

### CoolMOS™ Power Transistor

#### Features

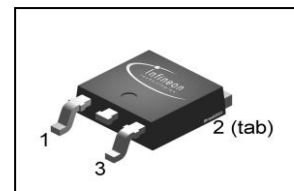
- New revolutionary high voltage technology
- Extreme dv/dt rated
- High peak current capability
- Qualified according to AEC Q101
- Green package (RoHS compliant), Pb-free lead plating, halogen free for mold compound
- Ultra low gate charge
- Ultra low effective capacitances



#### Product Summary

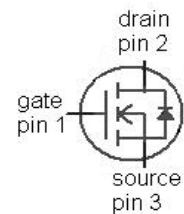
$V_{DS}$	800	V
$R_{DS(on)max}$ @ $T_j = 25^\circ\text{C}$	2.7	$\Omega$
$Q_{g,typ}$	12	nC

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 <sup>2)</sup>	$I_{D,pulse}$	$T_C=25^\circ\text{C}$	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	$V_{DS}=0\dots640\text{ V}$	50	V/ns
Gate source voltage	$V_{GS}$	static	$\pm 20$	V
		AC ( $f > 1\text{ Hz}$ )	$\pm 30$	
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 <sup>2)</sup>	$I_{S,pulse}$		6	
Reverse diode $dv/dt$ <sup>4)</sup>	$dv/dt$		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 <sup>2</sup> cooling area <sup>5)</sup>	-	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 <sup>1)</sup>	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}$ , $I_D=250\text{ }\mu\text{A}$	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	$\mu\text{A}$
		$V_{DS}=800\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=150\text{ °C}$	-	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	$\Omega$
		$V_{GS}=10\text{ V}$ , $I_D=1.2\text{ A}$ , $T_j=150\text{ °C}$	-	5.5	-	
Gate resistance	$R_G$	$f=1\text{ MHz}$ , open drain	-	1.2	-	$\Omega$

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 <sup>6)</sup>	$C_{o(er)}$	$V_{GS}=0\text{ V}, V_{DS}=0\text{ V}$ to 480 V	-	11	-	
Effective output capacitance, time related <sup>7)</sup>	$C_{o(tr)}$		-	26	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=400\text{ V},$ $V_{GS}=0/10\text{ V}, I_D=2\text{ A},$ $R_{G,ext}=47\ \Omega, T_j=25\text{ }^\circ\text{C}$	-	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	-	$\mu\text{C}$
Peak reverse recovery current	$I_{rrm}$		-	6	-	A

<sup>1)</sup> 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.

<sup>2)</sup> Pulse width  $t_p$  limited by  $T_{j,max}$

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

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

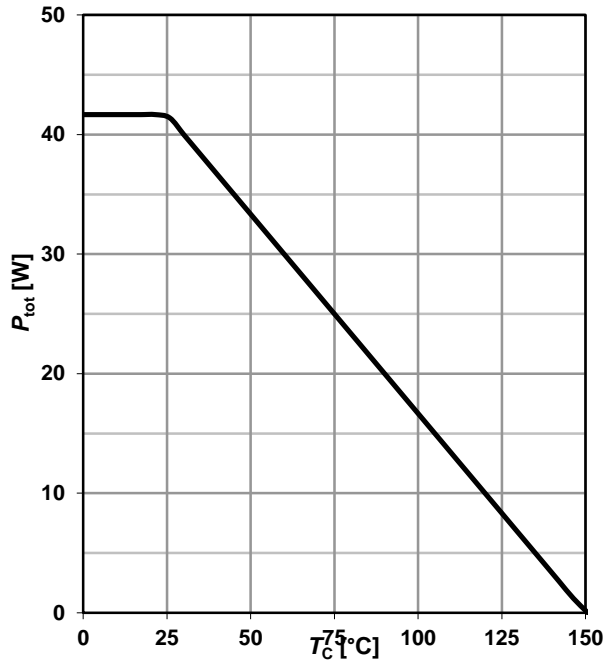
<sup>5)</sup> Device on 40mm\*40mm\*1.5 epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70 $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air

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

<sup>7)</sup>  $C_{o(tr)}$  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**

