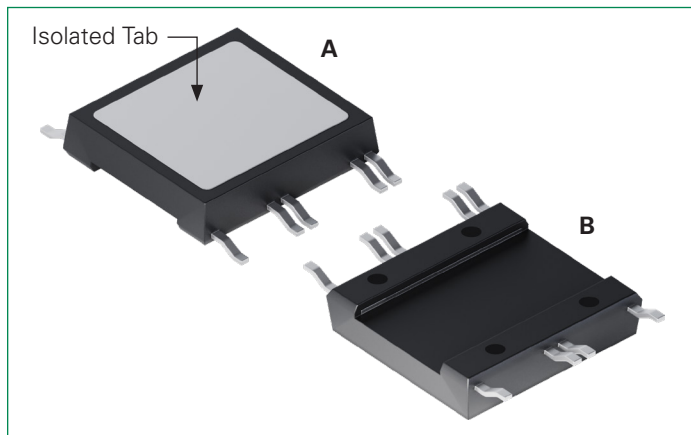


MMIX4B22N300

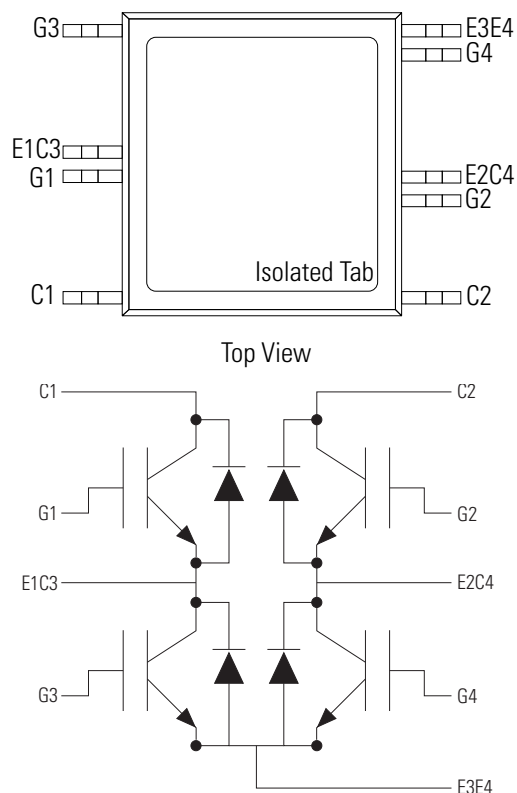
3000 V, 22 A High Voltage, High Gain BiMOSFET™
Monolithic Bipolar MOS Transistor

 E153432



A: Top, B: Bottom

Pinout Diagram (SMPD-Y)



G: Gate; C: Collector; E: Emitter

Description

The MMIX4B22N300 is a high - voltage, quad N - channel BiMOSFET (monolithic bipolar MOS transistor) rated for 3000 V collector-emitter voltage and 22 A continuous collector current at 90 °C in SMPD package with an electrically isolated tab. It targets switch-mode and resonant - mode power supplies and capacitor discharge circuits that require high blocking voltages and high peak current capability.

Features

- Silicon chip on direct-copper bond (DCB) substrate
- Isolated mounting surface
- 4000 V~ electrical isolation
- High blocking voltage
- High peak current capability
- Low saturation voltage

Benefits

- Low gate drive requirement
- High power density
- Reduces need for oversized components
- Improves overall system efficiency
- Enables safe mounting to heatsink

Applications

- Switch-mode and resonant-mode power supplies
- Capacitor discharge circuits

Product Summary

Characteristic	Value	Unit
V_{CES}	3000	V
$I_C @ 90\text{ }^{\circ}\text{C}$	22	A
$V_{CE(sat)}$	≤ 2.7	V

