

## CoolMOS™ Power Transistor

### Features

- New revolutionary high voltage technology
- Extreme dv/dt rated
- High peak current capability
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Pb-free lead plating; RoHS compliant
- Ultra low gate charge
- Ultra low effective capacitances

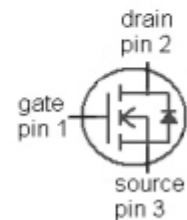
### Product Summary

$V_{DS}$	800	V
$R_{DS(on)max}$ @ $T_j = 25^\circ\text{C}$	0.29	$\Omega$
$Q_{g,typ}$	88	nC

**PG-TO247-3**


### CoolMOS™ 800V designed for:

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



Type	Package	Marking
SPW17N80C3	PG-TO247-3	17N80C3

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$T_C=25^\circ\text{C}$	17	A
		$T_C=100^\circ\text{C}$	11	
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	$T_C=25^\circ\text{C}$	51	
Avalanche energy, single pulse	$E_{AS}$	$I_D=3.4\text{ A}$ , $V_{DD}=50\text{ V}$	670	mJ
Avalanche energy, repetitive $t_{AR}$ <sup>2),3)</sup>	$E_{AR}$	$I_D=17\text{ A}$ , $V_{DD}=50\text{ V}$	0.5	
Avalanche current, repetitive $t_{AR}$ <sup>2),3)</sup>	$I_{AR}$		17	A
MOSFET dv/dt ruggedness	dv/dt	$V_{DS}=0\dots 640\text{ V}$	50	V/ns
Gate source voltage	$V_{GS}$	static	$\pm 20$	V
		AC ( $f>1\text{ Hz}$ )	$\pm 30$	
Power dissipation	$P_{tot}$	$T_C=25^\circ\text{C}$	227	W
Operating and storage temperature	$T_j$ , $T_{stg}$		-55 ... 150	$^\circ\text{C}$
Mounting torque		M2.5 screws	50	Ncm

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

Parameter	Symbol	Conditions	Value	Unit
Continuous diode forward current	$I_S$	$T_C=25\text{ °C}$	17	A
Diode pulse current <sup>2)</sup>	$I_{S,pulse}$		51	
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	$R_{thJC}$		-	-	0.55	K/W
Thermal resistance, junction - ambient	$R_{thJA}$	leaded	-	-	62	
Soldering temperature, wave soldering only allowed at leads	$T_{sold}$	1.6 mm (0.063 in.) from case for 10s	-	-	260	°C

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

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=250\text{ }\mu\text{A}$	800	-	-	V
Avalanche breakdown voltage	$V_{(BR)DS}$	$V_{GS}=0\text{ V}, I_D=17\text{ A}$	-	870	-	
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=1.0\text{ mA}$	2.1	3	3.9	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=800\text{ V}, V_{GS}=0\text{ V}, T_J=25\text{ °C}$	-	-	25	$\mu\text{A}$
		$V_{DS}=800\text{ V}, V_{GS}=0\text{ V}, T_J=150\text{ °C}$	-	150	-	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=11\text{ A}, T_J=25\text{ °C}$	-	0.25	0.29	$\Omega$
		$V_{GS}=10\text{ V}, I_D=11\text{ A}, T_J=150\text{ °C}$	-	0.67	-	
Gate resistance	$R_G$	$f=1\text{ MHz}$ , open drain	-	0.85	-	$\Omega$

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics**

Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=100\text{ V},$	-	2300	-	pF
Output capacitance	$C_{oss}$	$f=1\text{ MHz}$	-	94	-	
Effective output capacitance, energy related <sup>5)</sup>	$C_{o(er)}$	$V_{GS}=0\text{ V}, V_{DS}=0\text{ V}$ to 480 V	-	72	-	
Effective output capacitance, time related <sup>6)</sup>	$C_{o(tr)}$		-	210	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=400\text{ V},$ $V_{GS}=10\text{ V}, I_D=17\text{ A},$ $R_G=4.7\ \Omega, T_J=25\text{ }^\circ\text{C}$	-	25	-	ns
Rise time	$t_r$		-	15	-	
Turn-off delay time	$t_{d(off)}$		-	72	-	
Fall time	$t_f$		-	12	-	

