NEC

MOS FIELD EFFECT TRANSISTOR
μPA2716GR

SWITCHING
P-CHANNEL POWER MOS FET

DESCRIPTION

The μPA2716GR is P-Channel MOS Field Effect Transistor designed for power management applications of notebook computers and Li-ion battery protection circuit.

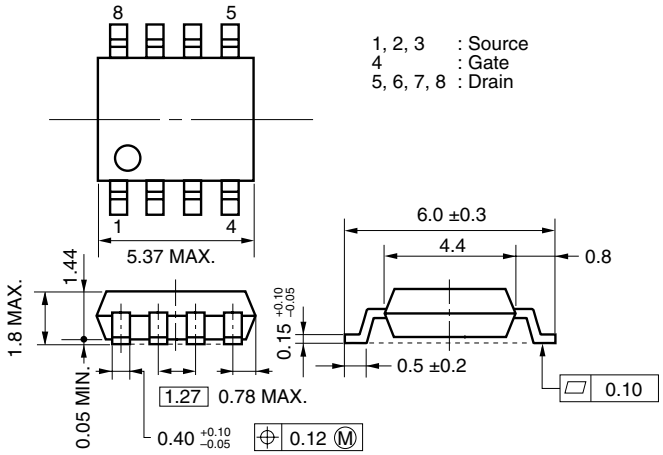
FEATURES

- Low on-state resistance
  $R_{DS(on)1}$ = 7.0 mΩ MAX. (V_{GS} = –10 V, I_D = –7.0 A)
  $R_{DS(on)2}$ = 11.3 mΩ MAX. (V_{GS} = –4.5 V, I_D = –7.0 A)
- Low C_{iss}: C_{iss} = 3000 pF TYP.
- Built-in gate protection diode
- Small and surface mount package (Power SOP8)

ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA2716GR	Power SOP8

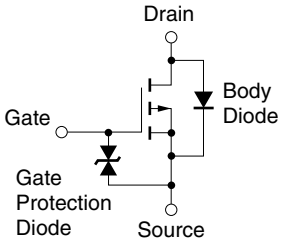
PACKAGE DRAWING (Unit: mm)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, All terminals are connected.)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	–30	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	∓20	V
Drain Current (DC)	$I_{D(DC)}$	∓14	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	∓140	A
Total Power Dissipation Note2	P_{T1}	2	W
Total Power Dissipation Note3	P_{T2}	2	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to + 150	°C
★ Single Avalanche Current Note4	I_{AS}	–14	A
Single Avalanche Energy Note4	E_{AS}	19.6	mJ

EQUIVALENT CIRCUIT



Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%
2. Mounted on ceramic substrate of 1200 mm² x 2.2 mm
3. Mounted on glass epoxy board of 25.4 mm x 25.4 mm x 0.8 mm, PW = 10 sec
4. Starting T_{ch} = 25°C, V_{DD} = –15 V, R_G = 25 Ω, L = 100 μH, V_{GS} = –20 → 0 V

Remark The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

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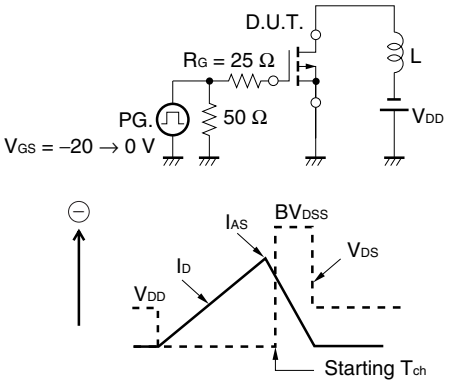
The mark ★ shows major revised points.

ELECTRICAL CHARACTERISTICS (T_A = 25°C, All terminals are connected.)

