

CoolMOS™ Power Transistor

Features

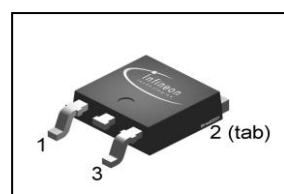
- New revolutionary high voltage technology
- Extreme dv/dt rated
- High peak current capability
- Qualified according to AEC Q101
- Green package (RoHS compliant), Pb-free lead plating, halogen free for mold compound
- Ultra low gate charge
- Ultra low effective capacitances



Product Summary

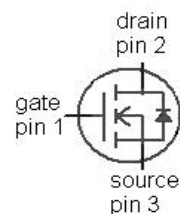
V_{DS}	800	V
$R_{DS(on)max}$ @ $T_j = 25^\circ\text{C}$	2.7	Ω
$Q_{g,typ}$	12	nC

PG-TO252-3



CoolMOS™ 800V designed for:

- Automotive application with high DC bulk voltage
- Switching Application (i.e. active clamp forward)



Type	Package	Marking
IPD80R2k7C3A	PG-TO252-3	80C2k7A

Maximum ratings, at $T_j=25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$T_C=25^\circ\text{C}$	2	A
		$T_C=100^\circ\text{C}$	1.2	
Pulsed drain current ²⁾	$I_{D,pulse}$	$T_C=25^\circ\text{C}$	6	
Avalanche energy, single pulse	E_{AS}	$I_D=1\text{ A}, V_{DD}=50\text{ V}$	90	mJ
Avalanche energy, repetitive $t_{AR}^{2),3)}$	E_{AR}	$I_D=2\text{ A}, V_{DD}=50\text{ V}$	0.05	
Avalanche current, repetitive $t_{AR}^{2),3)}$	I_{AR}		2	A
MOSFET dv/dt ruggedness	dv/dt	$V_{DS}=0\dots 640\text{ V}$	50	V/ns
Gate source voltage	V_{GS}	static	± 20	V
		AC ($f>1\text{ Hz}$)	± 30	
Power dissipation	P_{tot}	$T_C=25^\circ\text{C}$	42	W
Operating, Storage temperature	T_j, T_{stg}		-40 ... 150	$^\circ\text{C}$

Maximum ratings, at $T_j=25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous diode forward current	I_S	$T_C=25\text{ °C}$	2	A
Diode pulse current ²⁾	$I_{S,pulse}$		6	
Reverse diode dv/dt ⁴⁾	dv/dt		4	V/ns

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Thermal characteristics

Thermal resistance, junction - case	R_{thJC}		-	-	3	K/W
Thermal resistance, junction - ambient	R_{thJA}	SMD version, device on PCB, minimal footprint	-	-	62	
		SMD version, device on PCB, 6 cm ² cooling area ⁵⁾	-	35	-	
Soldering temperature, reflow soldering	T_{sold}	reflow MSL1	-	-	260	°C

Electrical characteristics, at $T_j=25\text{ °C}$, unless otherwise specified

Static characteristics

Drain-source breakdown voltage ¹⁾	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}$, $I_D=250\text{ }\mu\text{A}$	800	-	-	V
Avalanche breakdown voltage	$V_{(BR)DS}$	$V_{GS}=0\text{ V}$, $I_D=2\text{ A}$	-	870	-	
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=0.12\text{ mA}$	2.1	3	3.9	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=800\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$	-	-	5	μA
		$V_{DS}=800\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=150\text{ °C}$	-	25	-	
Gate-source leakage current	I_{GSS}	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}$, $I_D=1.2\text{ A}$, $T_j=25\text{ °C}$	-	2.4	2.7	Ω
		$V_{GS}=10\text{ V}$, $I_D=1.2\text{ A}$, $T_j=150\text{ °C}$	-	5.5	-	
Gate resistance	R_G	$f=1\text{ MHz}$, open drain	-	1.2	-	Ω

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics

Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=100\text{ V},$ $f=1\text{ MHz}$	-	290	-	pF
Output capacitance	C_{oss}		-	13	-	
Effective output capacitance, energy related ⁶⁾	$C_{o(er)}$	$V_{GS}=0\text{ V}, V_{DS}=0\text{ V}$ to 480 V	-	11	-	
Effective output capacitance, time related ⁷⁾	$C_{o(tr)}$		-	26	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=400\text{ V},$ $V_{GS}=0/10\text{ V}, I_D=2\text{ A},$ $R_{G,ext}=47\text{ }\Omega, T_j=25\text{ }^\circ\text{C}$	-	25	-	ns
Rise time	t_r		-	15	-	
Turn-off delay time	$t_{d(off)}$		-	72	-	
Fall time	t_f		-	18	-	