**Gate Charge Characteristics**

Gate to source charge	$Q_{gs}$	$V_{DD}=640\text{ V}, I_D=17\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	12	-	nC
Gate to drain charge	$Q_{gd}$		-	45	-	
Gate charge total	$Q_g$		-	88	117	
Gate plateau voltage	$V_{plateau}$		-	5.5	-	V

**Reverse Diode**

Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=I_S=17\text{ A},$ $T_J=25\text{ }^\circ\text{C}$	-	1	1.2	V
Reverse recovery time	$t_{rr}$	$V_R=400\text{ V},$ $I_F=I_S=17\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	550	-	ns
Reverse recovery charge	$Q_{rr}$		-	15	-	$\mu\text{C}$
Peak reverse recovery current	$I_{rrm}$		-	51	-	A

<sup>1)</sup> J-STD20 and JESD22

<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  $P_{AV}=E_{AR} \cdot f$ .

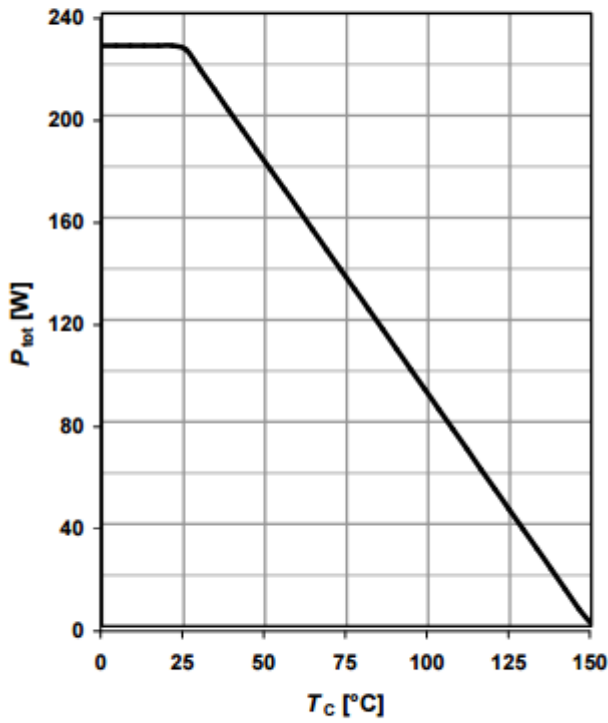
<sup>4)</sup>  $I_{SD}=I_D, di/dt=200\text{ A}/\mu\text{s}, V_{DCLink}=400\text{ V}, V_{peak}<V_{(BR)DSS}, T_J<T_{j,max}$ , identical low side and high side switch

<sup>5)</sup>  $C_{o(er)}$  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>6)</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