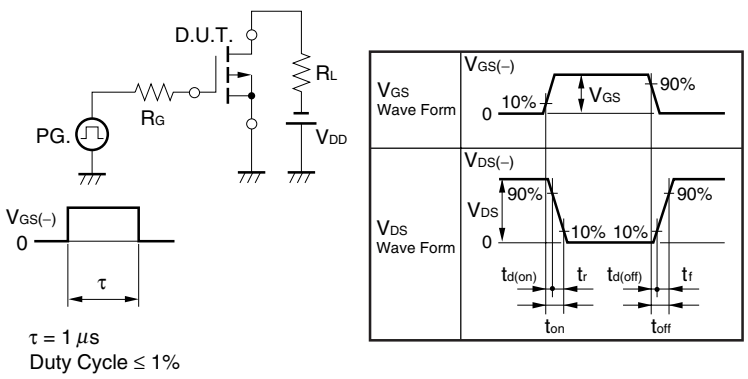
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = –30 V, V_{GS} = 0 V			–1	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ∓20 V, V_{DS} = 0 V			∓10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = –10 V, I_D = –1 mA	–1.0		–2.5	V
Forward Transfer Admittance Note	$\|y_{fs}\|$	V_{DS} = –10 V, I_D = –7.0 A	10			S
Drain to Source On-state Resistance Note	$R_{DS(on)1}$	V_{GS} = –10 V, I_D = –7.0 A		5.5	7.0	mΩ
	$R_{DS(on)2}$	V_{GS} = –4.5 V, I_D = –7.0 A		7.3	11.3	mΩ
★	$R_{DS(on)3}$	V_{GS} = –4.0 V, I_D = –7.0 A		8.3	13.5	mΩ
Input Capacitance	C_{iss}	V_{DS} = –10 V		3000		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		960		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		500		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = –15 V, I_D = –7.0 A		14		ns
Rise Time	t_r	V_{GS} = –10 V		19		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		680		ns
Fall Time	t_f			340		ns
Total Gate Charge	Q_G	V_{DD} = –24 V		95		nC
Gate to Source Charge	Q_{GS}	V_{GS} = –10 V		11		nC
Gate to Drain Charge	Q_{GD}	I_D = –14 A		25		nC
Body Diode Forward Voltage Note	$V_{F(S-D)}$	I_F = 14 A, V_{GS} = 0 V		0.83		V
Reverse Recovery Time	t_{rr}	I_F = 14 A, V_{GS} = 0 V		380		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 50 A/μs		690		nC

Note Pulsed

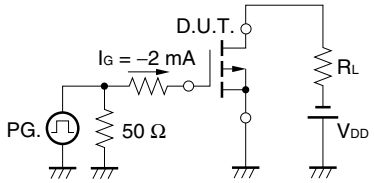
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

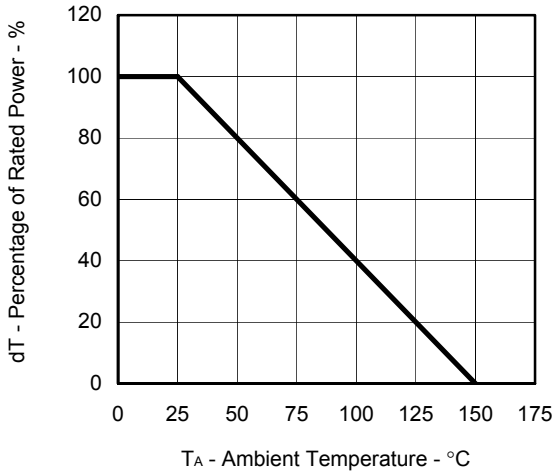


TEST CIRCUIT 3 GATE CHARGE

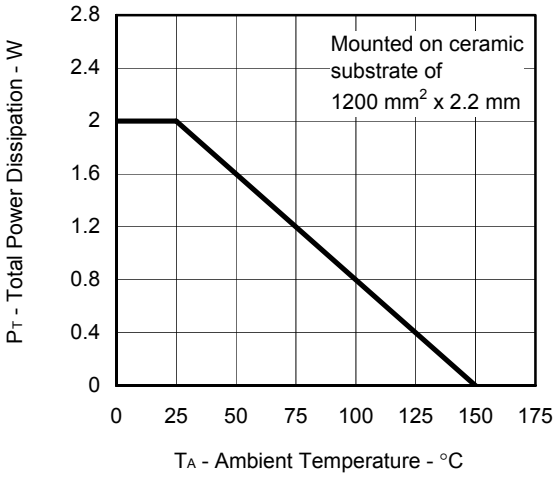


TYPICAL CHARACTERISTICS (T_A = 25°C)