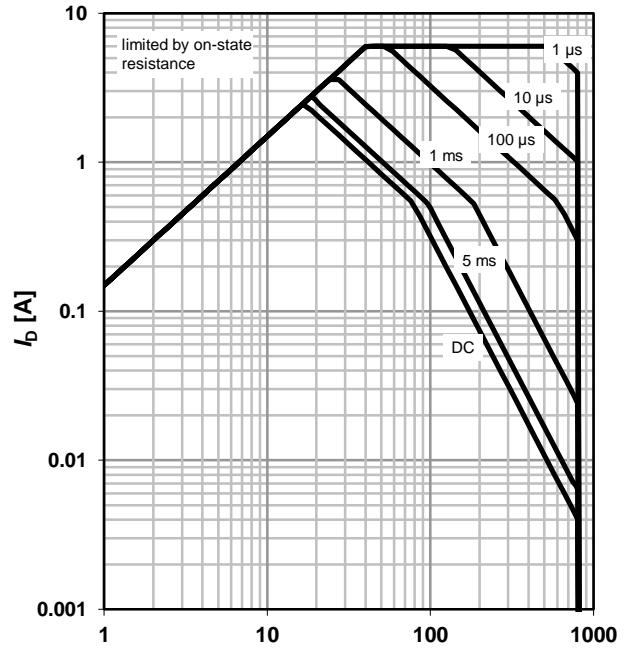
$P_{tot}=f(T_C)$



**2 Safe operating area <sup>1)</sup>**

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

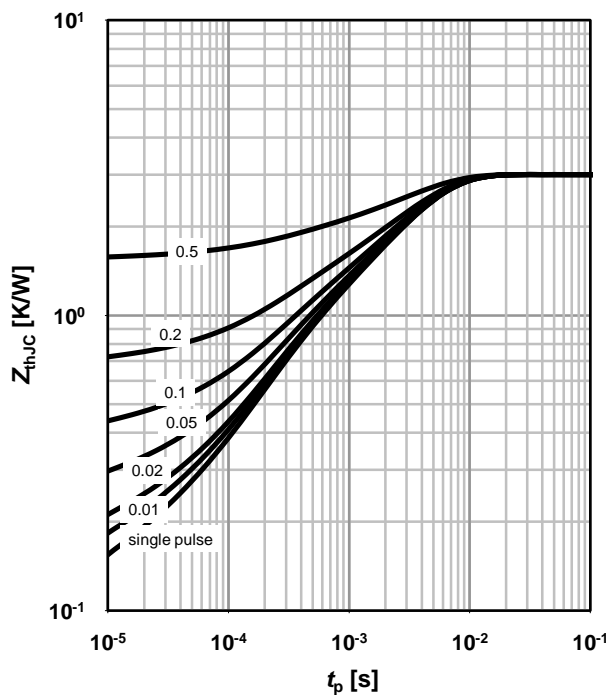
<sup>1)</sup> DC curve indicates operation at thermal equilibrium state, not guaranteed over lifetime.