Maximum Ratings

Symbol	Characteristic	Conditions	Value	Unit
V_{CES}	Collector-Emitter Voltage	$T_{vj} = 25\text{ °C to }150\text{ °C}$	3000	V
V_{CGR}	Collector-Gate Voltage	$T_{vj} = 25\text{ °C to }150\text{ °C}$ $R_{GE} = 1\text{ m}\Omega$	3000	V
V_{GES}	Gate-Emitter Voltage	–	± 20	V
V_{GEM}	Transient Gate-Emitter Voltage	–	± 30	V
I_C	Collector Current	$T_c = 25\text{ °C}$	38	A
		$T_c = 90\text{ °C}$	22	A
I_{CM}	Peak Collector Current	$T_c = 25\text{ °C}$, $t_p = 1\text{ ms}$	165	A
P_{tot}	Collector Power Dissipation	$T_c = 25\text{ °C}$	150	W
T_{vj}	Virtual Junction Temperature Range	–	–55 to 150	°C
T_{stg}	Storage Temperature Range	–	–55 to 150	°C
T_L	Maximum Lead Temperature For Soldering	–	300	°C
T_{sld}	Soldering Temperature	Plastic body for 10 s	260	°C
V_{ISOL}	Isolation Withstand Voltage	50/60 Hz, 1 minute	4000	V
SSOA (RBSOA)	Switching Safe Operating Area (Reverse Biased Safe Operating Area)	$V_{GE} = 15\text{ V}$, $T_{vj} = 125\text{ °C}$, $R_{G(ext)} = 15\text{ }\Omega$, $I_{CM} \leq V_{CES}$	180	A
			1500	V
T_{SC} (SCSOA)	Short Circuit Duration (Short Circuit Safe Operating Area)	$V_{GE} = 15\text{ V}$, $T_{vj} = 125\text{ °C}$, $R_{G(ext)} = 52\text{ }\Omega$, $V_{CE} = 1500\text{ V}$, non-repetitive	10	μs

Electrical Characteristics – Static ($T_{vj} = 25\text{ °C}$ unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$I_C = 250\text{ }\mu\text{A}$, $V_{GE} = 0\text{ V}$	3000	–	–	V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C = 250\text{ }\mu\text{A}$, $V_{CE} = V_{GE}$	3	–	5	V
I_{CES}	Collector-Emitter Leakage Current ²	$V_{CE} = V_{CES}$, $V_{GE} = 0\text{ V}$	–	–	35	μA
		$V_{CE} = V_{CES}$, $V_{GE} = 0\text{ V}$, $T_{vj} = 125\text{ °C}$	–	–	1.5	mA
I_{GES}	Gate Leakage Current	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$	–	–	± 100	nA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ¹	$I_C = 22\text{ A}$, $V_{GE} = 15\text{ V}$	–	2.2	2.7	V
		$I_C = 22\text{ A}$, $V_{GE} = 15\text{ V}$, $T_{vj} = 125\text{ °C}$	–	2.7	–	V

Electrical Characteristics – Dynamic ($T_{vj} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions		Value			Unit
				Min.	Typ.	Max.	
g_{fs}	Transconductance ¹	$I_C = 22\text{ A}, V_{CE} = 10\text{ V}$		13	22	–	S
C_{ies}	Input Capacitance	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$		–	2200	–	pF
C_{oes}	Output Capacitance			–	85	–	
C_{res}	Reverse Transfer Capacitance			–	30	–	
Q_G	Total Gate Charge	$I_C = 22\text{ A}, V_{GE} = 15\text{ V}, V_{CE} = 1500\text{ V}$		–	110	–	nC
Q_{GE}	Gate-Emitter Charge			–	13	–	
Q_{GC}	Gate-Collector Charge			–	45	–	
$t_{d(on)}$	Turn-On Delay Time	Resistive Switching Times, $I_C = 22\text{ A}, V_{GE} = 15\text{ V},$ $V_{CE} = 960\text{ V}, R_{G(ext)} = 15\text{ }\Omega$	$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	46	–	ns
			$T_{vj} = 125\text{ }^{\circ}\text{C}$	–	43	–	
t_r	Rise Time		$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	360	–	ns
			$T_{vj} = 125\text{ }^{\circ}\text{C}$	–	700	–	
$t_{d(off)}$	Turn-Off Delay Time		$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	205	–	ns
			$T_{vj} = 125\text{ }^{\circ}\text{C}$	–	220	–	
t_f	Fall Time		$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	1820	–	ns
			$T_{vj} = 125\text{ }^{\circ}\text{C}$	–	1650	–	

Electrical Characteristics - Reverse Diode ($T_{vj} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_F	Forward Voltage ¹	$I_F = 22\text{ A}, V_{GE} = 0\text{ V}$	–	–	2.7	V
t_{rr}	Reverse Recovery Time	$I_F = 11\text{ A}, V_{GE} = 0\text{ V},$ $-di_F/dt = 100\text{ V}, V_{GE} = 0\text{ V}$	–	1.4	–	μs
I_{rrm}	Peak Reverse Recovery Current		–	30	–	A
Q_{rr}	Reverse Recovery Charge		–	21	–	μC

Note 1: Pulse test, $t \leq 300\text{ }\mu\text{s}$, duty cycle, $d \leq 2\%$.

