IPI60R099CPA

CoolMOS™ Power Transistor

Product Summary

V_{DS}	600	V
$R_{DS(on),max}$	0.105	Ω
$Q_{g,typ}$	60	nC

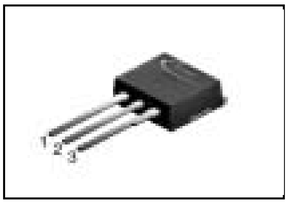
Features

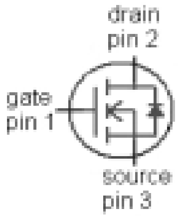
- Worldwide best Rds,on in TO262
- Ultra low gate charge
- Extreme dv/dt rated
- High peak current capability
- Automotive AEC Q101 qualified
- Green package (RoHS compliant)

CoolMOS CPA is specially designed for:

- DC/DC converters for Automotive Applications

PG-TO262-3-1





Type	Package	Marking
IPI60R099CPA	PG-TO262-3-1	6R099A

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	T_C=25 °C	31	A
		T_C=100 °C	19	
Pulsed drain current[1)]	$I_{D,pulse}$	T_C=25 °C	93	
Avalanche energy, single pulse	E_{AS}	I_D=11 A, V_{DD}=50 V	800	mJ
Avalanche energy, repetitive t_{AR}[1),2)]	E_{AR}	I_D=11 A, V_{DD}=50 V	1.2	
Avalanche current, repetitive t_{AR}[1),2)]	I_{AR}		11	A
MOSFET dv/dt ruggedness	dv/dt	V_{DS}=0...480 V	50	V/ns
Gate source voltage	V_{GS}	static	±20	V
Power dissipation	P_{tot}	T_C=25 °C	255	W
Operating temperature	T_j		-40 … 150	°C
Storage temperature	T_{stg}		-40 ... 150	

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

Parameter	Symbol	Conditions	Value	Unit
Continuous diode forward current	I_S	T_C=25 °C	18	A
Diode pulse current[1]	$I_{S,pulse}$		93	
Reverse diode d*v*/d*t*[3]	d*v*/d*t*		15	V/ns

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}		-	-	0.5	K/W
Thermal resistance, junction - ambient	R_{thJA}	leaded	-	-	62	
Soldering temperature, wavesoldering only allowed at leads	T_{sold}	1.6 mm (0.063 in.) from case for 10 s	-	-	260	°C
Soldering temperature, reflow soldering	T_{sold}	MSL1, reflow acc. to IPC-JEDEC J-STD-020C	-	-	245	°C

Electrical characteristics, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0 V, I_D=250 µA	600	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=1.2 mA	2.5	3	3.5	
Zero gate voltage drain current	I_{DSS}	V_{DS}=600 V, V_{GS}=0 V, T_j=25 °C	-	-	5	µA
Gate-source leakage current	I_{GSS}	V_{GS}=20 V, V_{DS}=0 V	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=18 A, T_j=25 °C	-	0.09	0.105	Ω
		V_{GS}=10 V, I_D=18 A, T_j=150 °C	-	0.24	-	
Gate resistance	R_G	*f*=1 MHz, open drain	-	1.3	-	Ω

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=100 V, f=1 MHz	-	2800	-	pF
Output capacitance	C_{oss}		-	130	-	
Effective output capacitance, energy related[4]	$C_{o(er)}$	V_{GS}=0 V, V_{DS}=0 V to 480 V	-	130	-	
Effective output capacitance, time related[5]	$C_{o(tr)}$		-	340	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=400 V, V_{GS}=10 V, I_D=18 A, R_G=3.3 Ω	-	10	-	ns
Rise time	t_r		-	5	-	
Turn-off delay time	$t_{d(off)}$		-	60	-	
Fall time	t_f		-	5	-	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=400 V, I_D=18 A, V_{GS}=0 to 10 V	-	14	-	nC
Gate to drain charge	Q_{gd}		-	20	-	
Gate charge total	Q_g		-	60	80	
Gate plateau voltage	$V_{plateau}$		-	5.0	-	V
Reverse Diode						
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=18 A, T_j=25 °C	-	0.9	1.2	V
Reverse recovery time	t_{rr}	V_R=400 V, I_F=I_S, di_F/dt=100 A/µs	-	450	-	ns
Reverse recovery charge	Q_{rr}		-	12	-	µC
Peak reverse recovery current	I_{rrm}		-	70	-	A

[1] Pulse width t_p limited by $T_{j,max}$

[2] Repetitive avalanche causes additional power losses that can be calculated as $P_{AV}=E_{AR}*f$.