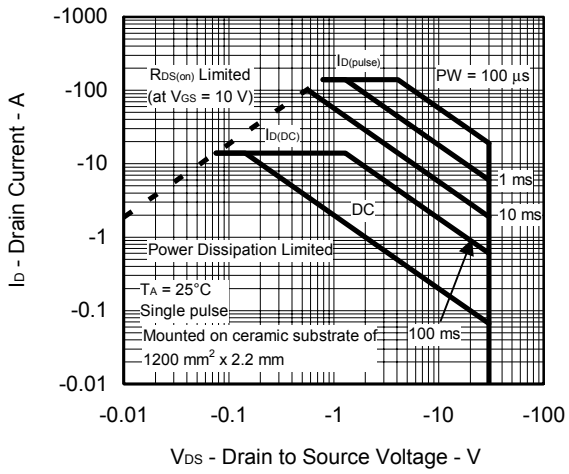
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



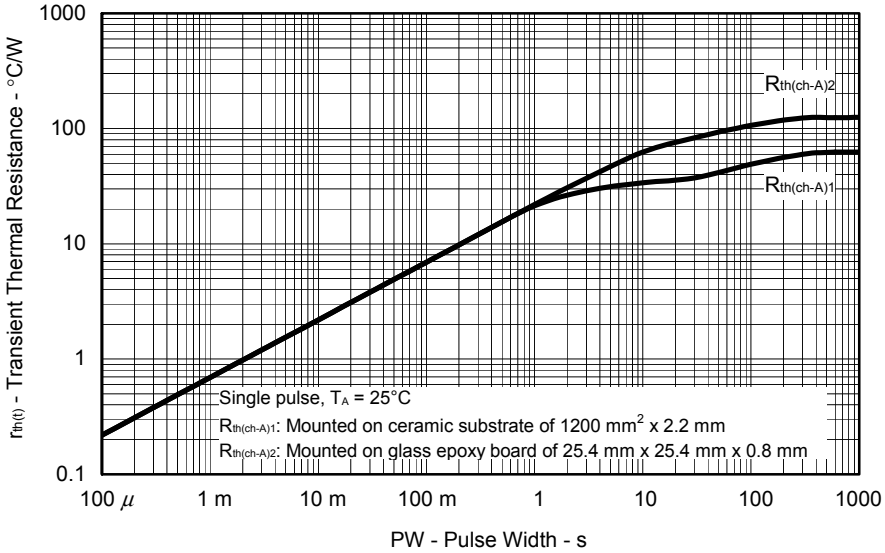
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



