC
Gate charge at threshold	$Q_{g(th)}$		-	22	-	
Gate to drain charge	Q_{gd}		-	19	25	
Switching charge	Q_{sw}		-	32	-	
Gate charge total	Q_g		-	106	124	
Gate plateau voltage	$V_{plateau}$		-	4.5	-	V
Gate charge total, sync. FET	$Q_{g(sync)}$	V_{DS}=0.1 V, V_{GS}=0 to 10 V	-	94	-	nC
Output charge	Q_{oss}	V_{DD}=30 V, V_{GS}=0 V	-	119	-	
Reverse Diode						
Diode continuous forward current	I_S	T_C=25 °C	-	-	180	A
Diode pulse current	$I_{S,pulse}$		-	-	720	
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=100 A, T_j=25 °C	-	0.9	1.2	V
Reverse recovery time	t_{rr}	V_R=30 V, I_F=100A , di_F/dt =100 A/µs	-	67	107	ns
Reverse recovery charge	Q_{rr}		-	112	-	nC

[5)] See figure 16 for gate charge parameter definition

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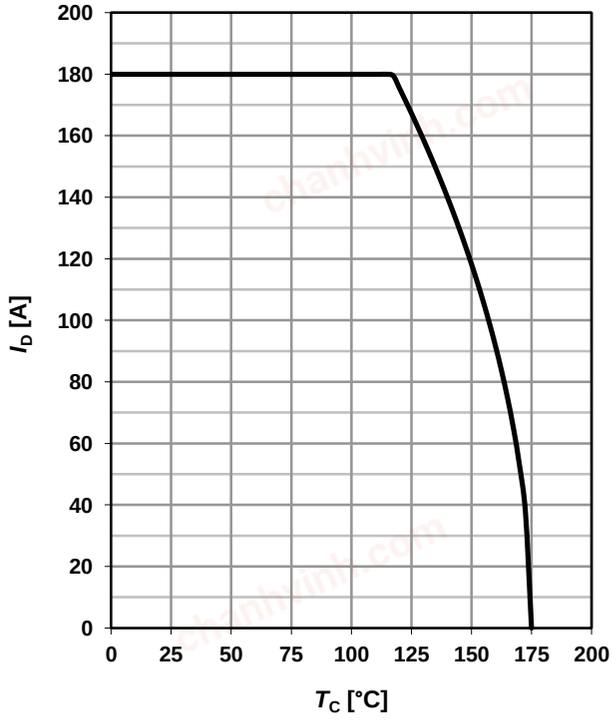
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