**3 Max. transient thermal impedance**

$Z_{thJC}=f(t_p)$

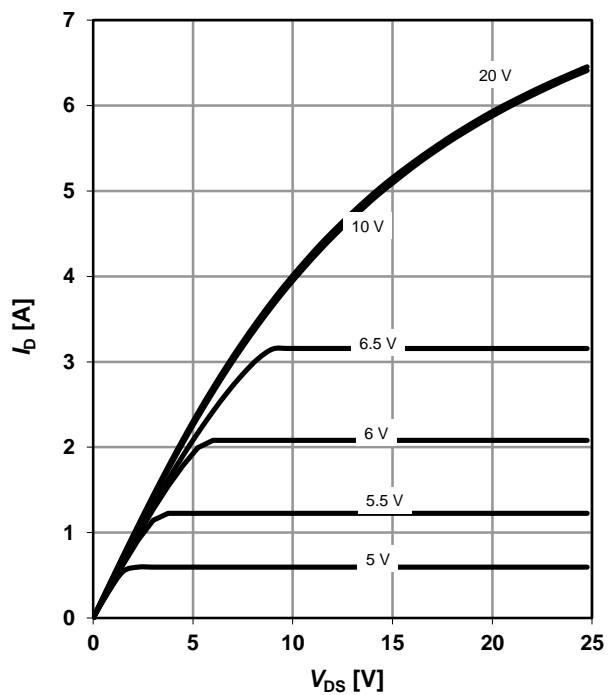
parameter:  $D=t_p/T$



**4 Typ. output characteristics**

$I_D=f(V_{DS}); T_j=25\text{ °C}; t_p=10\text{ μs}$

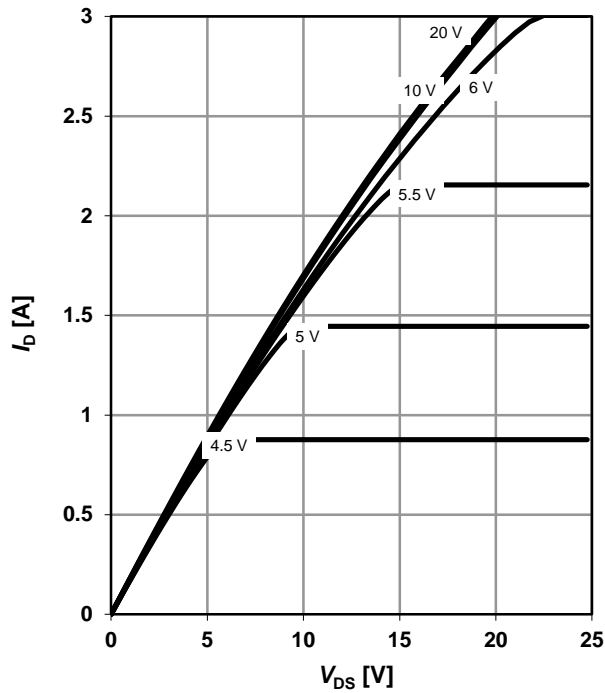
parameter:  $V_{GS}$



**5 Typ. output characteristics**

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

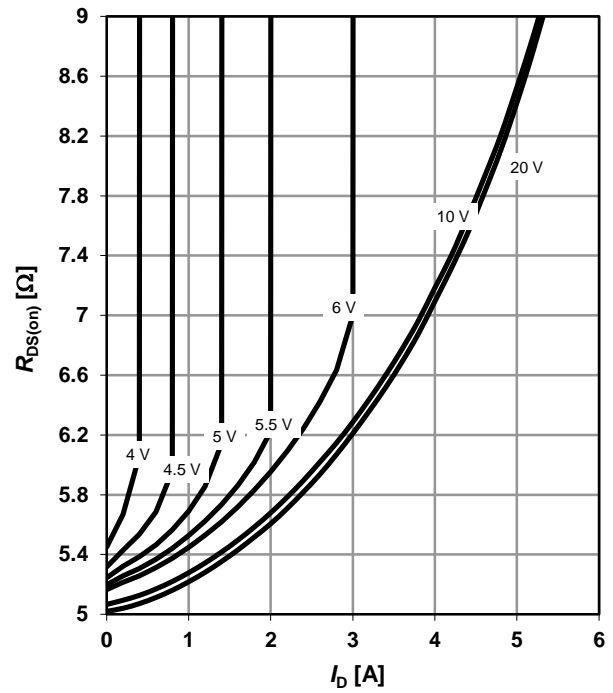
parameter:  $V_{GS}$



**6 Typ. drain-source on-state resistance**

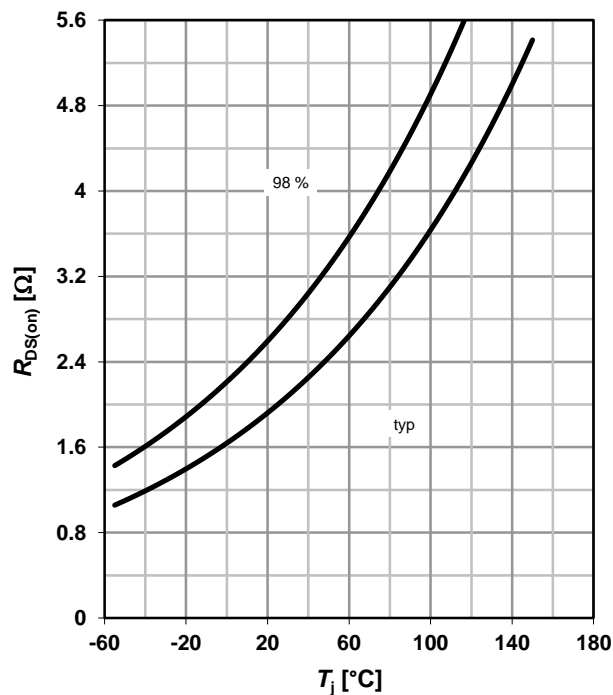
$R_{DS(on)}=f(I_D); T_j=150\text{ }^\circ\text{C}$