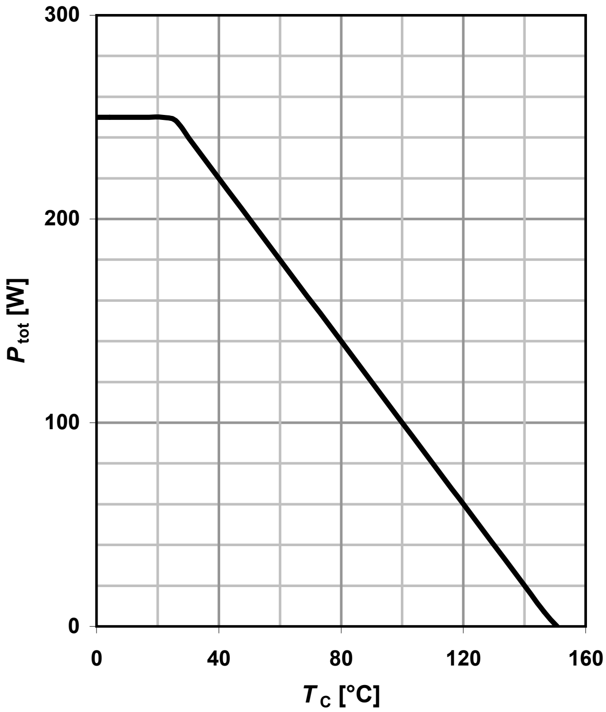
[3] $I_{SD} \leq I_D$, di/dt≤100A/µs, V_{DClink}=400V, $V_{peak}<V_{(BR)DSS}$, $T_j<T_{jmax}$, identical low side and high side switch