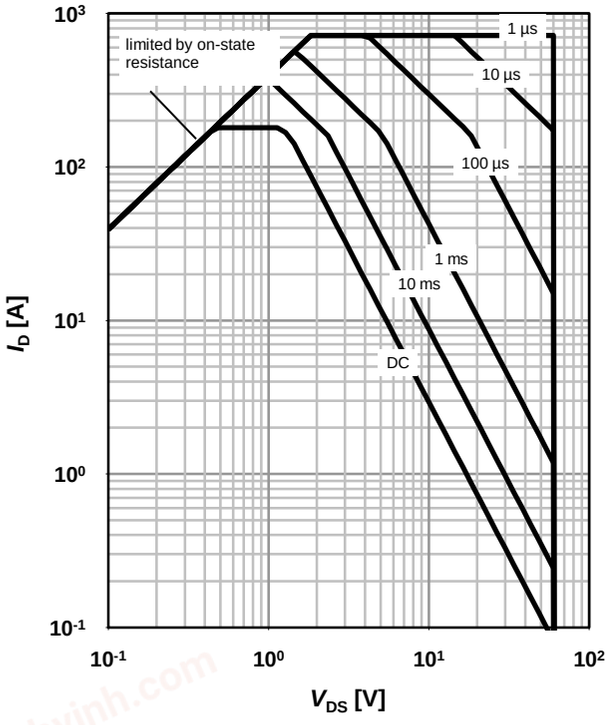
$I_D=f(T_C)$; $V_{GS}\geq 10$ V



3 Safe operating area

$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$

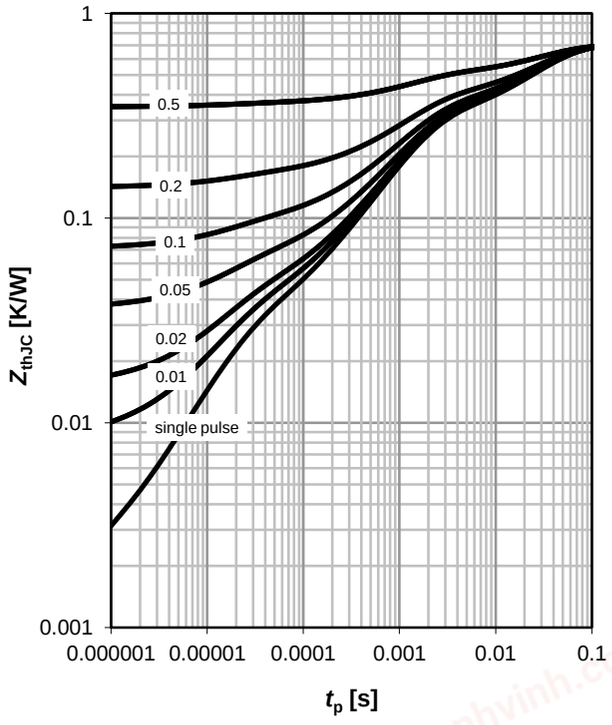
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

parameter: $D=t_p/T$

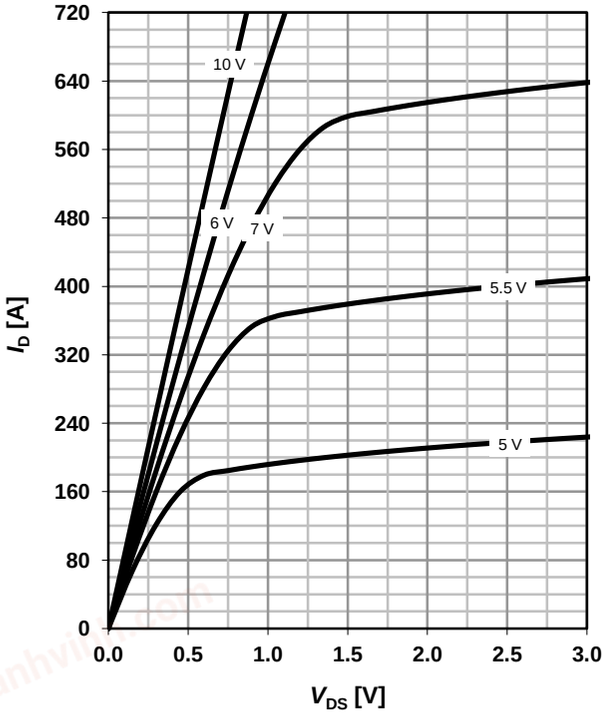


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5 Typ. output characteristics