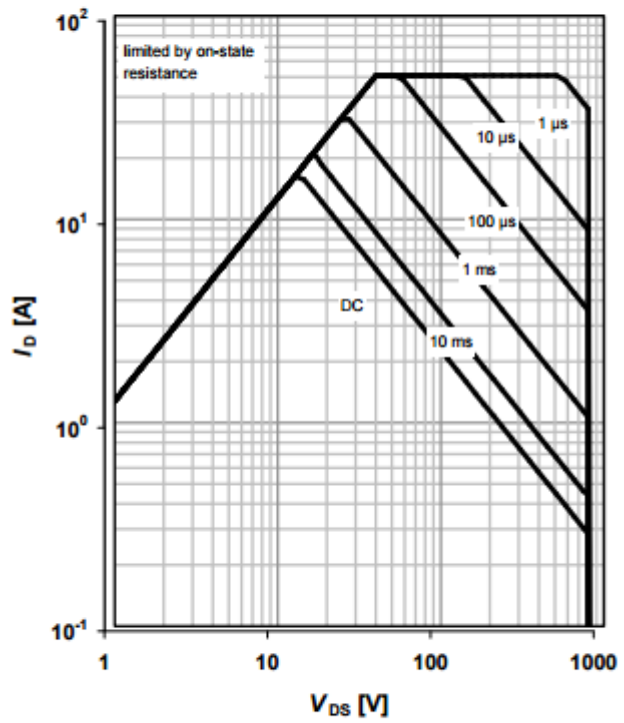
$$P_{\text{tot}} = f(T_c)$$



### 2 Safe operating area

$$I_D = f(V_{DS}); T_c = 25^\circ\text{C}; D = 0$$

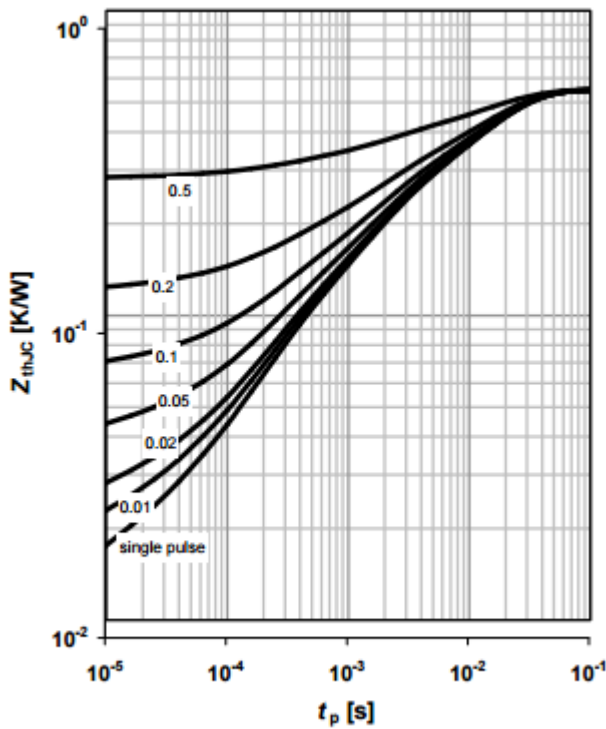
parameter:  $t_p$



### 3 Max. transient thermal impedance

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

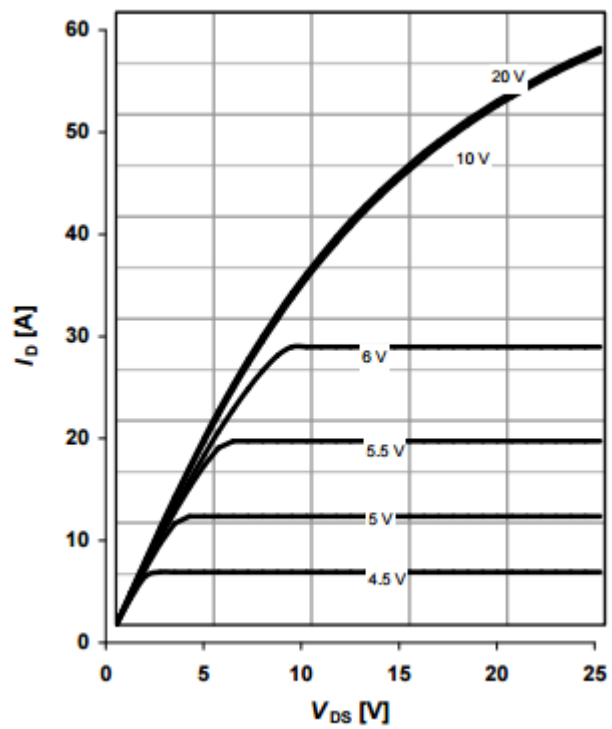
parameter:  $D = t_p / T$