Gate Charge Characteristics

Gate to source charge	Q_{gs}	$V_{DD}=640\text{ V}, I_D=2\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	1.5	-	nC
Gate to drain charge	Q_{gd}		-	6	-	
Gate charge total	Q_g		-	12	16	
Gate plateau voltage	$V_{plateau}$		-	5.5	-	V

Reverse Diode

Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=I_S=2\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	1	1.2	V
Reverse recovery time	t_{rr}	$V_R=400\text{ V}, I_F=I_S=2\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	520	-	ns
Reverse recovery charge	Q_{rr}		-	2	-	μC
Peak reverse recovery current	I_{rrm}		-	6	-	A

¹⁾ For applications with applied blocking voltage > 65% of the specified blocking voltage, we recommend to evaluate the impact of the cosmic radiation effect in early design phase. For assessment please contact local Infineon sales office.

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

³⁾ Repetitive avalanche causes additional power losses that can be calculated as $P_{AV}=E_{AR} \cdot f$.

⁴⁾ $I_{SD} \leq I_D$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DCLink} = 400\text{ V}$, $V_{peak} < V_{(BR)DSS}$, $T_j < T_{j,max}$, identical low side and high side switch

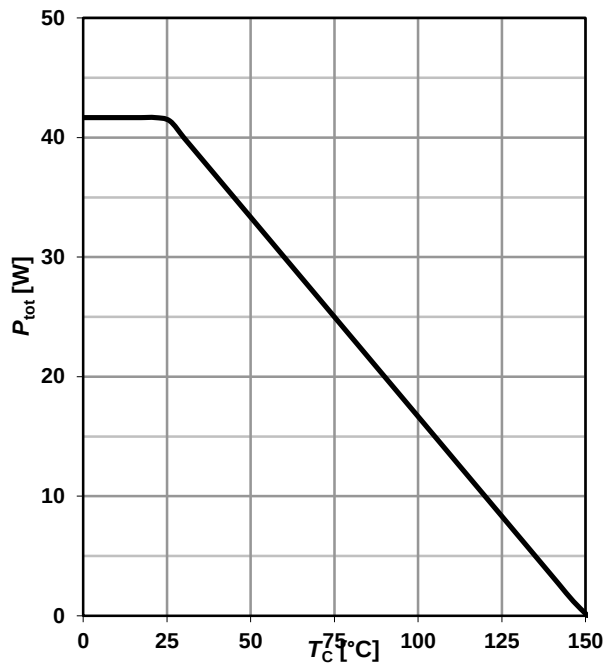
⁵⁾ Device on 40mm*40mm*1.5 epoxy PCB FR4 with 6cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical without blown air

⁶⁾ $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .

⁷⁾ $C_{o(tr)}$ 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

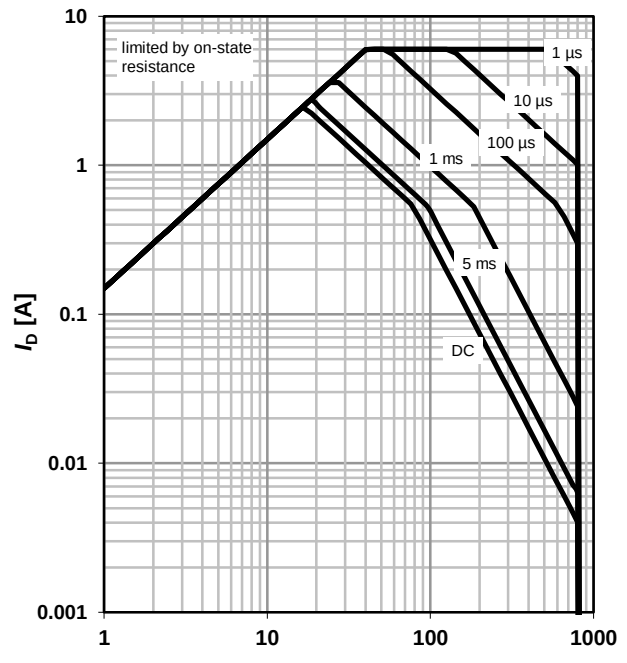
$$P_{\text{tot}} = f(T_C)$$



2 Safe operating area ¹⁾

$$I_D = f(V_{DS}); T_C = 25^\circ\text{C}; D = 0, \text{ Parameter: } t_p$$

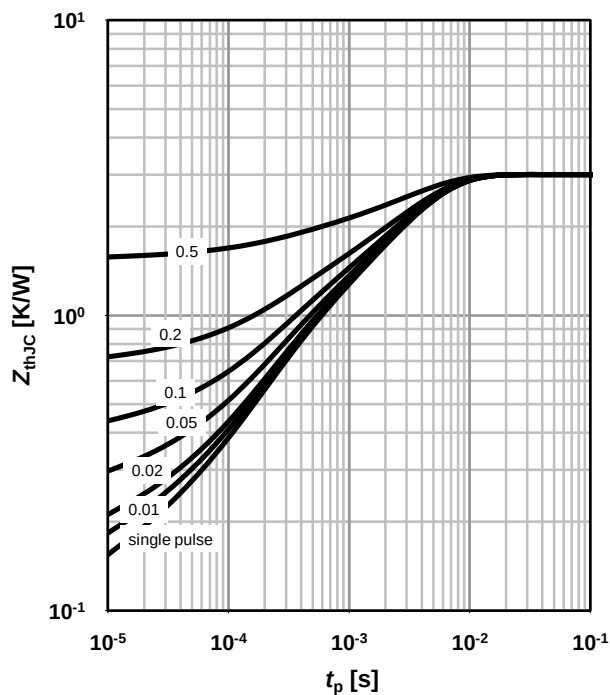
¹⁾ DC curve indicates operation at thermal equilibrium state, not guaranteed over lifetime.



3 Max. transient thermal impedance

$$Z_{\text{thJC}} = f(t_p)$$

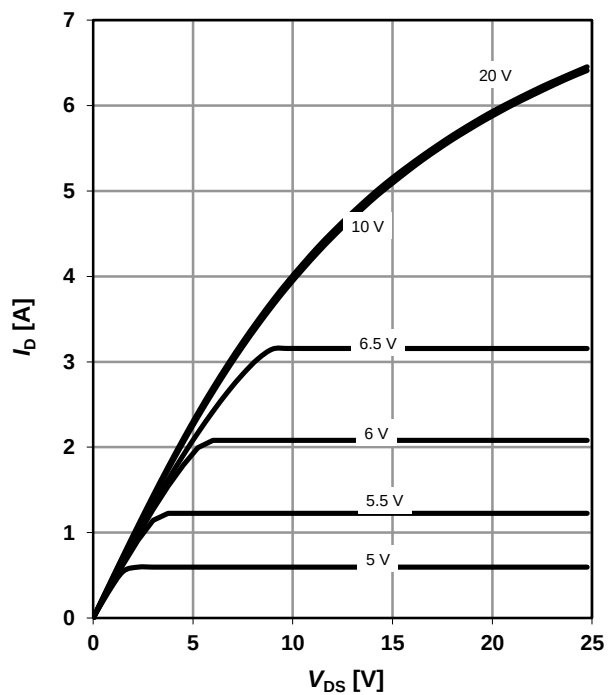
parameter: $D = t_p / T$



4 Typ. output characteristics

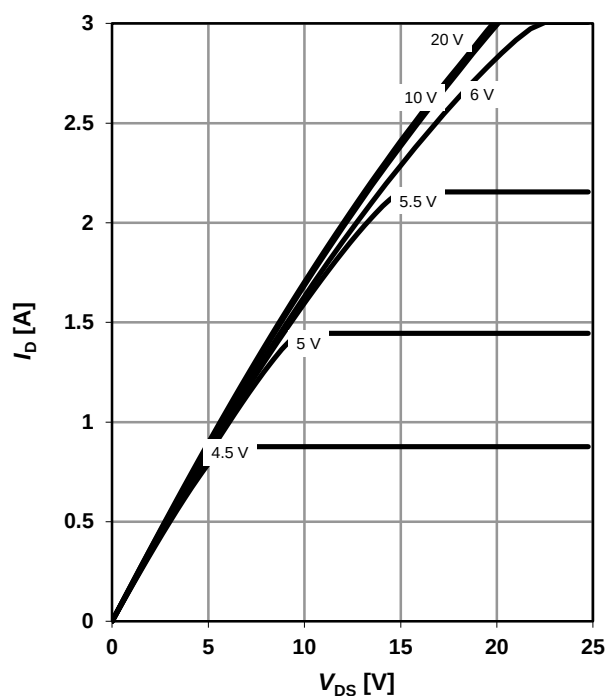
$$I_D = f(V_{DS}); T_J = 25^\circ\text{C}; t_p = 10\text{ }\mu\text{s}$$