$I_D=f(V_{DS})$; $T_j=25$ °C

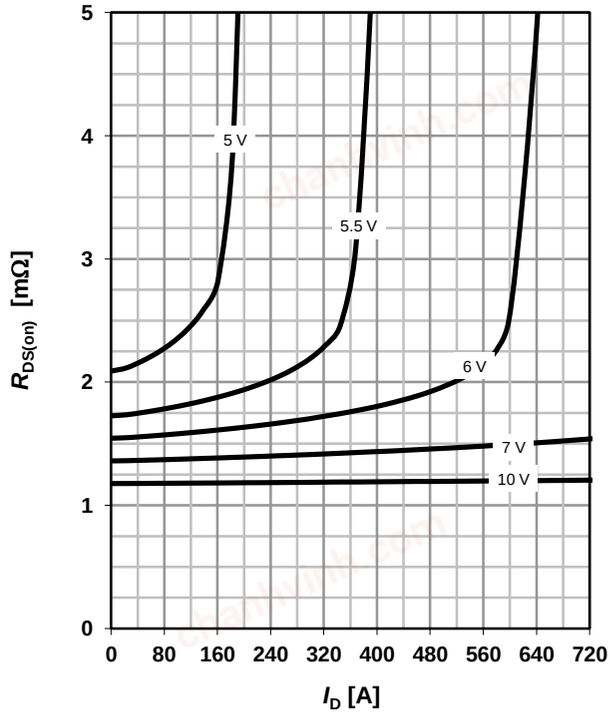
parameter: V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)}=f(I_D)$; $T_j=25$ °C

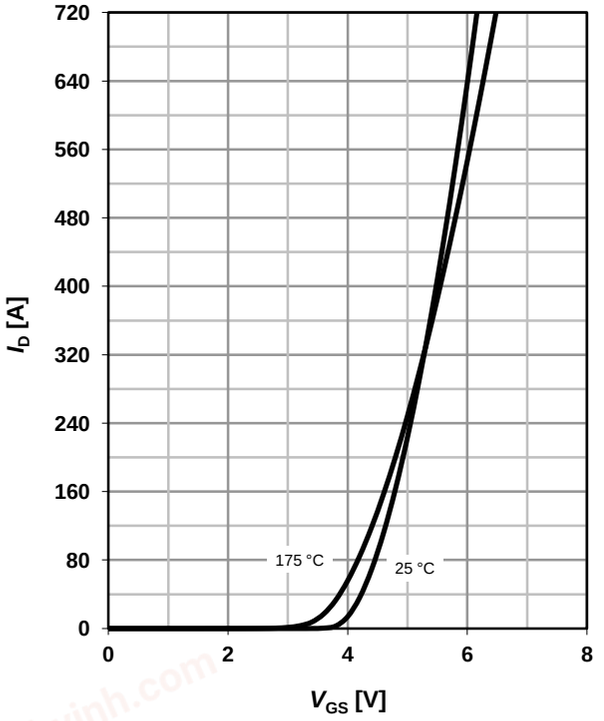
parameter: V_{GS}



7 Typ. transfer characteristics

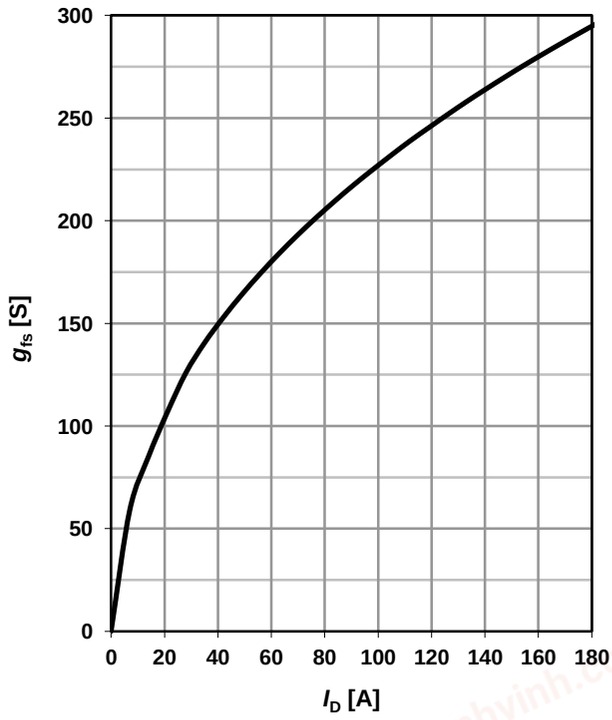
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$