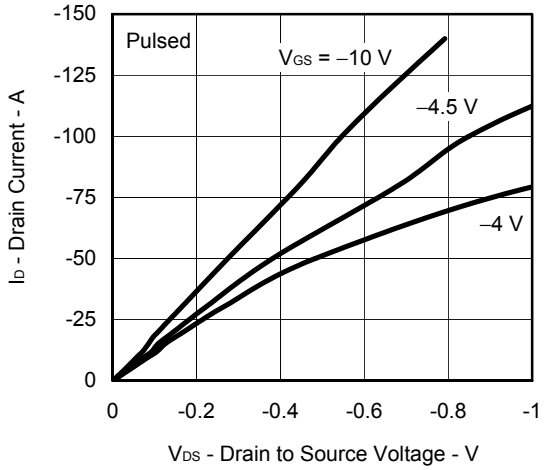
FORWARD BIAS SAFE OPERATING AREA



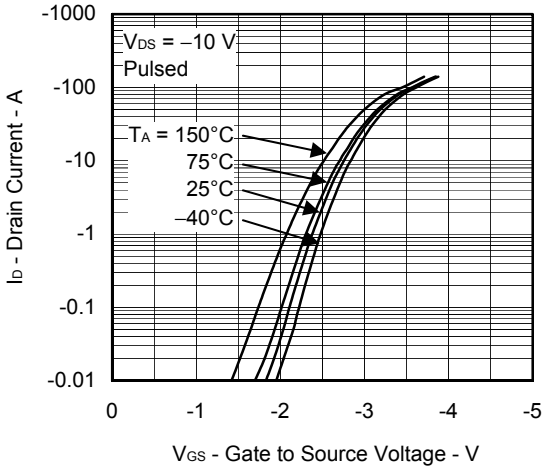
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



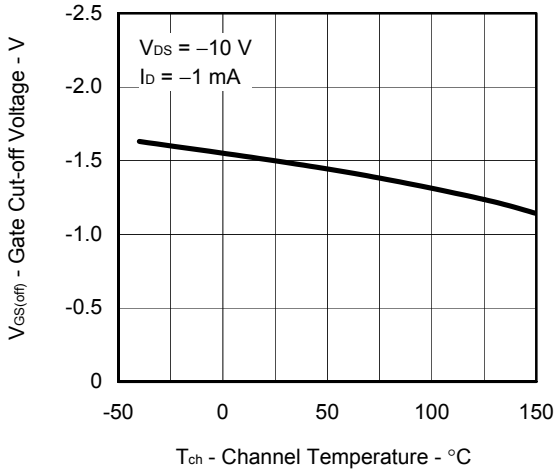
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



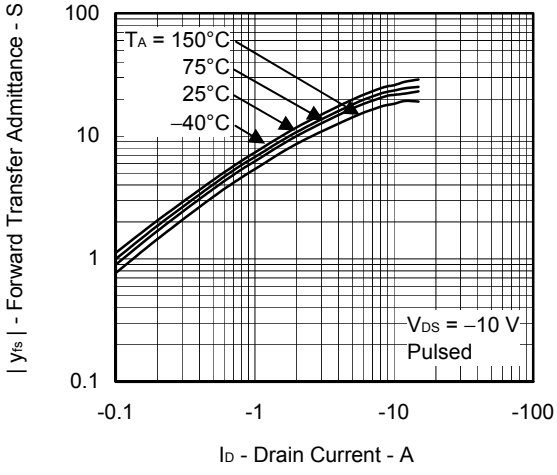
FORWARD TRANSFER CHARACTERISTICS



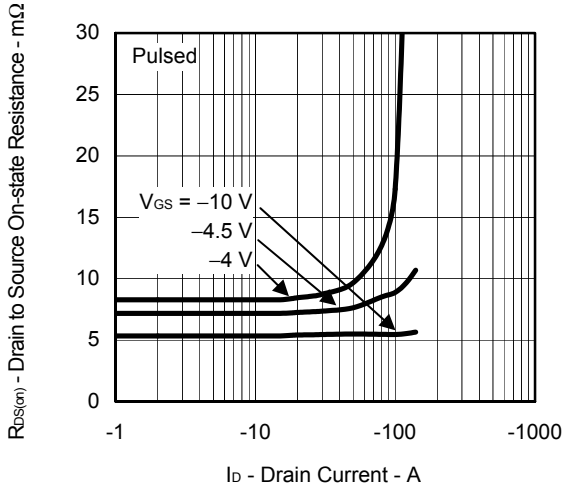
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



