NEC

COMPOUND FIELD EFFECT POWER TRANSISTOR

μPA1560

N-CHANNEL POWER MOS FET ARRAY
SWITCHING
INDUSTRIAL USE

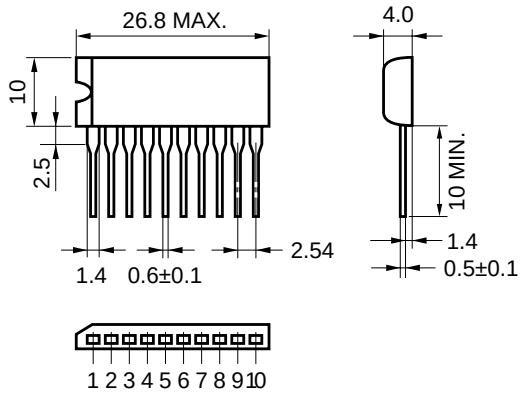
DESCRIPTION

The μPA1560 is N-Channel Power MOS FET Array that built in 4 circuits designed for solenoid, motor and lamp driver.

FEATURES

- Full mold package with 4 circuits
- 4 V driving is possible
- Low on-state resistance
  $R_{DS(on)1}$ = 165 mΩ MAX. (V_{GS} = 10 V, I_D = 1.5 A)
  $R_{DS(on)2}$ = 200 mΩ MAX. (V_{GS} = 4 V, I_D = 1.5 A)
- Low input capacitance
  C_{iss} = 600 pF TYP.

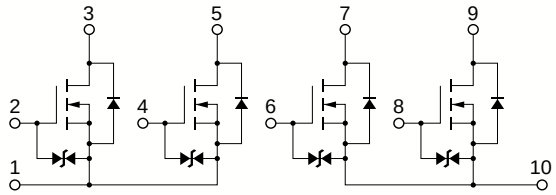
PACKAGE DRAWING (Unit : mm)



ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1560H	10-pin SIP

EQUIVALENT CIRCUIT



ELECTRODE CONNECTION
2, 4, 6, 8 : Gate
3, 5, 7, 9 : Drain
1, 10 : Source

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	120	V
Gate to Source Voltage (V_{DS} = 0 V)	$V_{GSS(AC)}$	±20	V
Gate to Source Voltage (V_{DS} = 0 V)	$V_{GSS(DC)}$	+ 20, –10	V
Drain Current (DC) (T_C = 25°C)	$I_{D(DC)}$	±3.0	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±12	A
Total Power Dissipation (T_C = 25°C)	P_{T1}	28	W
Total Power Dissipation (T_A = 25°C)	P_{T2}	3.7	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to + 150	°C
Single Avalanche Current Note2	I_{AS}	3.0	A
Single Avalanche Energy Note2	E_{AS}	0.9	mJ

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1 %

2. Starting T_{ch} = 25 °C, V_{DD} = 60 V, R_G = 25 Ω, V_{GS} = 20 V → 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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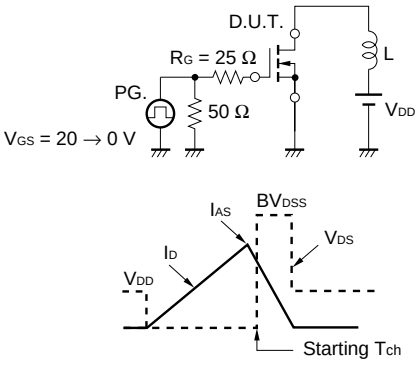
The mark ★ shows major revised points.