### 4 Typ. output characteristics

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

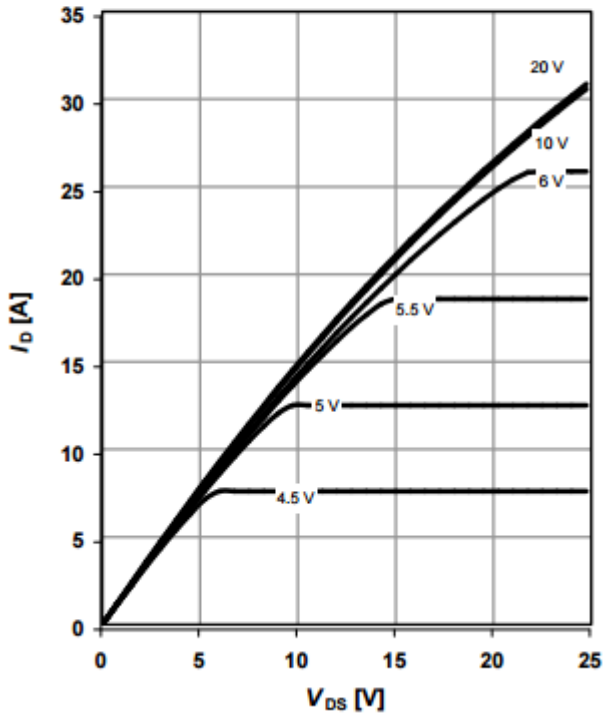
parameter:  $V_{GS}$



**5 Typ. output characteristics**

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

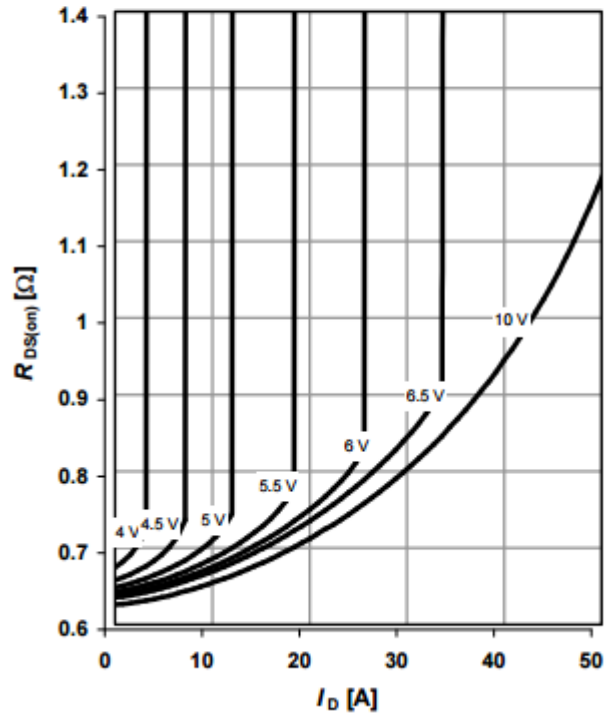
parameter:  $V_{GS}$



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

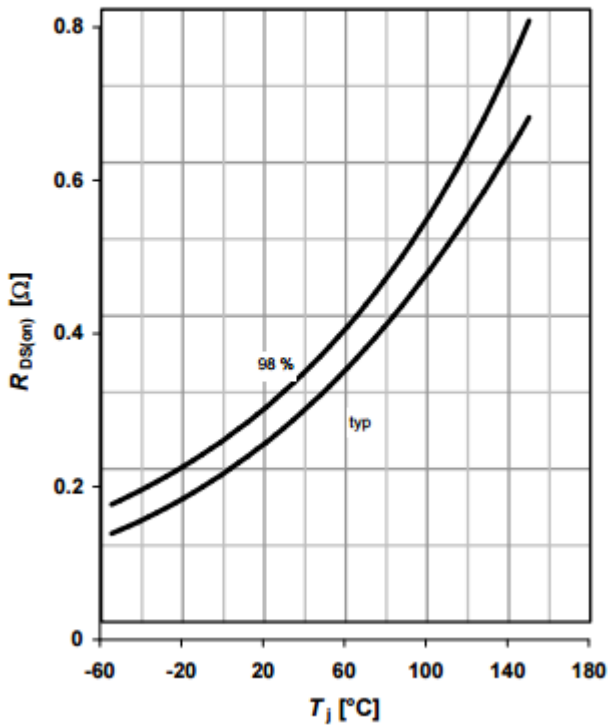
$R_{DS(on)} = f(I_D); T_J = 150\text{ }^\circ\text{C}$