parameter: T_j



8 Typ. forward transconductance

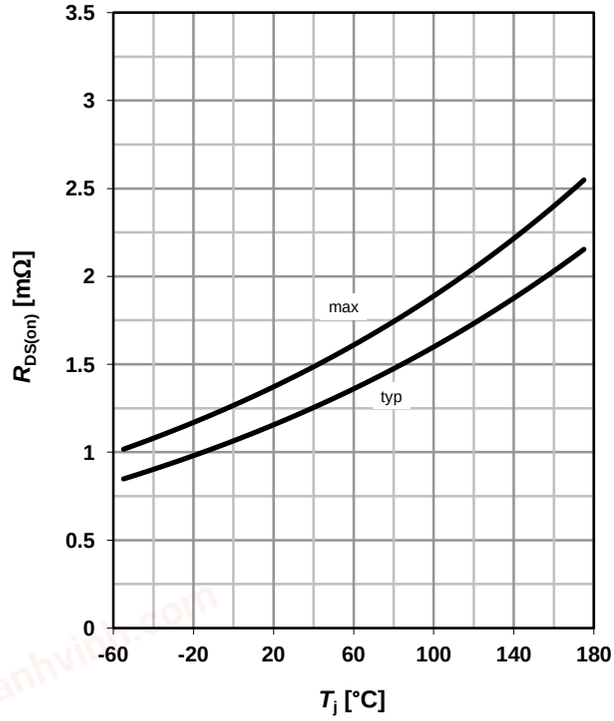
$g_{fs}=f(I_D)$; $T_j=25$ °C



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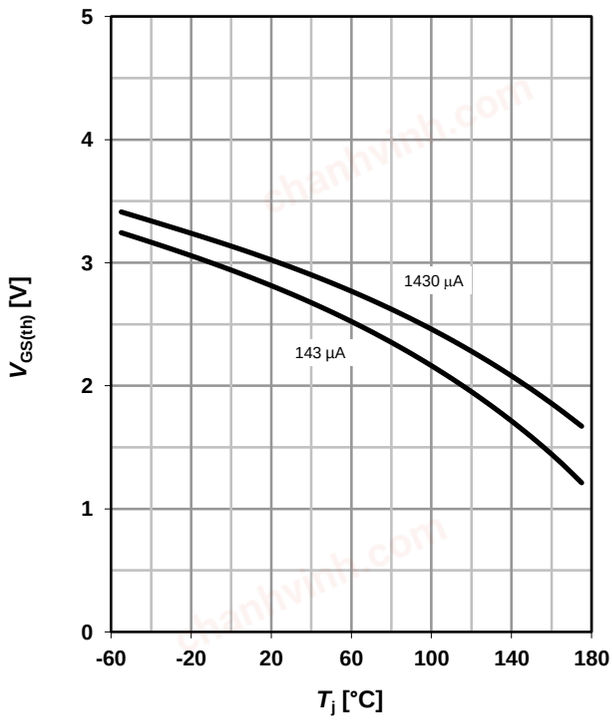
9 Drain-source on-state resistance