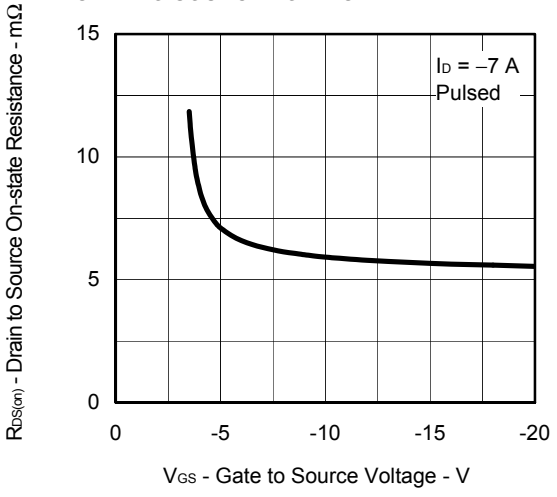
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



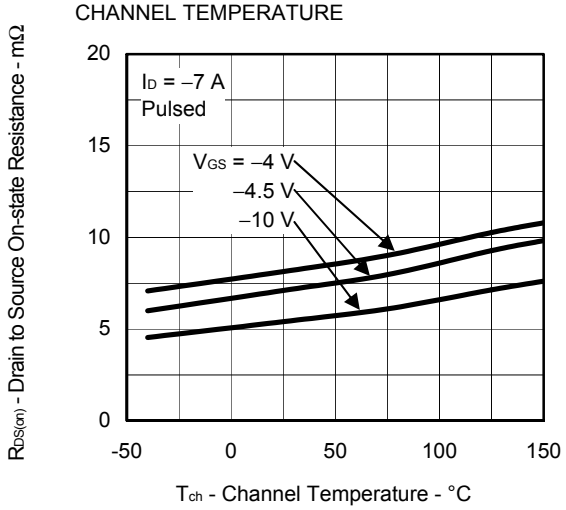
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



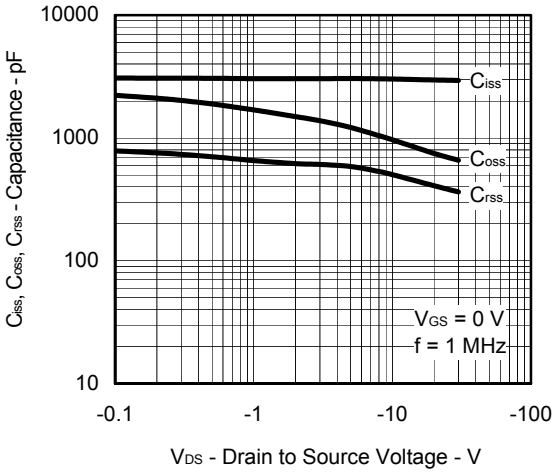
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



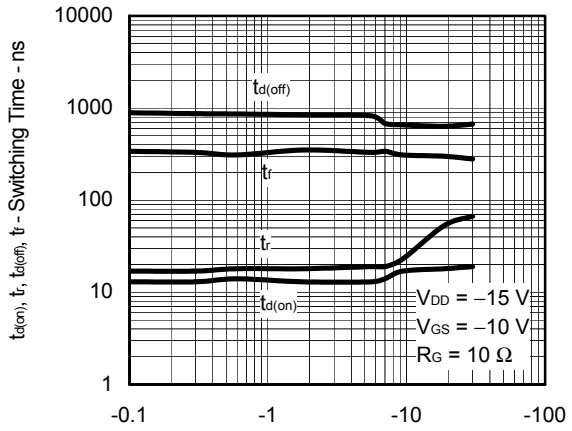
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



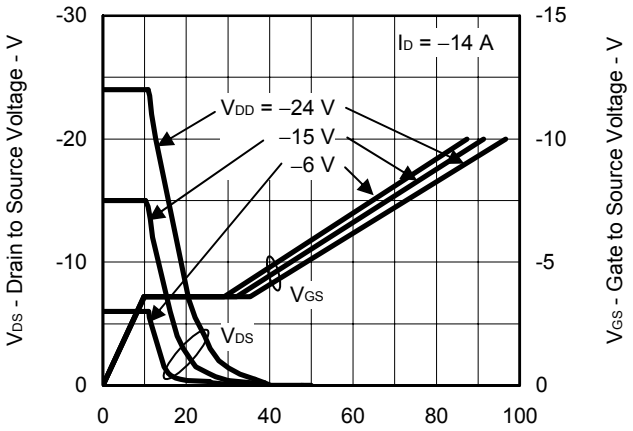
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