parameter:  $V_{GS}$



**7 Drain-source on-state resistance**

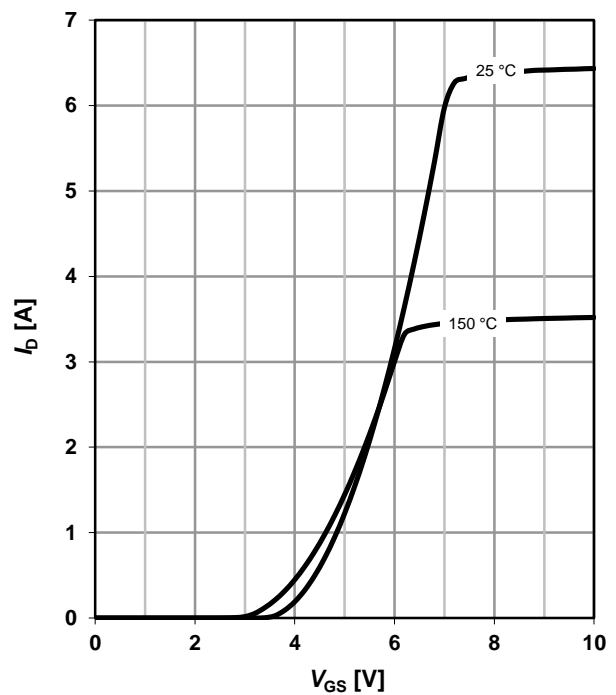
$R_{DS(on)}=f(T_j); I_D=1.2\text{ A}; V_{GS}=10\text{ V}$