$R_{DS(on)}$=f(T_j); I_D=100 A; V_{GS}=10 V



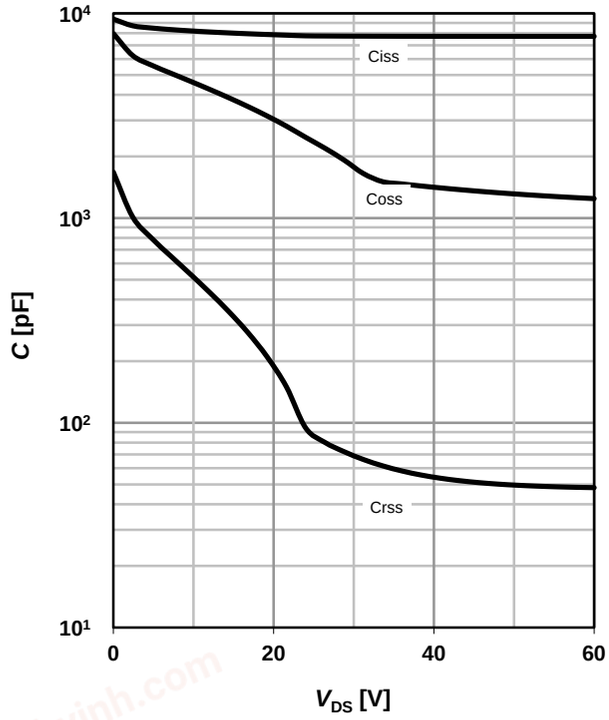
10 Typ. gate threshold voltage

$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}



11 Typ. capacitances

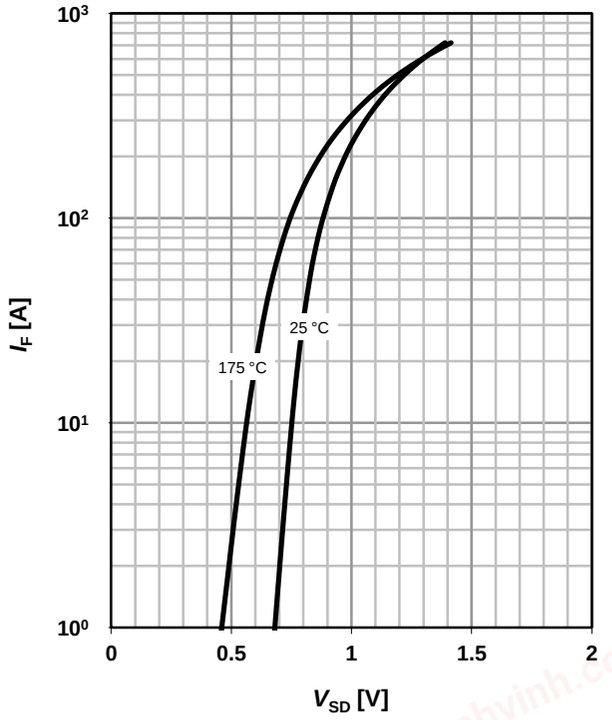
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz



12 Forward characteristics of reverse diode

I_F=f(V_{SD})

parameter: T_j

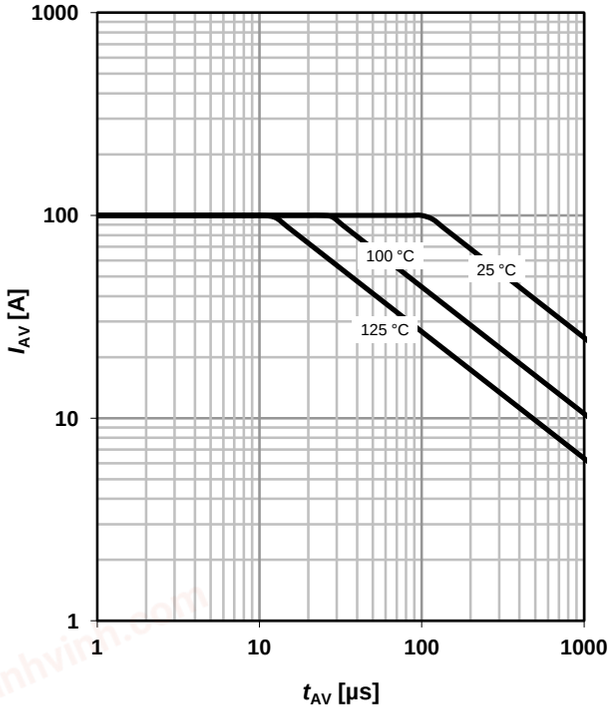


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13 Avalanche characteristics