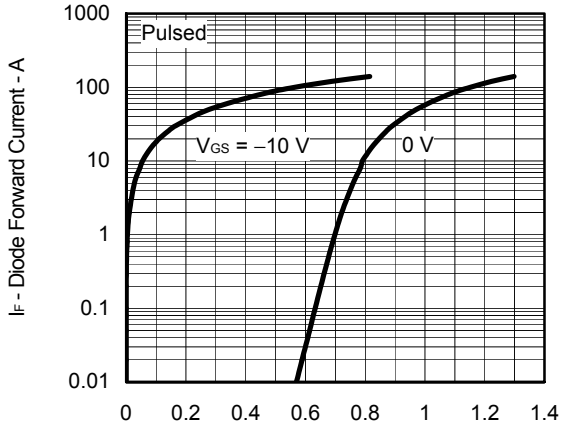
SWITCHING CHARACTERISTICS



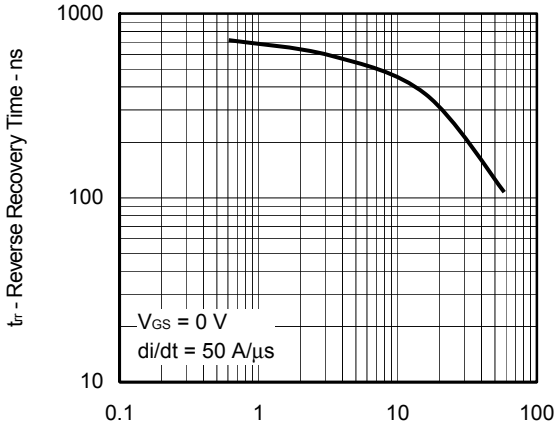
★ DYNAMIC INPUT/OUTPUT CHARACTERISTICS



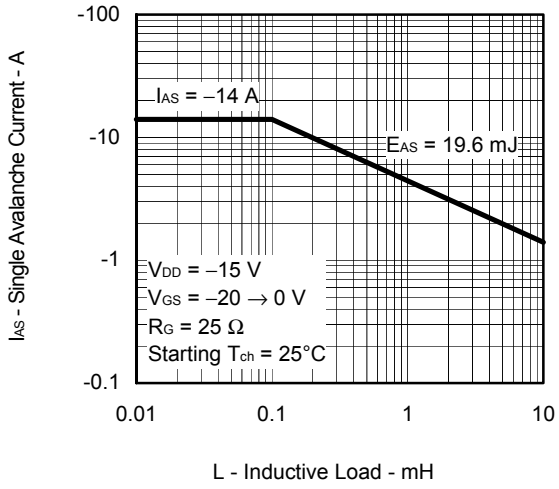
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



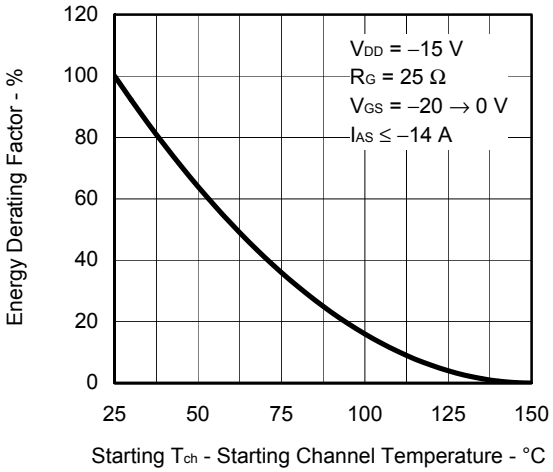
REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



SINGLE AVALANCHE CURRENT vs.
INDUCTIVE LOAD



SINGLE AVALANCHE ENERGY
DERATING FACTOR



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