parameter: V_{GS}



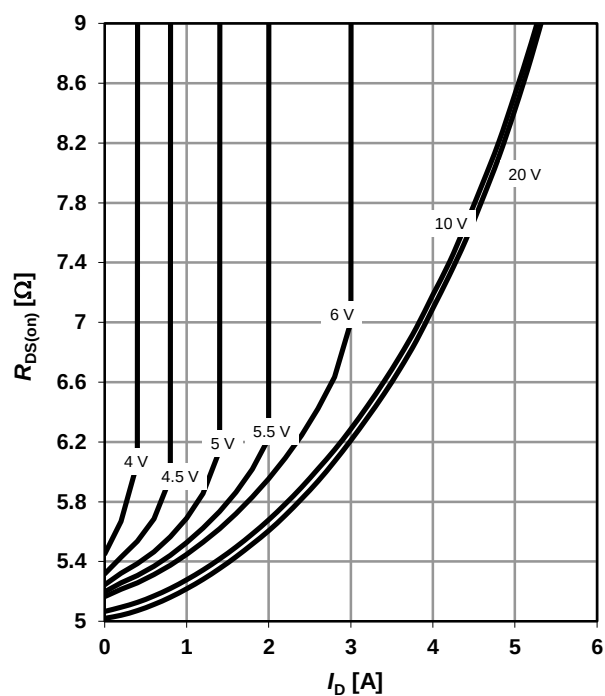
5 Typ. output characteristics

 $I_D = f(V_{DS}); T_j = 150^\circ\text{C}; t_p = 10\ \mu\text{s}$

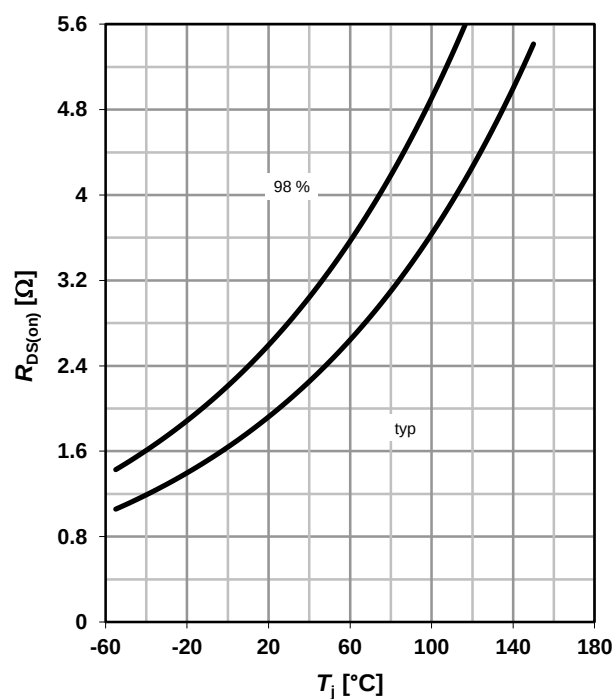
parameter: V_{GS}


6 Typ. drain-source on-state resistance

 $R_{DS(on)} = f(I_D); T_j = 150^\circ\text{C}$

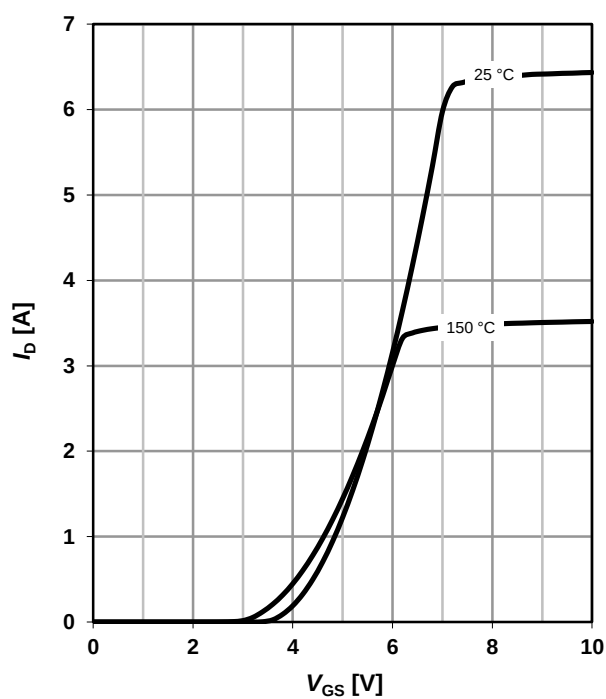
parameter: V_{GS}


7 Drain-source on-state resistance

 $R_{DS(on)} = f(T_j); I_D = 1.2\ \text{A}; V_{GS} = 10\ \text{V}$


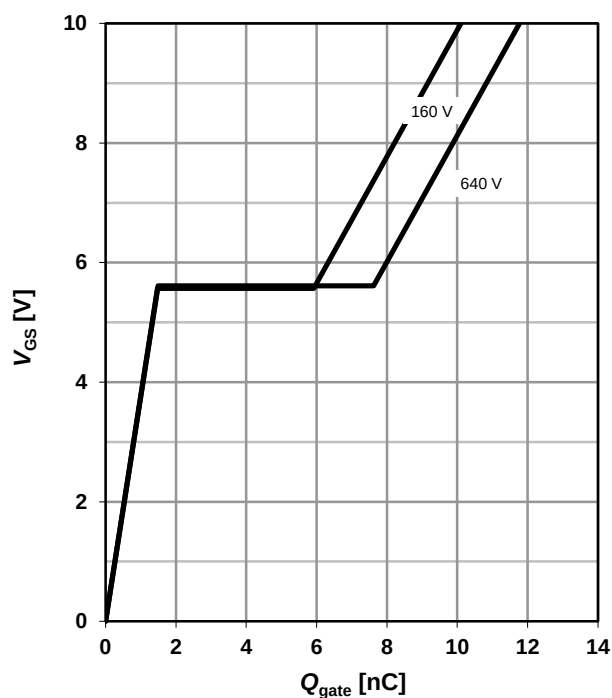
8 Typ. transfer characteristics

 $I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)\max}; t_p = 10\ \mu\text{s}$