I_{AS}=f(t_{AV}); R_{GS}=25 Ω

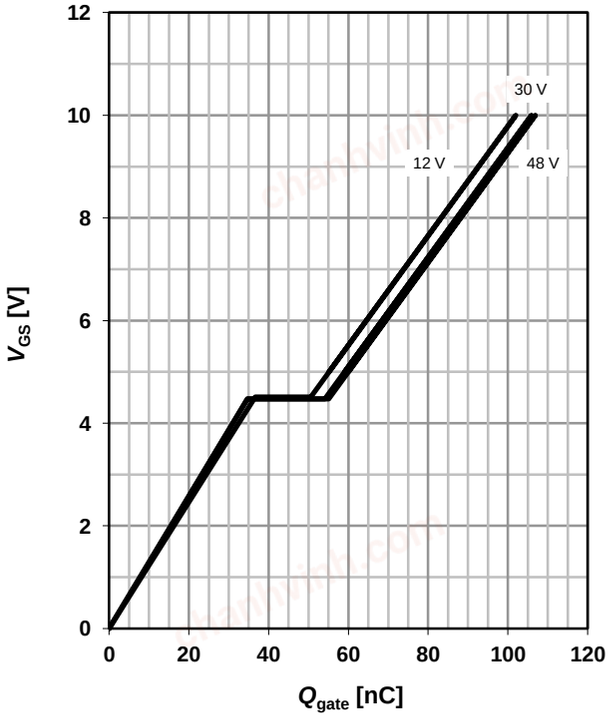
parameter: $T_{j(start)}$



14 Typ. gate charge

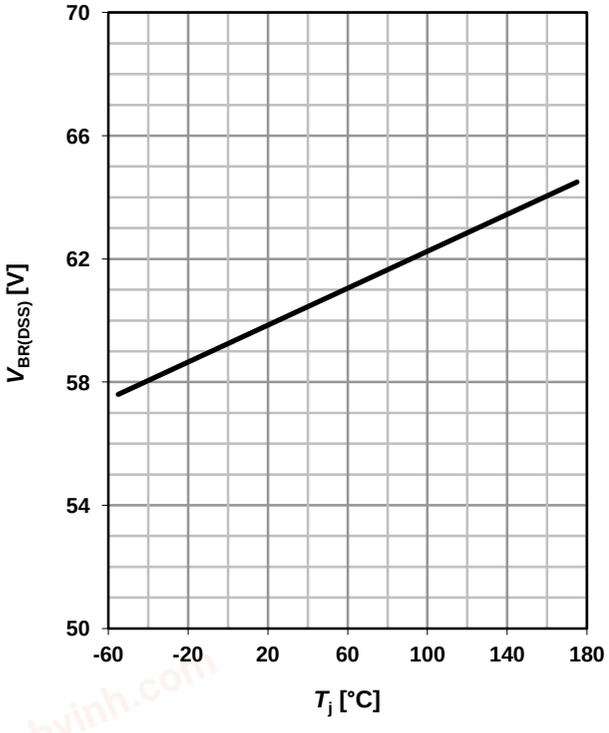
V_{GS}=f(Q_{gate}); I_D=100 A pulsed

parameter: V_{DD}

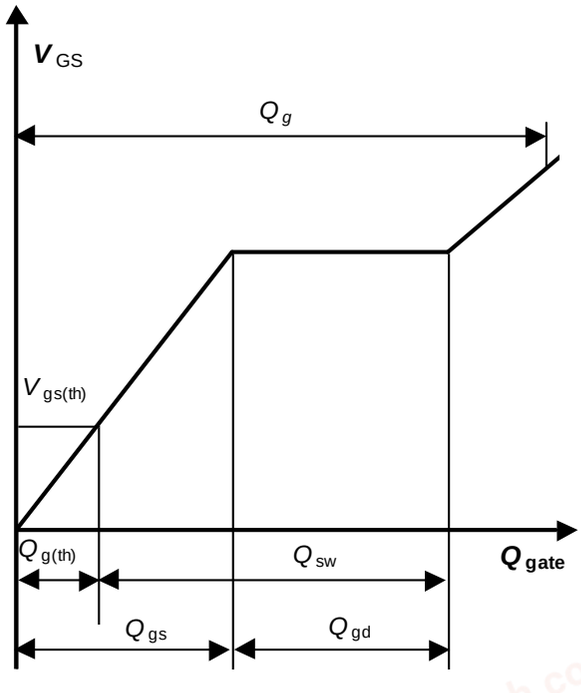


15 Drain-source breakdown voltage

$V_{BR(DSS)}$=f(T_j); I_D=1 mA

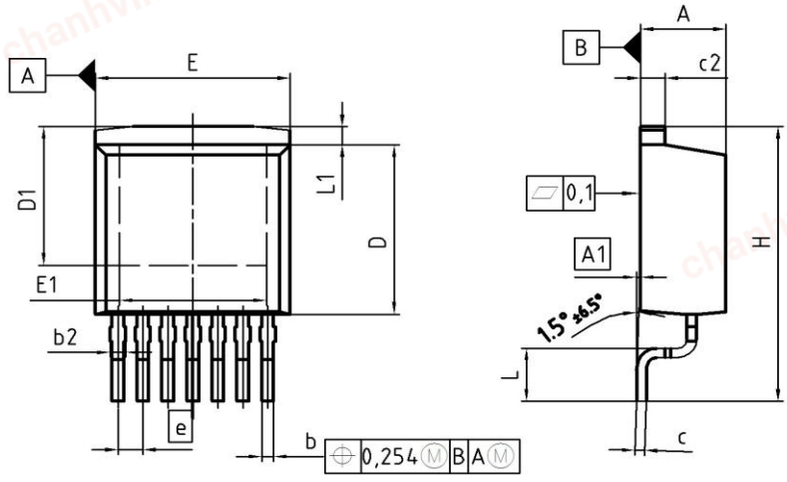


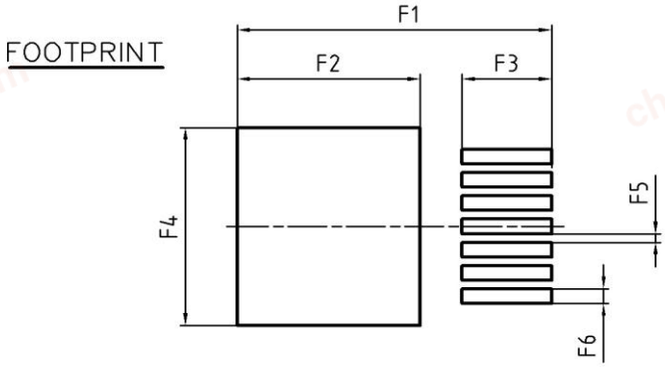
16 Gate charge waveforms



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Package Outline **TO 263-7**



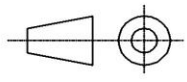


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.57	0.169	0.180
A1	0.00	0.25	0.000	0.010
b	0.50	0.70	0.020	0.028
b2	0.50	1.00	0.020	0.039
c	0.33	0.65	0.013	0.026
c2	1.17	1.40	0.046	0.055
D	8.51	9.45	0.335	0.372
D1	6.90	7.90	0.272	0.311
E	9.80	10.31	0.386	0.406
E1	6.50	8.60	0.256	0.339
e	1.27		0.050	
N	7		7	
H	14.61	15.88	0.575	0.625
L	2.29	3.00	0.090	0.118
L1	0.70	1.60	0.028	0.063
F1	16.05	16.25	0.632	0.640
F2	9.30	9.50	0.366	0.374
F3	4.50	4.70	0.177	0.185
F4	10.70	10.90	0.421	0.429
F5	0.37	0.57	0.015	0.022
F6	0.70	0.90	0.028	0.035

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SCALE 0 5 5 7.5mm

EUROPEAN PROJECTION



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01

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