[4] $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

[5] $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

1 Power dissipation

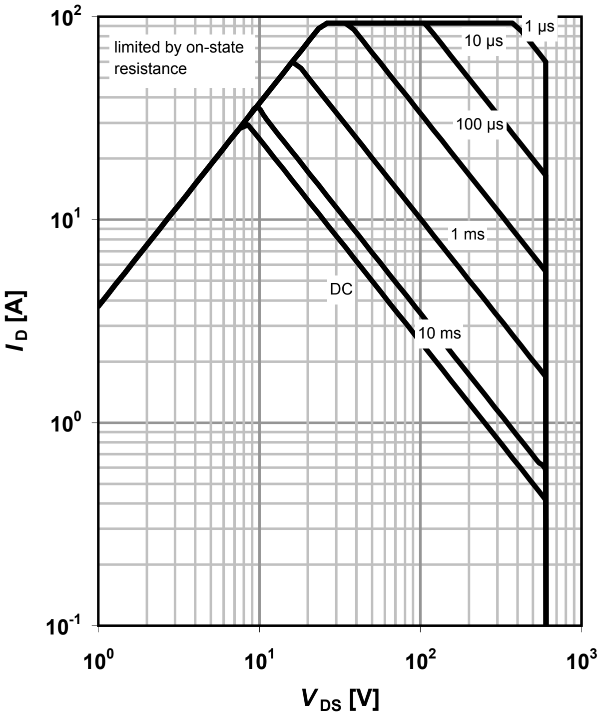
$P_{tot}=f(T_C)$



2 Safe operating area

$I_D=f(V_{DS})$; T_C=25 °C; D=0

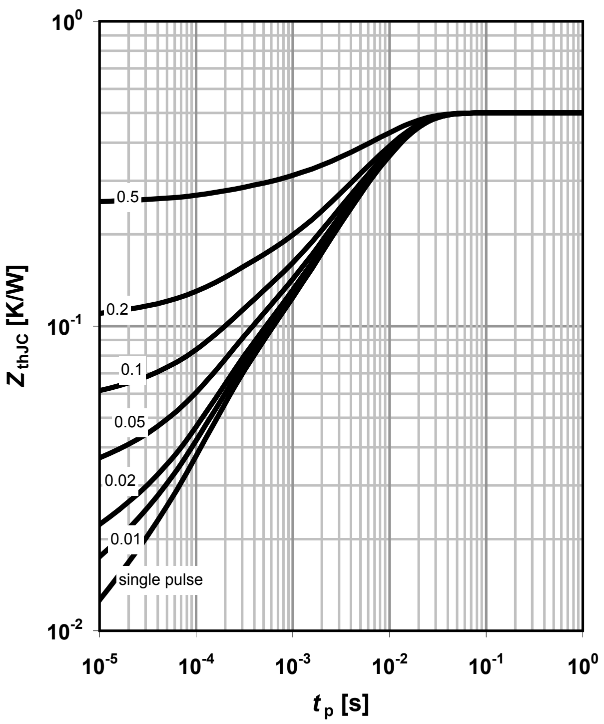
parameter: t_p