parameter: T_j


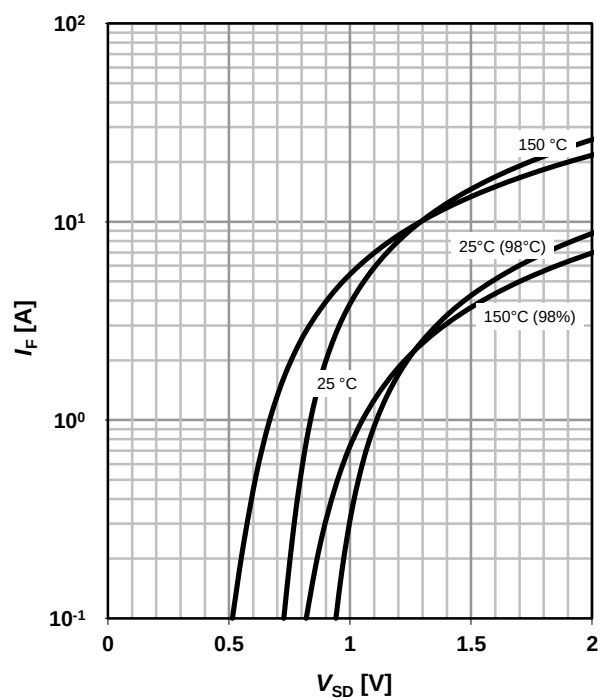
9 Typ. gate charge

 $V_{GS}=f(Q_{gate}); I_D=2\text{ A pulsed}$

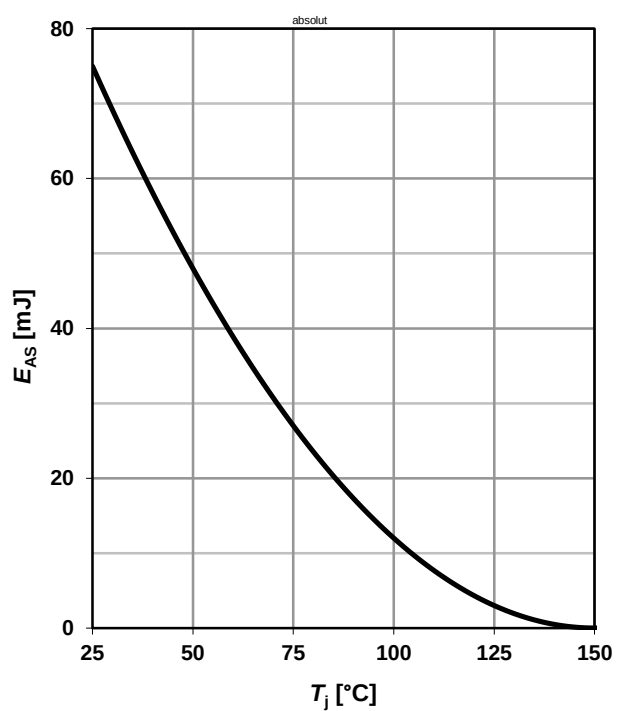
parameter: V_{DD}


10 Forward characteristics of reverse diode