parameter:  $V_{GS}$



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

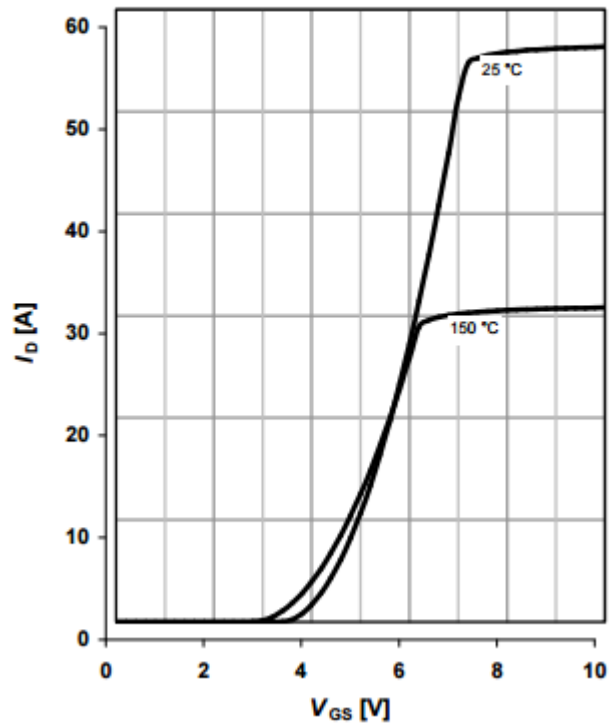
$R_{DS(on)} = f(T_J); I_D = 11\text{ A}; V_{GS} = 10\text{ V}$