3 Max. transient thermal impedance

$Z_{thJC}=f(t_P)$

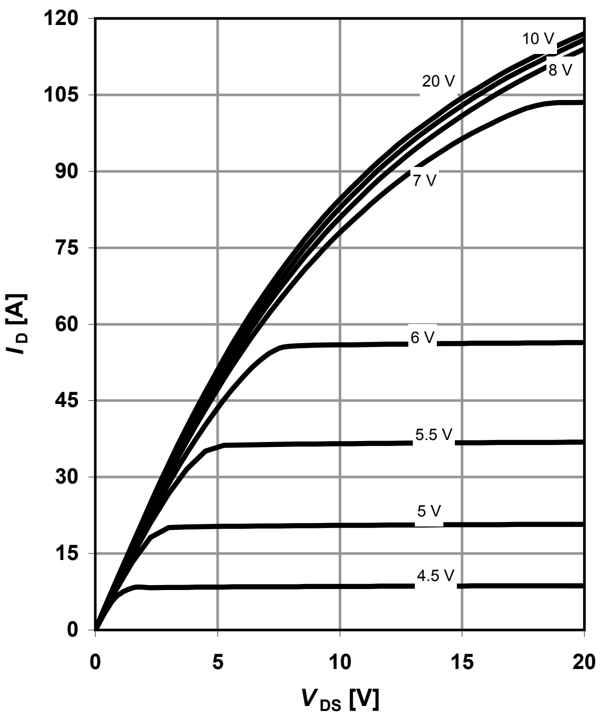
parameter: $D=t_p/T$



4 Typ. output characteristics

$I_D=f(V_{DS})$; T_j=25 °C

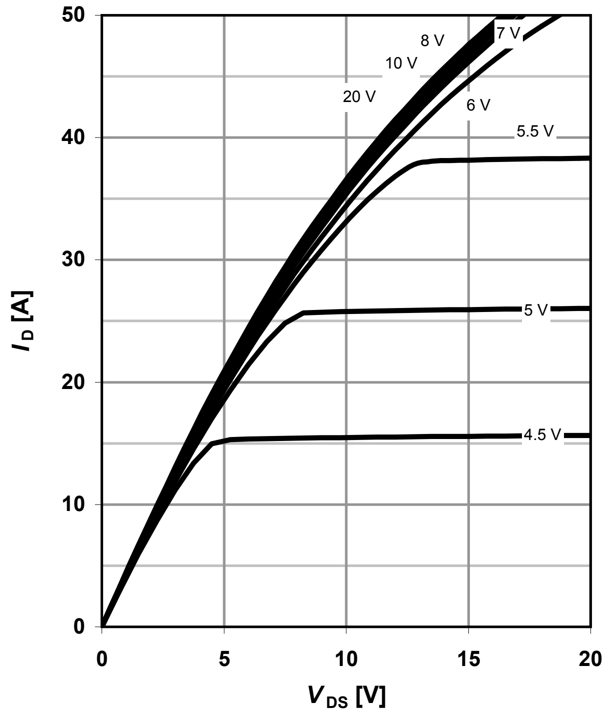
parameter: V_{GS}



5 Typ. output characteristics

I_D=f(V_{DS}); T_j=150 °C