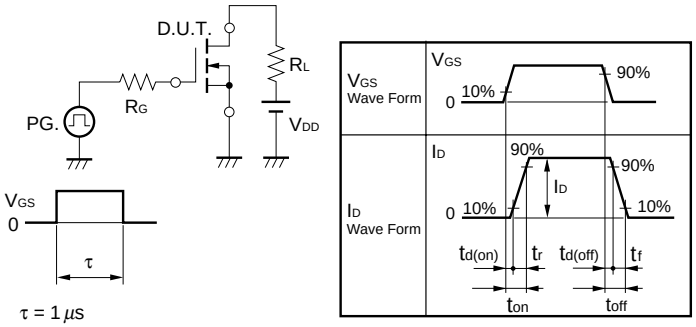
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 120 V, V_{GS} = 0 V			10	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 = 1.0 mA	1.0	1.8	2.5	V
Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = 10 V, I_D = 1.5 A	2	4		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 1.5 A		130	165	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.0 V, I_D = 1.5 A		145	200	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10 V		600		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		160		pF
Reverse Transfer Capacitance	C_{rss}	f = 1.0 MHz		70		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 60 V ,I_D = 3.0 A		35		ns
Rise Time	t_r	V_{GS} = 10 V		80		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		700		ns
Fall Time	t_f			250		ns
Total Gate Charge	Q_G	V_{DD} = 96 V		28		nC
Gate to Source Charge	Q_{GS}	V_{GS} = 10 V		2.5		nC
Gate to Drain Charge	Q_{GD}	I_D = 3.0 A		9		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 3.0 A, V_{GS} = 0 V		0.9		V
Reverse Recovery Time	t_{rr}	I_F = 3.0 A, V_{GS} = 0 V		160		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 50 A/μs		280		nC

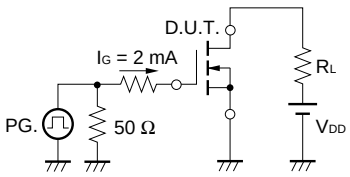
TEST CIRCUIT 1 AVALANCHE CAPABILITY



★ **TEST CIRCUIT 2 SWITCHING TIME**

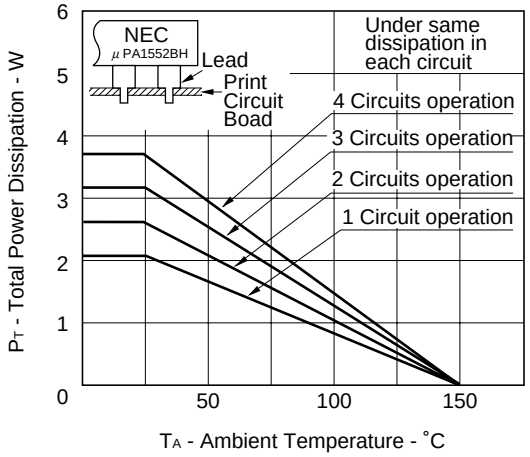


TEST CIRCUIT 3 GATE CHARGE

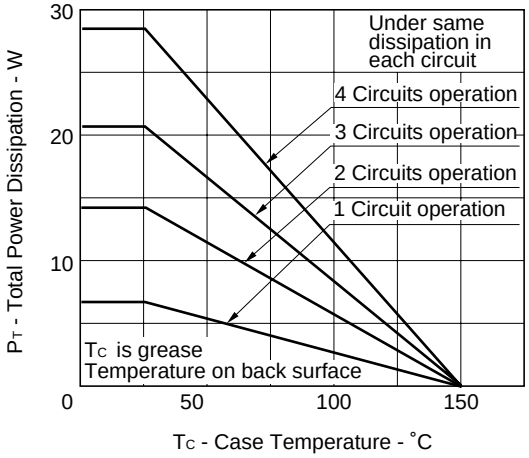


★ TYPICAL CHARACTERISTICS (T_A = 25°C)