Note 2: Device must be heatsunk for high temperature leakage current measurements to avoid thermal runaway.

Additional provisions for lead-to-lead voltage isolation are required at $V_{CE} > 1200\text{ V}$.

Thermal Characteristics

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance Junction To Case - IGBT	–	–	0.83	K/W
$R_{th(c-sold)}$	Thermal Resistance Junction To Soldering Point - IGBT	–	0.05	–	K/W
$R_{th(j-a)}$	Thermal Resistance Junction To Ambient - IGBT	–	30	–	K/W

Package

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
G	Package Weight	–	–	8	g

Characteristic Curves

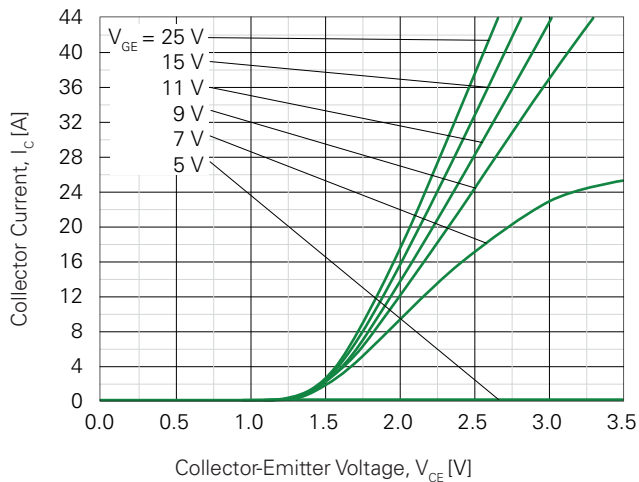
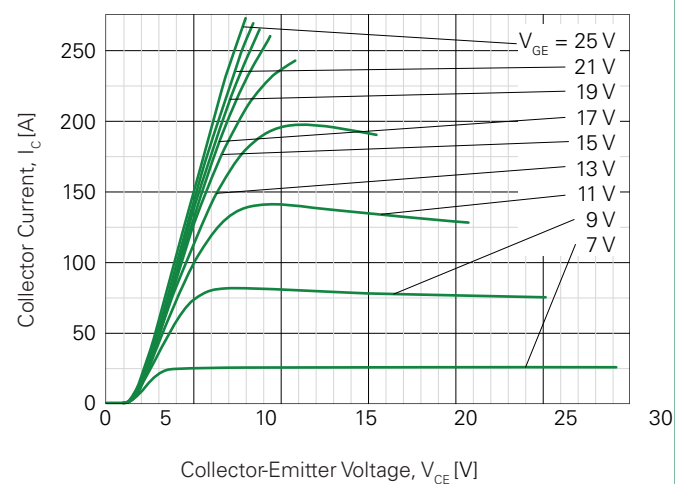
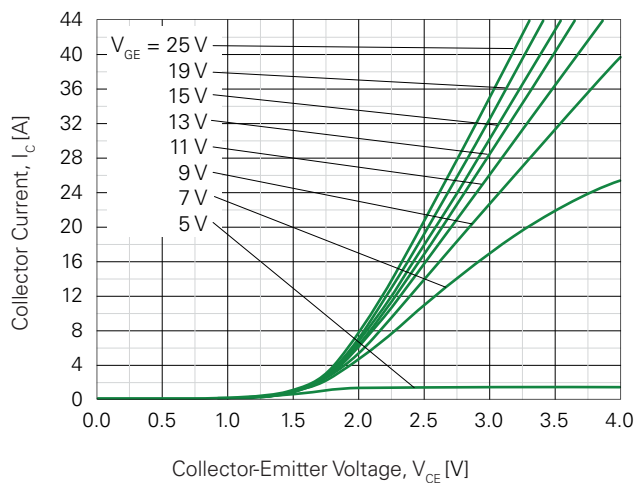
Fig. 1. Typical Output Characteristics @ $T_{vj} = 25^\circ\text{C}$ Fig. 2. Typical Extended Output Characteristics @ $T_{vj} = 25^\circ\text{C}$ Fig. 3. Typical Output Characteristics @ $T_{vj} = 125^\circ\text{C}$ 