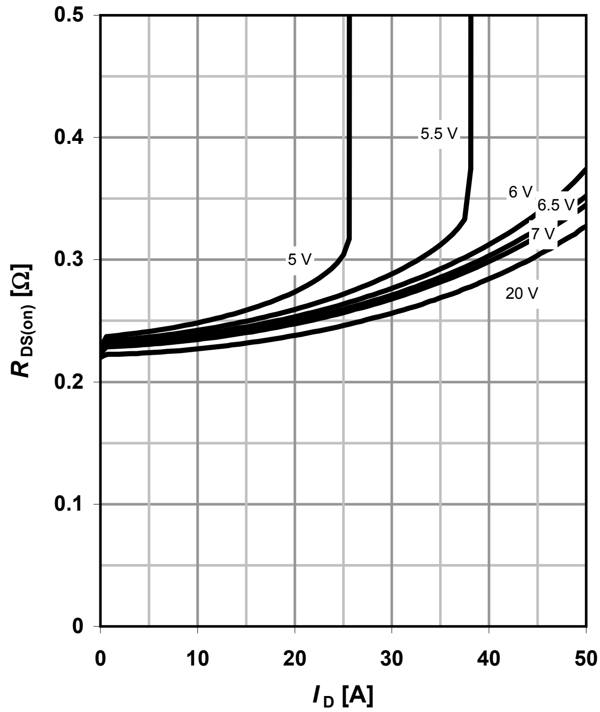
parameter: V_{GS}



6 Typ. drain-source on-state resistance

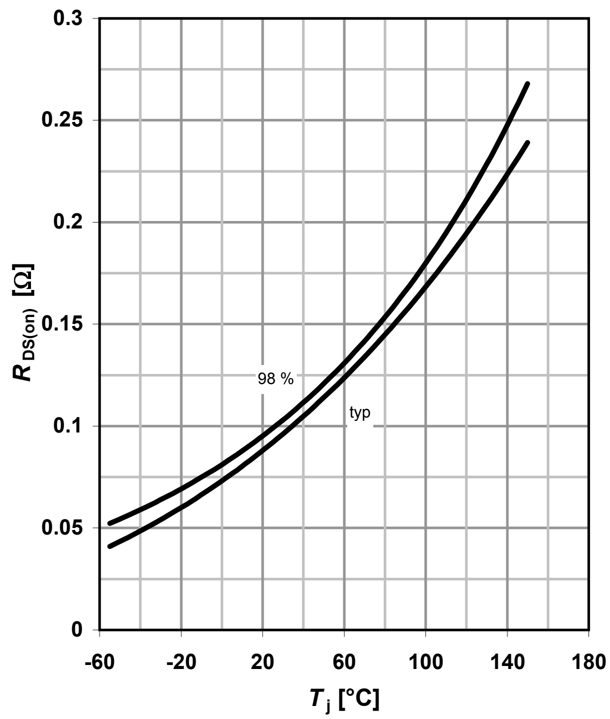
$R_{DS(on)}$=f(I_D); T_j=150 °C

parameter: V_{GS}



7 Drain-source on-state resistance

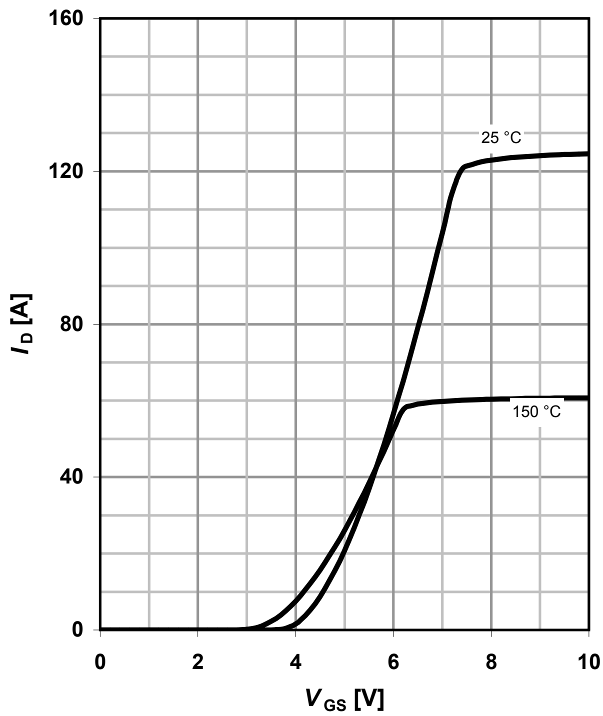
$R_{DS(on)}$=f(T_j); I_D=18 A; V_{GS}=10 V