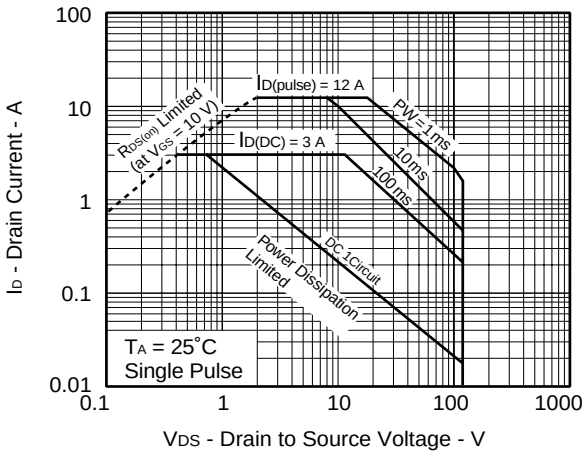
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



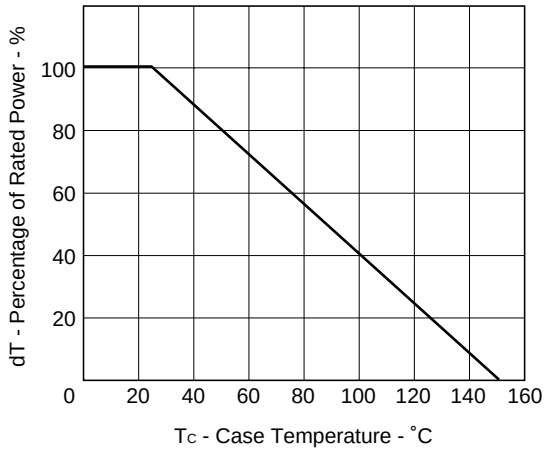
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



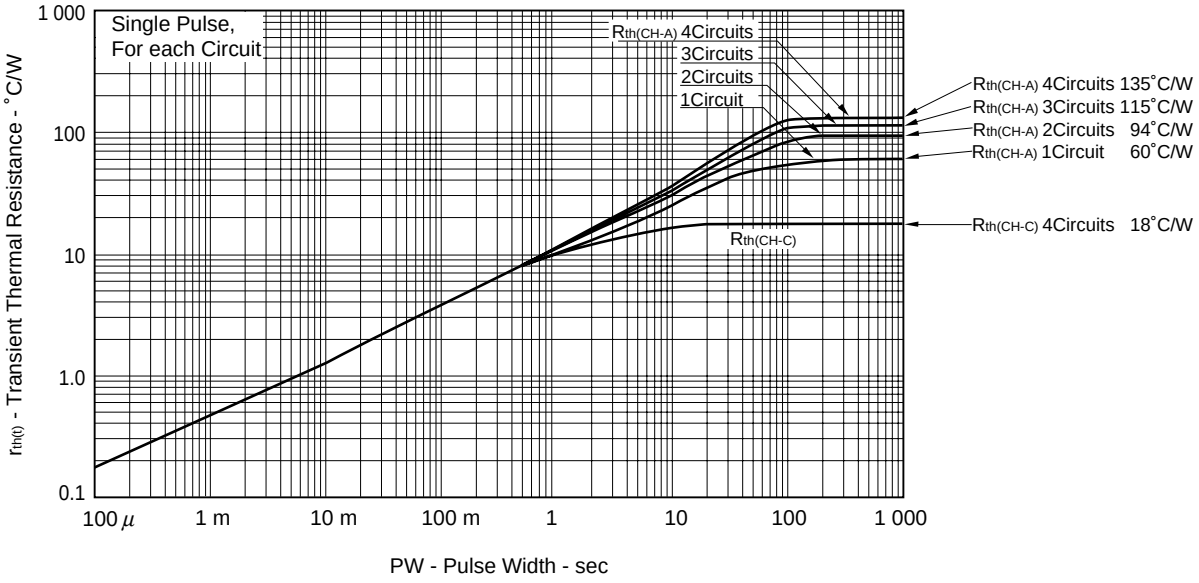
FORWARD BIAS SAFE OPERATING AREA



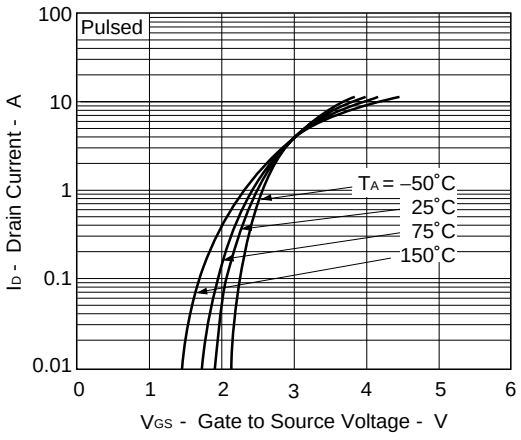
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