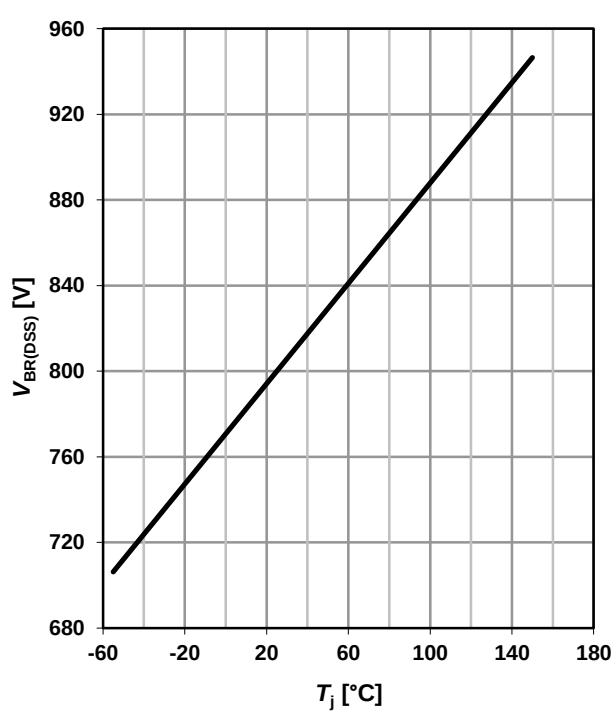
 $I_F=f(V_{SD}); t_p=10\text{ }\mu\text{s}$

parameter: T_j


11 Avalanche energy

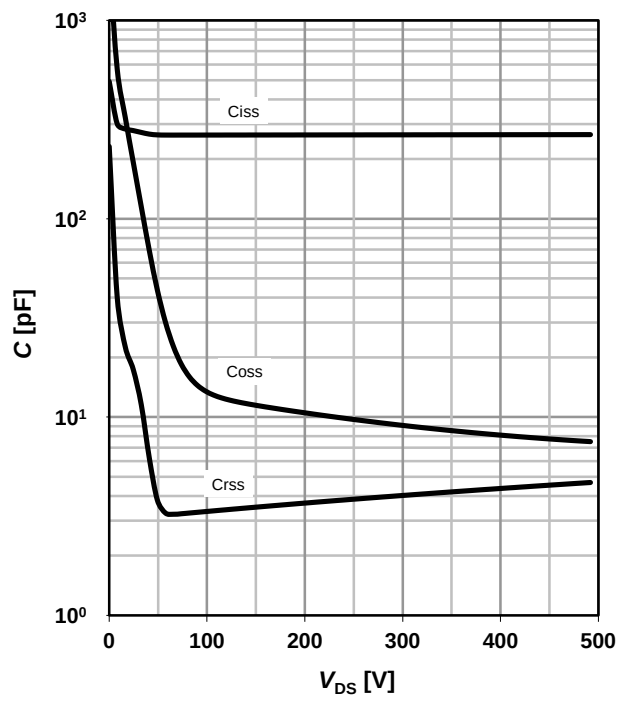
 $E_{AS}=f(T_j); I_D=1\text{ A}; V_{DD}=50\text{ V}$