Fig. 4. Typical Collector-Emitter Saturation Voltage vs. Virtual Junction Temperature

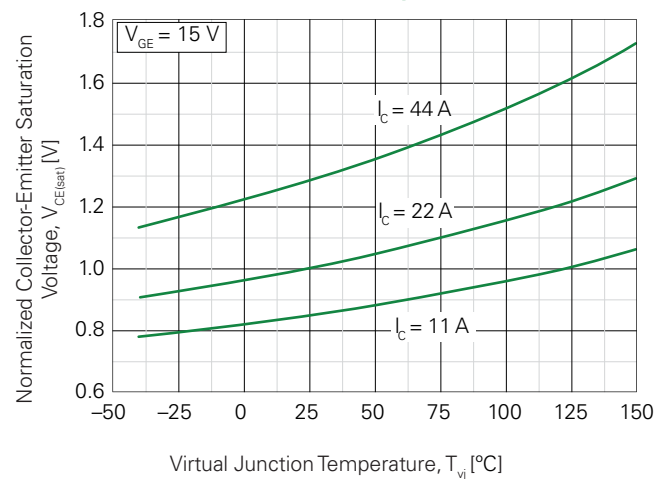


Fig. 5. Typical Collector-Emitter Voltage vs. Gate-Emitter Voltage

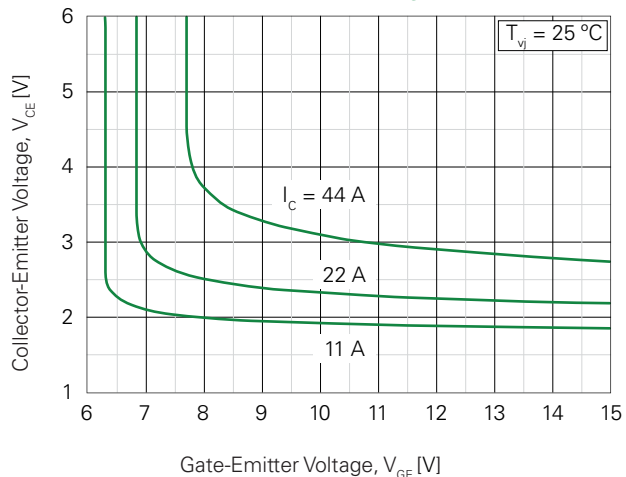


Fig. 6. Typical Transfer Characteristics

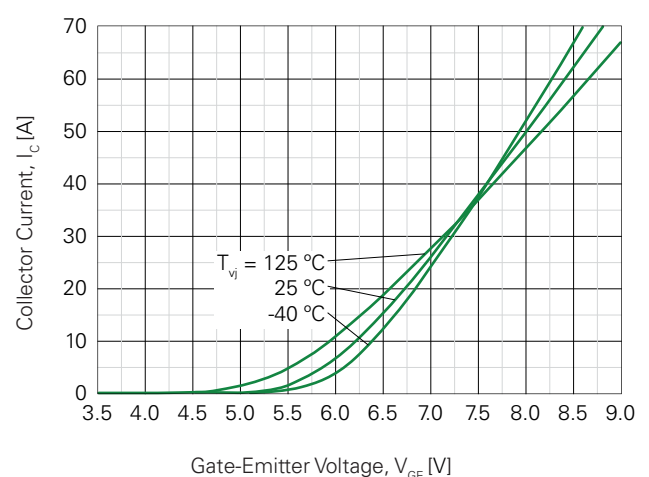


Fig. 7. Typical Transconductance