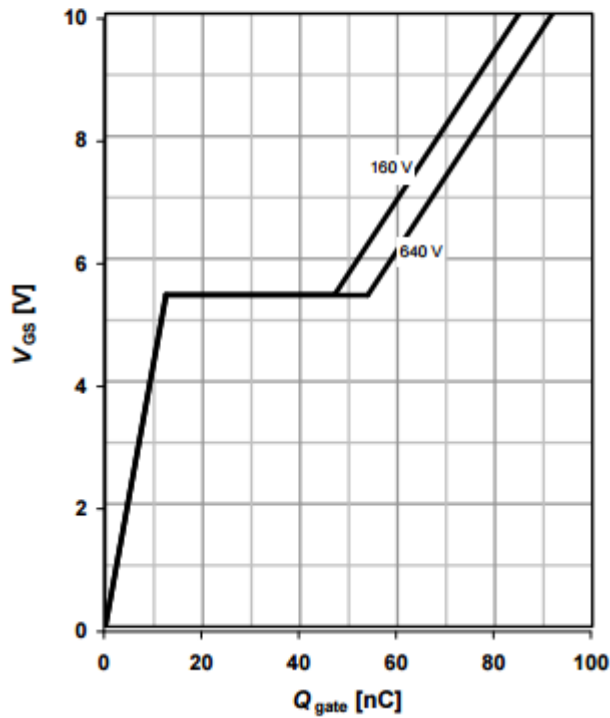
**8 Typ. transfer characteristics**

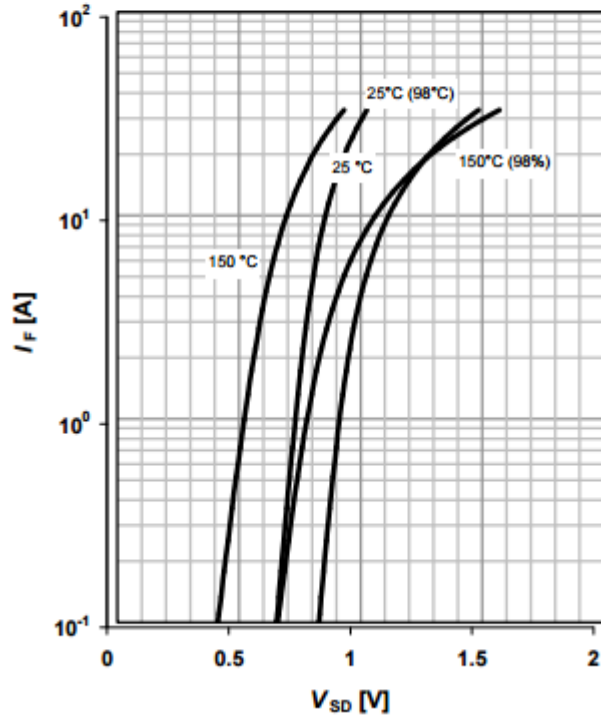
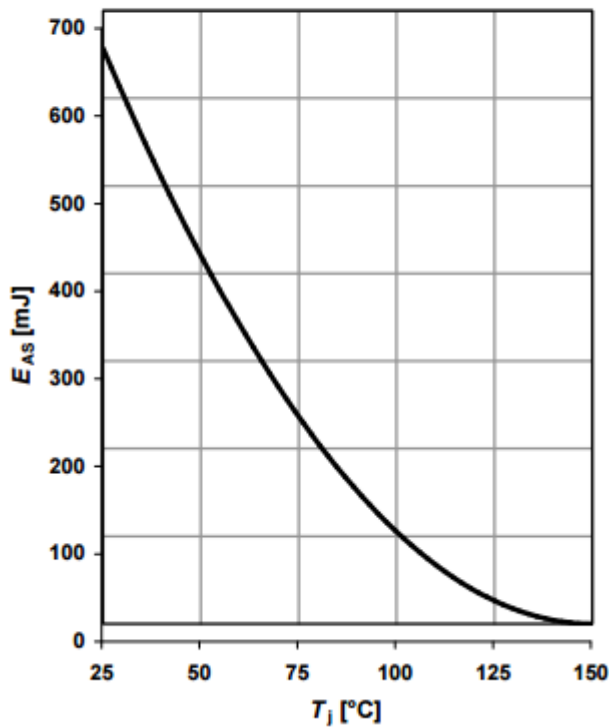
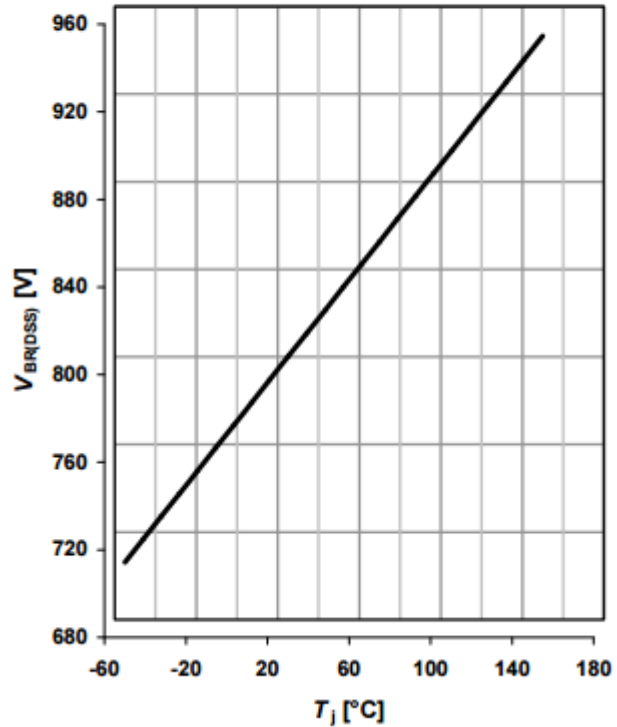
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}; t_p = 10\text{ }\mu\text{s}$