8 Typ. transfer characteristics

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

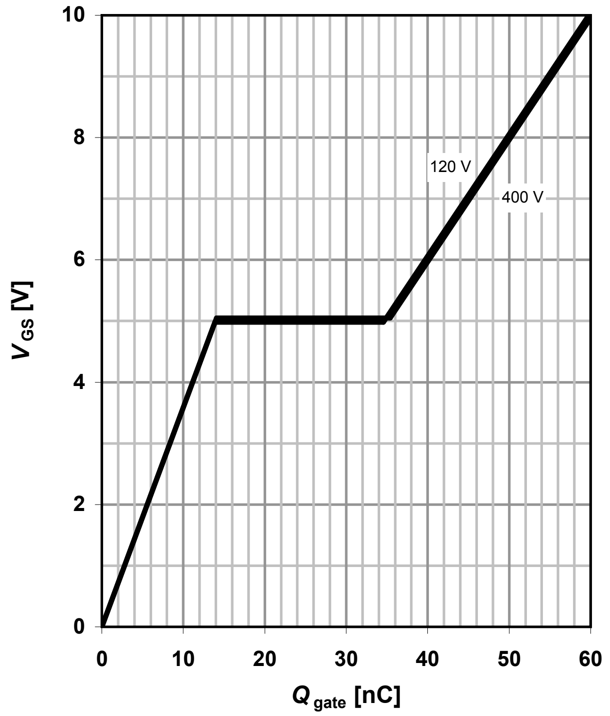
parameter: T_j



9 Typ. gate charge

V_{GS}=f(Q_{gate}); I_D=18 A pulsed

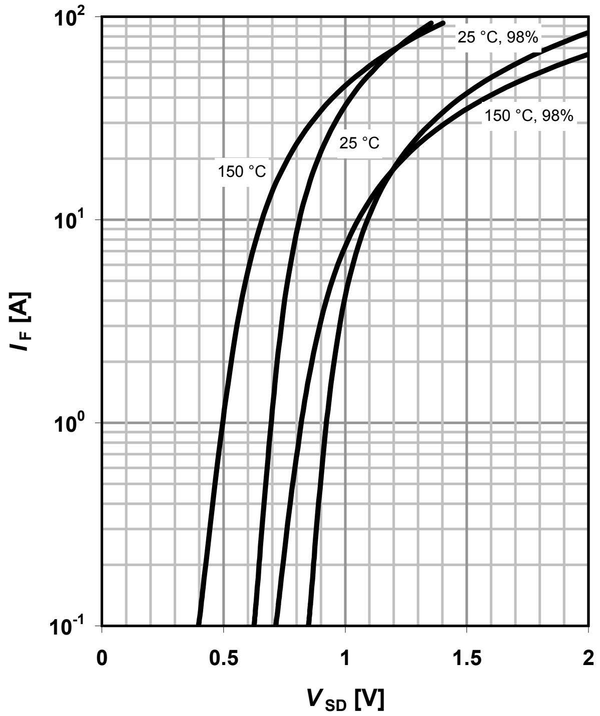
parameter: V_{DD}



10 Forward characteristics of reverse diode

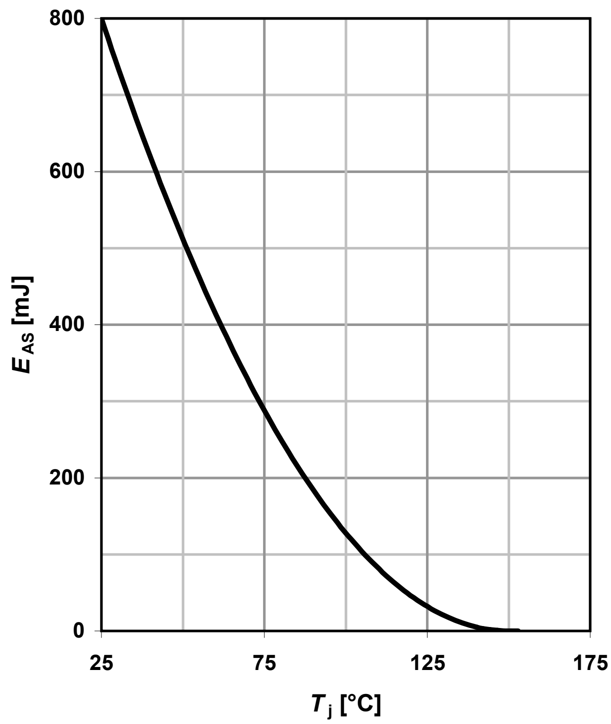
I_F=f(V_{SD})