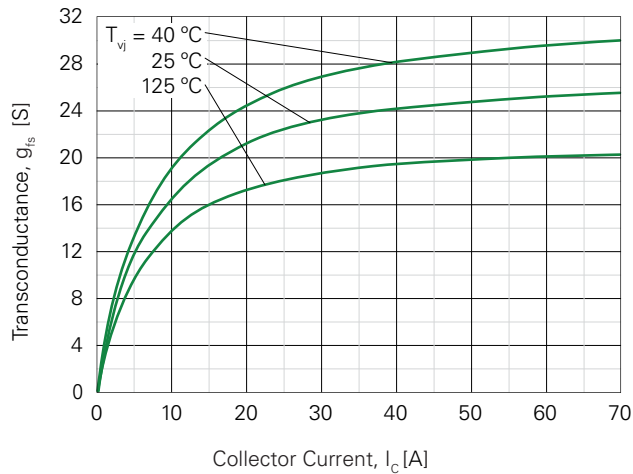


Fig. 8. Typical Gate Charge Characteristics

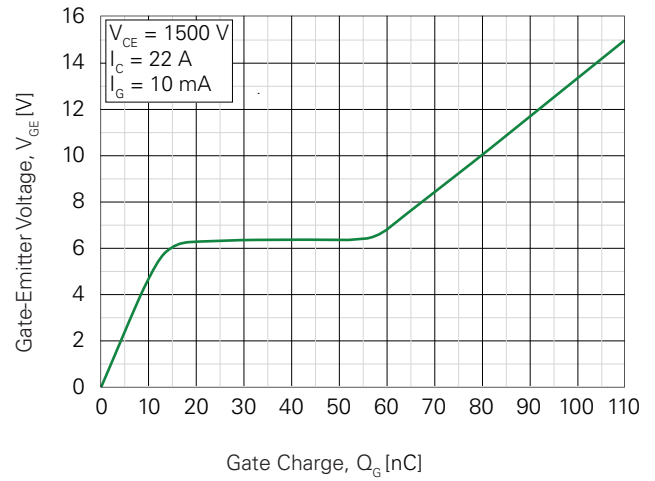


Fig. 9. Typical Forward Characteristics of a Reverse Diode

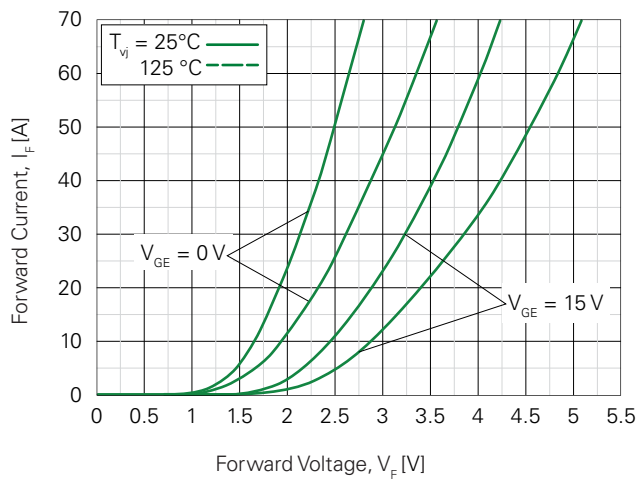


Fig. 10. Typical Junction Capacitance Characteristics

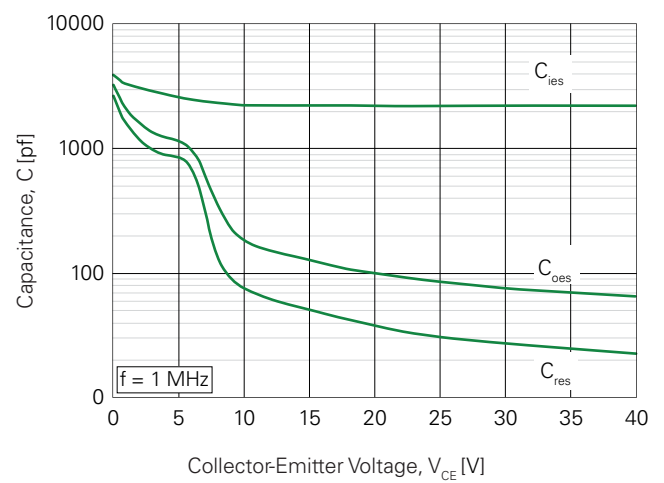


Fig. 11. Reverse-Bias Safe Operating Area (RB)