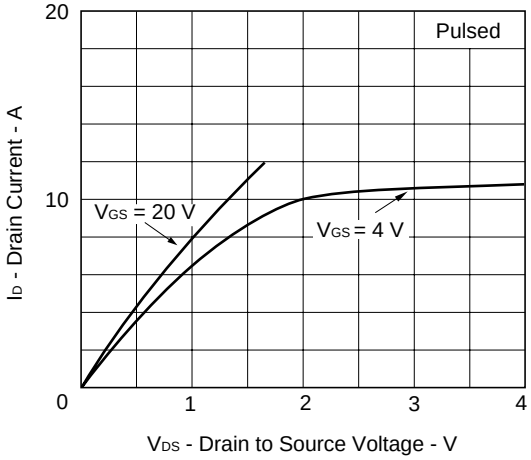
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



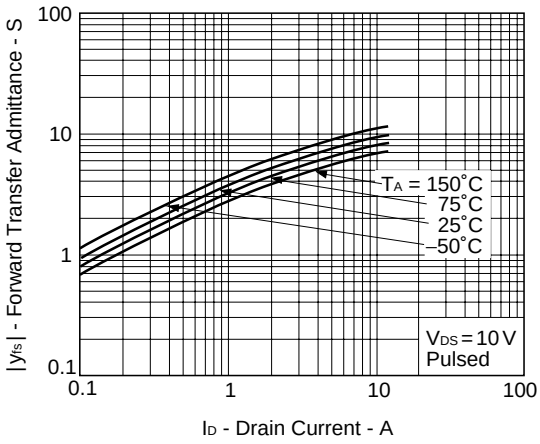
FORWARD TRANSFER CHARACTERISTICS



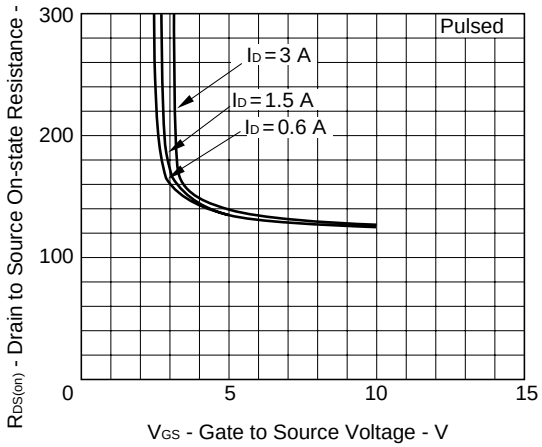
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



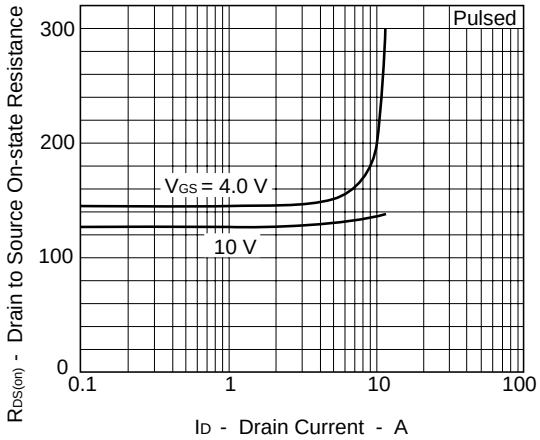
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