parameter:  $T_J$



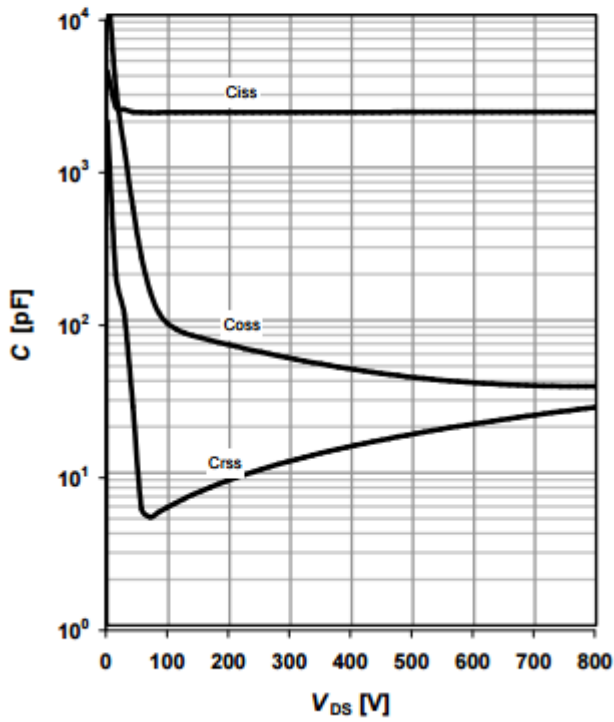
**9 Typ. gate charge**
 $V_{GS}=f(Q_{gate}); I_D=17\text{ A pulsed}$ 

 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**
 $E_{AS}=f(T_J); I_D=3.4\text{ A}; V_{DD}=50\text{ V}$ 

**12 Drain-source breakdown voltage**
 $V_{BR(DSS)}=f(T_J); I_D=0.25\text{ mA}$ 


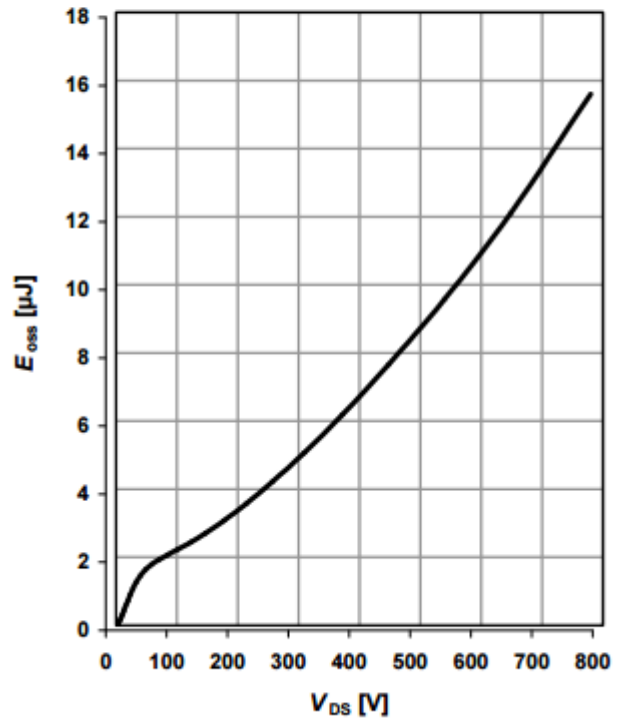
13 Typ. capacitances

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



14 Typ. Coss stored energy

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



Definition of diode switching characteristics