12 Drain-source breakdown voltage

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


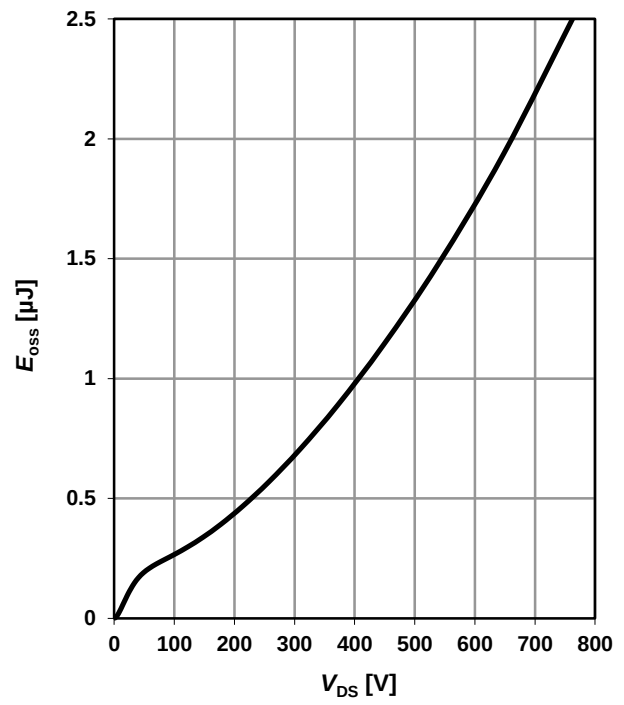
13 Typ. capacitances

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

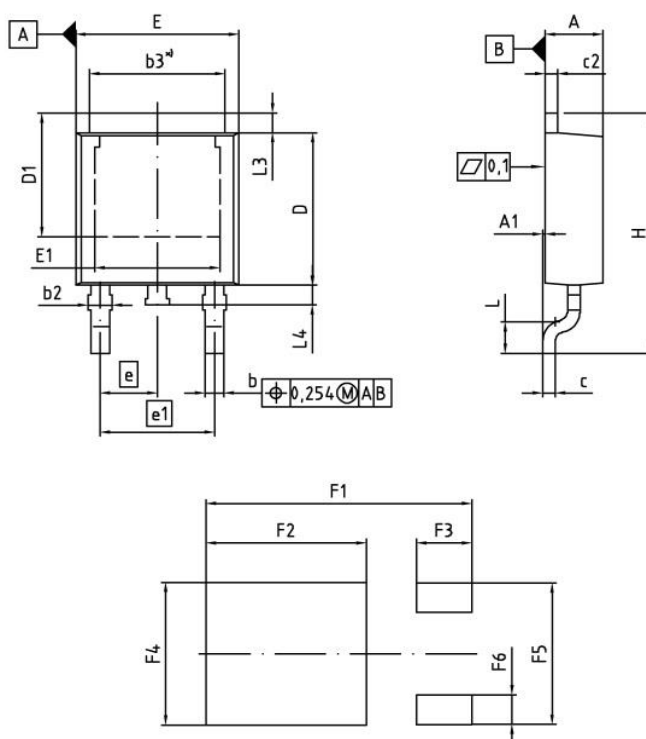


14 Typ. Coss stored energy

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



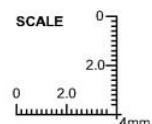
TO252-3 (DPAK)



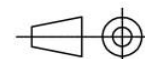
*) mold flash not included

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.16	2.41	0.085	0.095
A1	0.00	0.15	0.000	0.006
b	0.64	0.89	0.025	0.035
b2	0.65	1.15	0.026	0.045
b3	5.00	5.50	0.197	0.217
c	0.46	0.60	0.018	0.024
c2	0.46	0.98	0.018	0.039
D	5.97	6.22	0.235	0.245
D1	5.02	5.84	0.198	0.230
E	6.40	6.73	0.252	0.265
E1	4.70	5.21	0.185	0.205
e	2.29 (BSC)		0.090 (BSC)	
e1	4.57		0.180	
N	3		180	
H	9.40	10.48	0.370	0.413
L	1.18	1.70	0.046	0.067
L3	0.90	1.25	0.035	0.049
L4	0.51	1.00	0.020	0.039
F1	10.60		0.417	
F2	6.40		0.252	
F3	2.20		0.087	
F4	5.80		0.228	
F5	5.76		0.227	
F6	1.20		0.047	

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04

dimensions in mm/inches

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