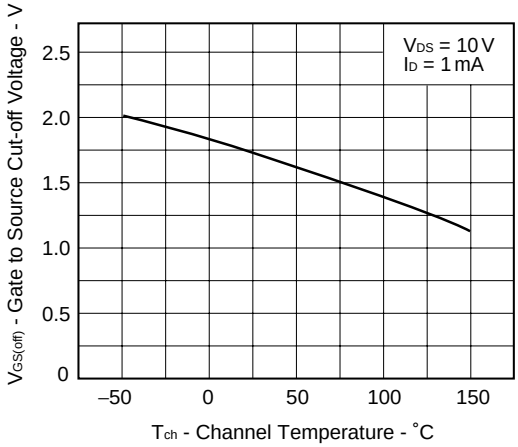
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



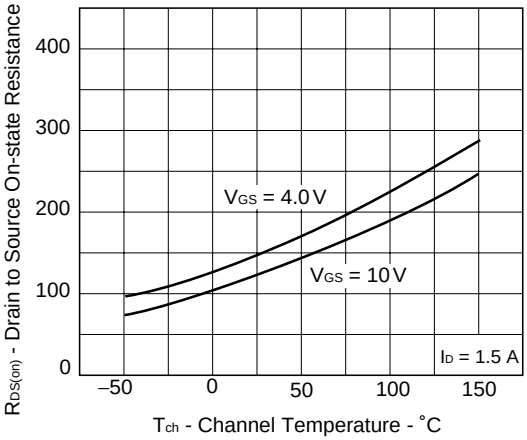
DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



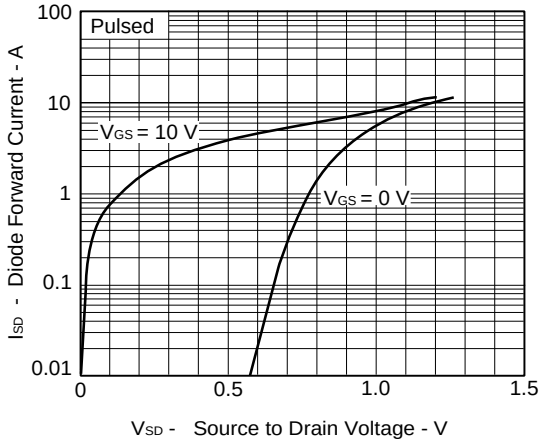
GATE TO SOURCE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



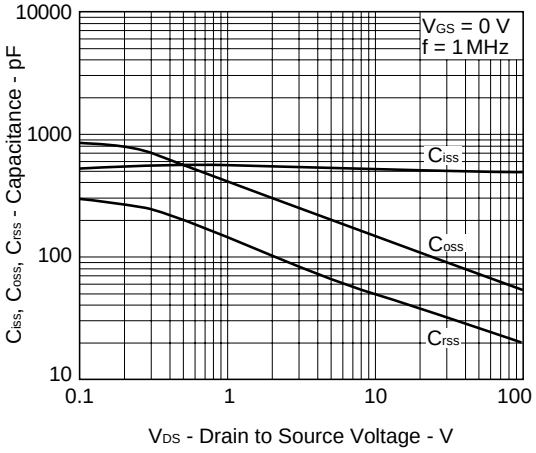
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



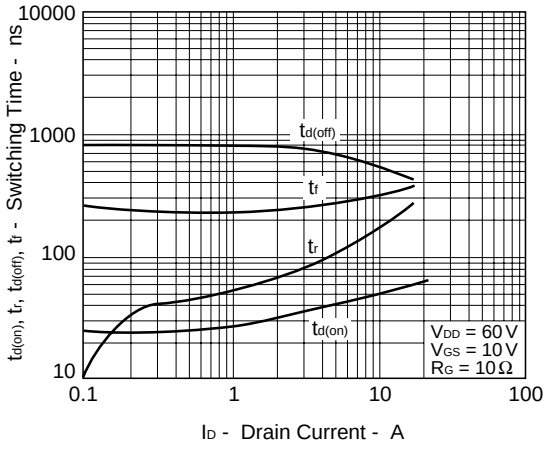
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