**8 Typ. transfer characteristics**

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

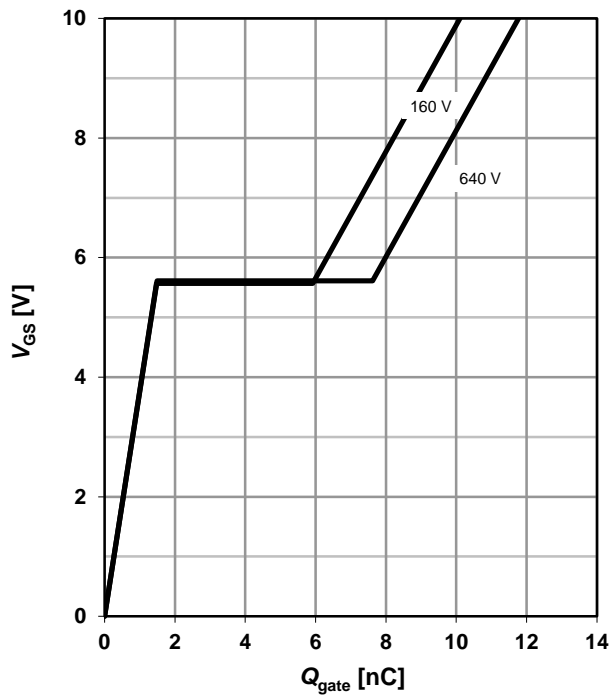
parameter:  $T_j$



**9 Typ. gate charge**

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

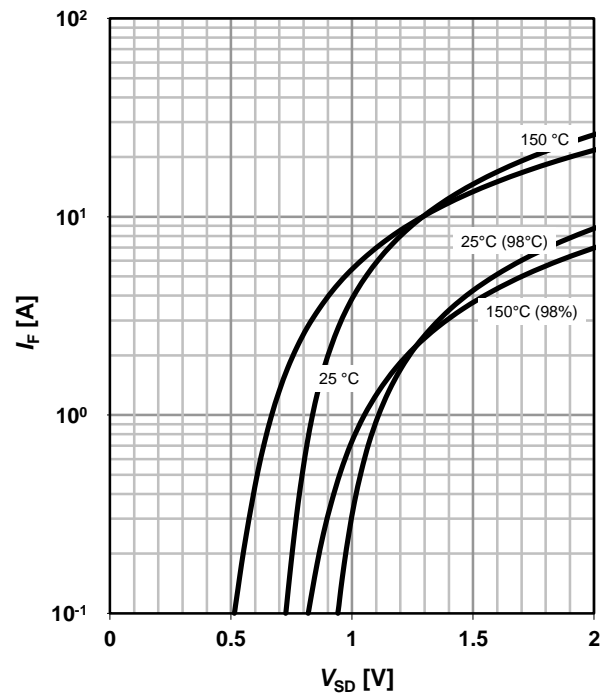
parameter:  $V_{DD}$



**10 Forward characteristics of reverse diode**

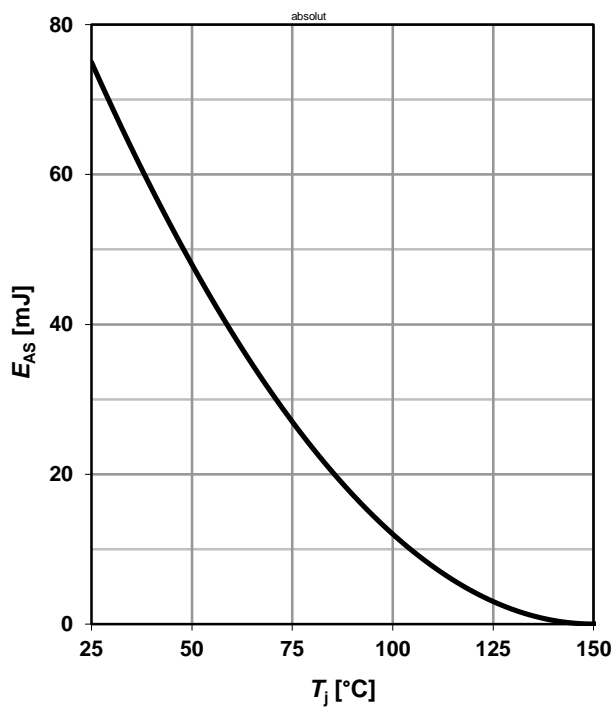
$I_F=f(V_{SD}); t_p=10\ \mu\text{s}$

parameter:  $T_j$



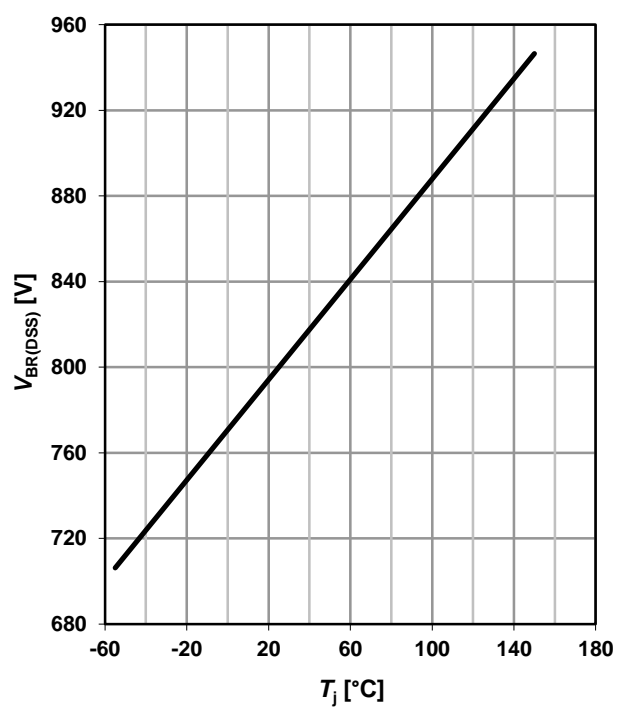
**11 Avalanche energy**

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



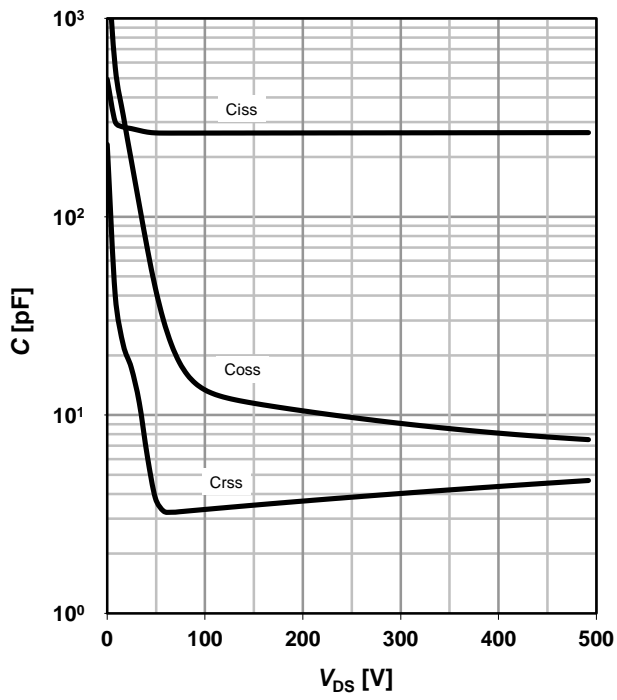