parameter: T_j



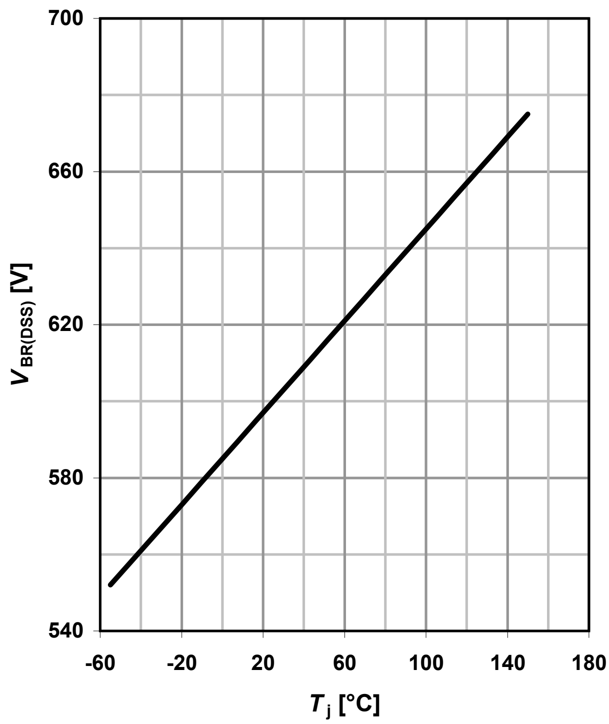
11 Avalanche energy

E_{AS}=f(T_j); I_D=11 A; V_{DD}=50 V



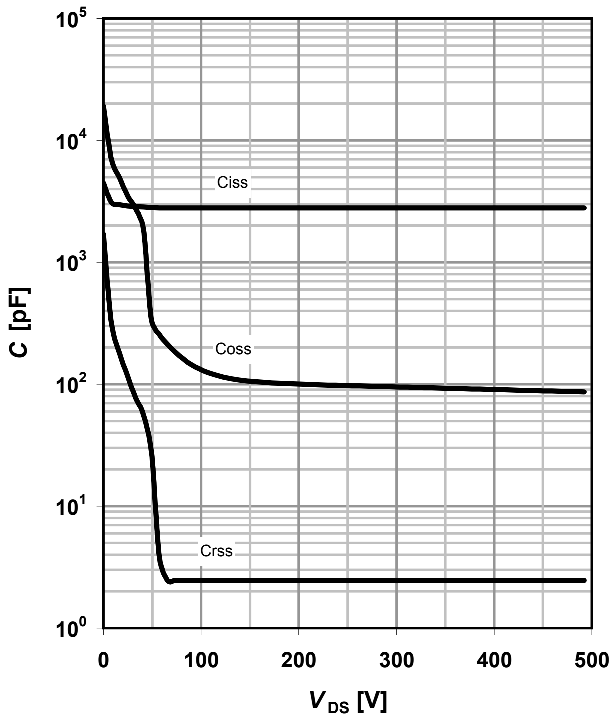
12 Drain-source breakdown voltage

$V_{BR(DSS)}$=f(T_j); I_D=0.25 mA



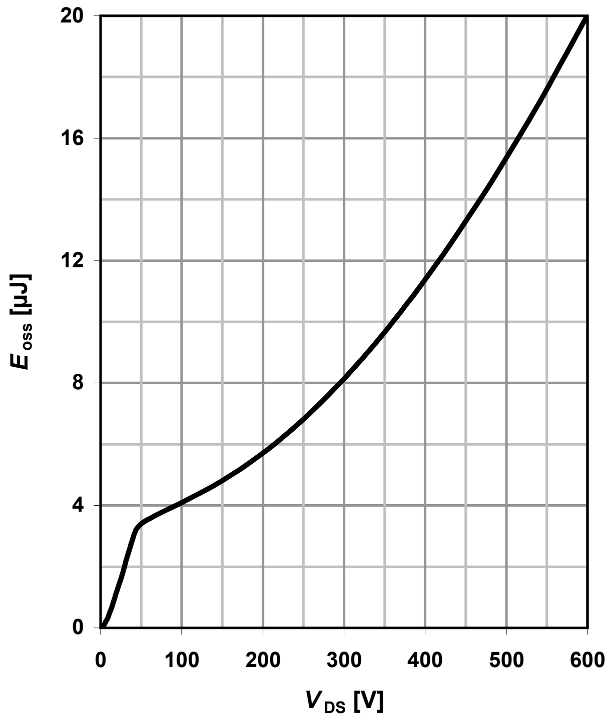
13 Typ. capacitances

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

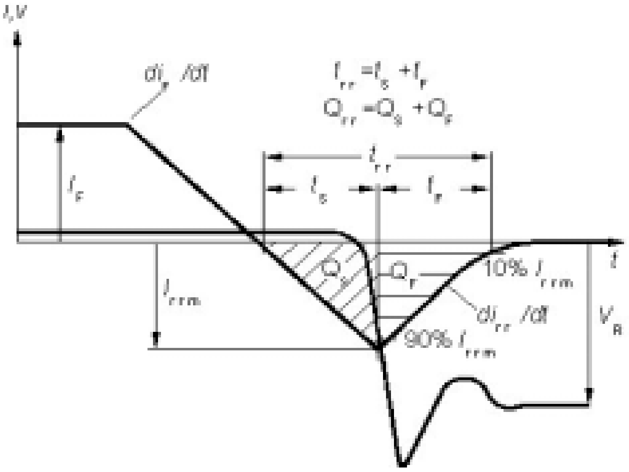


14 Typ. Coss stored energy

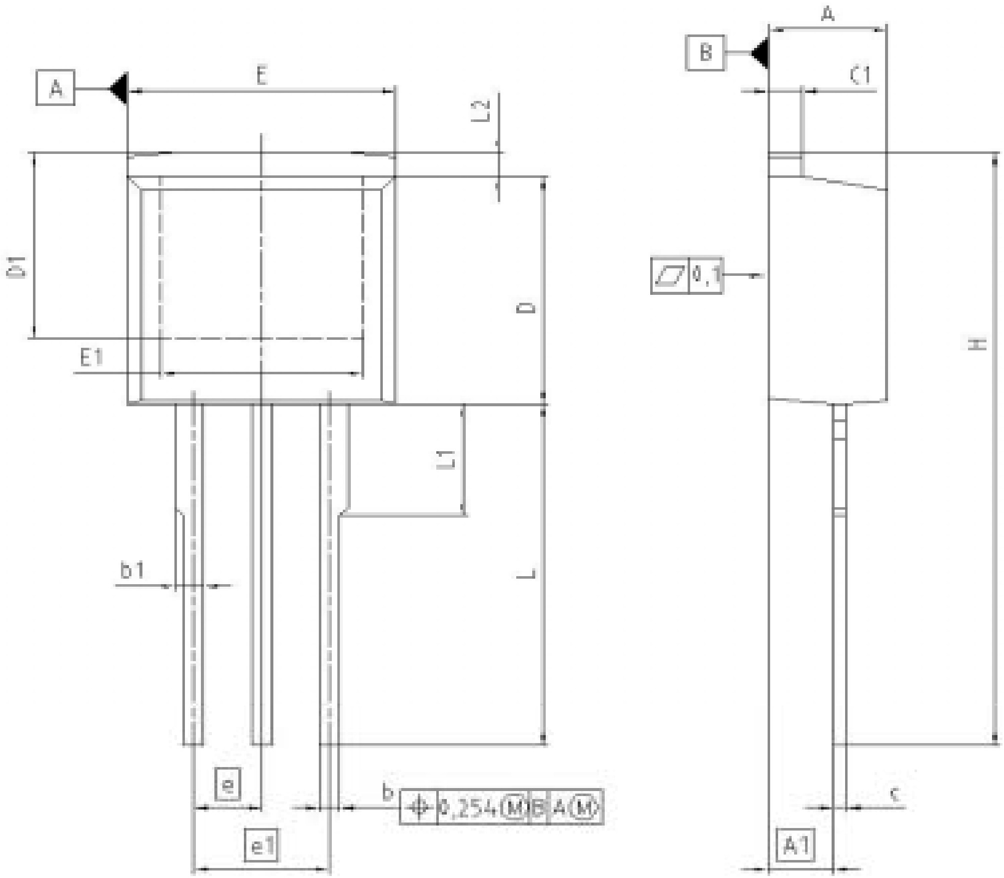
E_{oss}=f(V_{DS})



Definition of diode switching characteristics



PG-TO262-3-1: Outlines



to

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.300	4.500	0.169	0.177
A1	2.150	2.650	0.085	0.104
b	0.650	0.850	0.026	0.033
b1	0.635	1.400	0.025	0.055
c	0.400	0.600	0.016	0.024
c1	1.170	1.370	0.046	0.054
D	9.050	9.450	0.356	0.372
D1	6.900	7.650	0.272	0.301
E	9.800	10.200	0.386	0.402
E1	7.250	8.600	0.285	0.339
e	2.540		0.100	
e1	5.080		0.200	
N	3		3	
L	13.000	14.000	0.512	0.551
L1	4.350	4.750	0.171	0.187
L2	0.700	1.300	0.028	0.051

REFERENCE
JEDEC TO262

SCALE
0
2.5
0 2.5 5mm

EUROPEAN PROJECTION

ISSUE DATE
01-06-2005

FILE
TO262_1

Dimensions in mm/inches

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NOTIFICATION

N° 040/10

Information on N-Channel MOSFET products designed for automotive applications

Products affected:

SalesName	Package
IPB60R099CPA	PG-TO263-3-2
IPB60R199CPA	PG-TO263-3-2
IPB60R299CPA	PG-TO263-3-2
IPC60R075CPA	Bare Die
IPI60R099CPA	PG-TO262-3-1
IPP60R099CPA	PG-TO220-3-1
IPW60R045CPA	PG-TO247-3-41
IPW60R075CPA	PG-TO247-3-41
IPW60R099CPA	PG-TO247-3-41

Dear Customer,

The devices listed for this notification are sensitive to hard commutation of the conducting body diode. This operating condition can occur in half-bridge configurations used in ZVS phase shift and resonant switching PWM converters. Using the device under such conditions may result in violation of the datasheet specification limits and may lead to permanent damage of the device.
Please take care that in the context of the application described above the datasheet limits are not exceeded.

Best Regards

Michael Paulu

If you have any questions, please do not hesitate to contact your local Sales office.