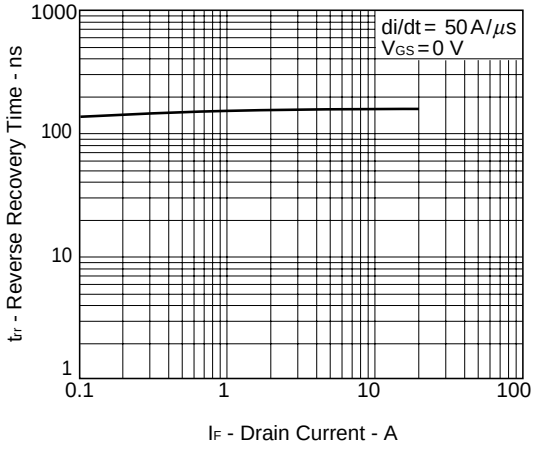
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



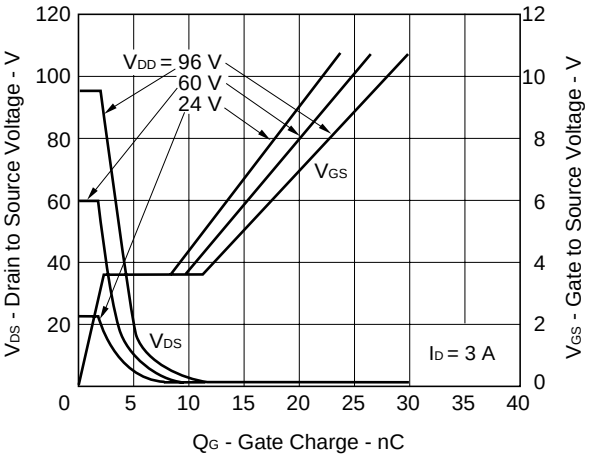
SWITCHING CHARACTERISTICS



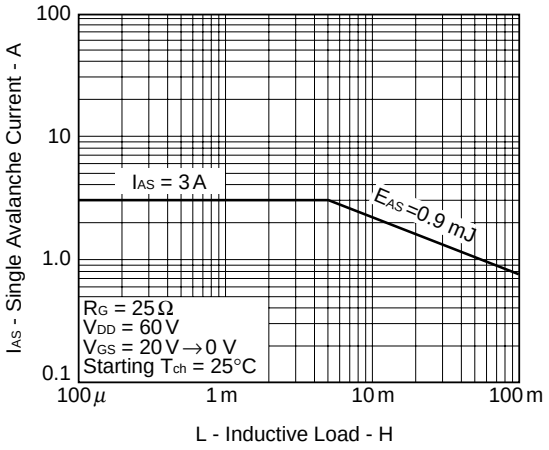
REVERSE RECOVERY TIME vs. DRAIN CURRENT



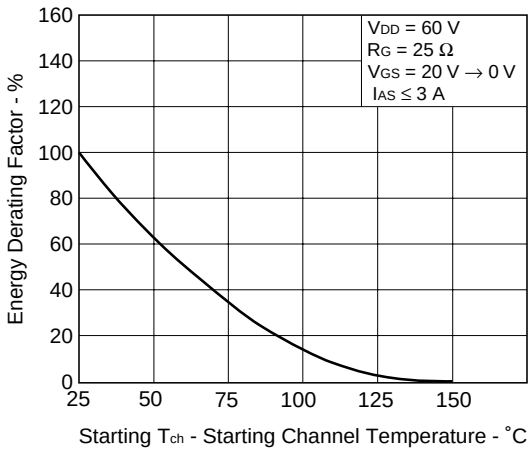
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SINGLE AVALANCHE CURRENT vs.
INDUCTIVE LOAD



SINGLE AVALANCHE ENERGY
DERATING FACTOR



[MEMO]

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