**12 Drain-source breakdown voltage**

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



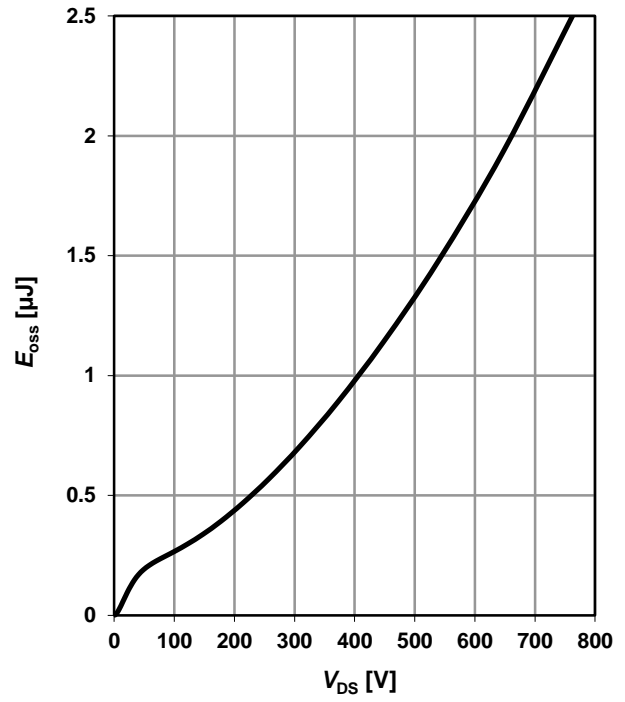
**13 Typ. capacitances**

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

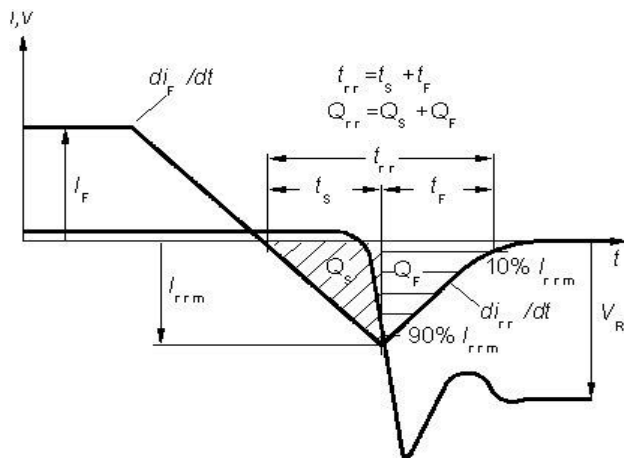


**14 Typ. Coss stored energy**

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

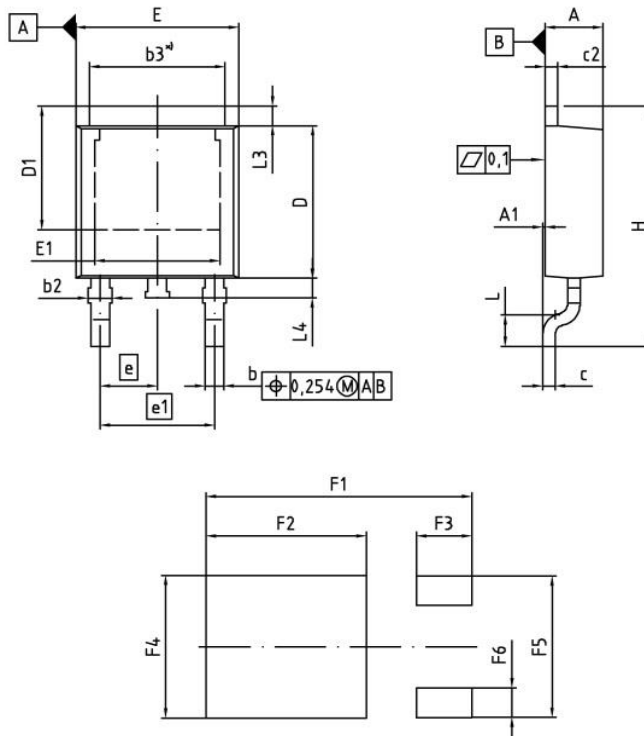


Definition of diode switching characteristics





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		3	
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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dimensions in mm/inches

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