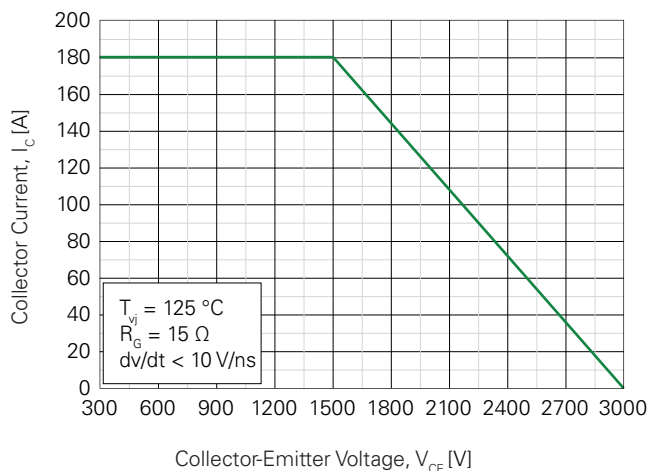


Fig. 12. Maximum Transient Thermal Impedance

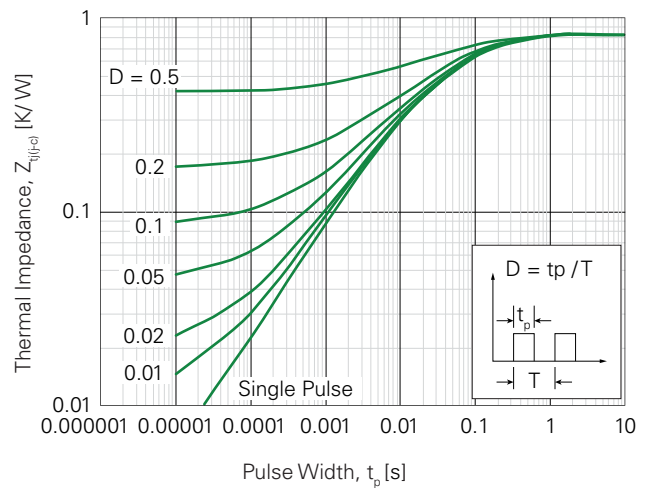


Fig. 13. Forward-Bias Safe Operating Area @ $T_c = 25\text{ }^\circ\text{C}$

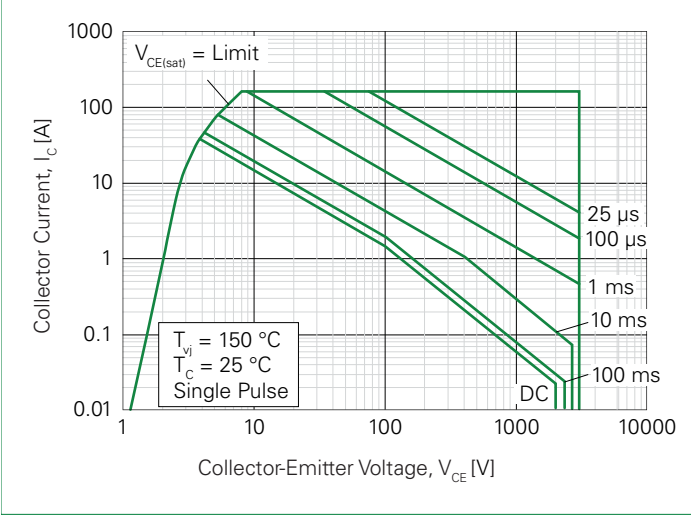
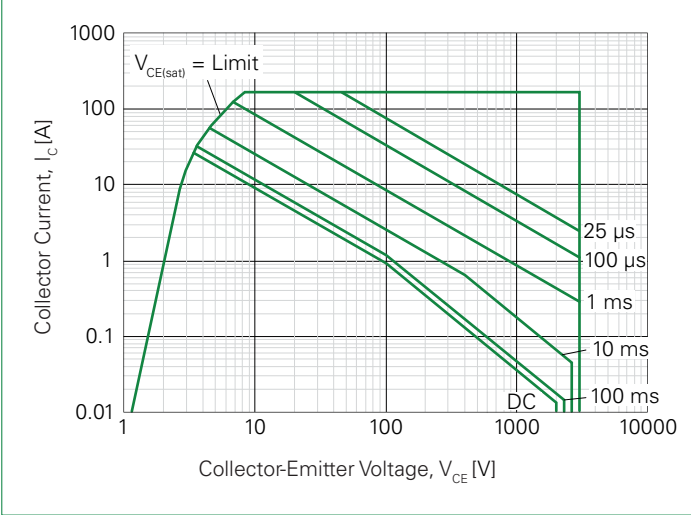
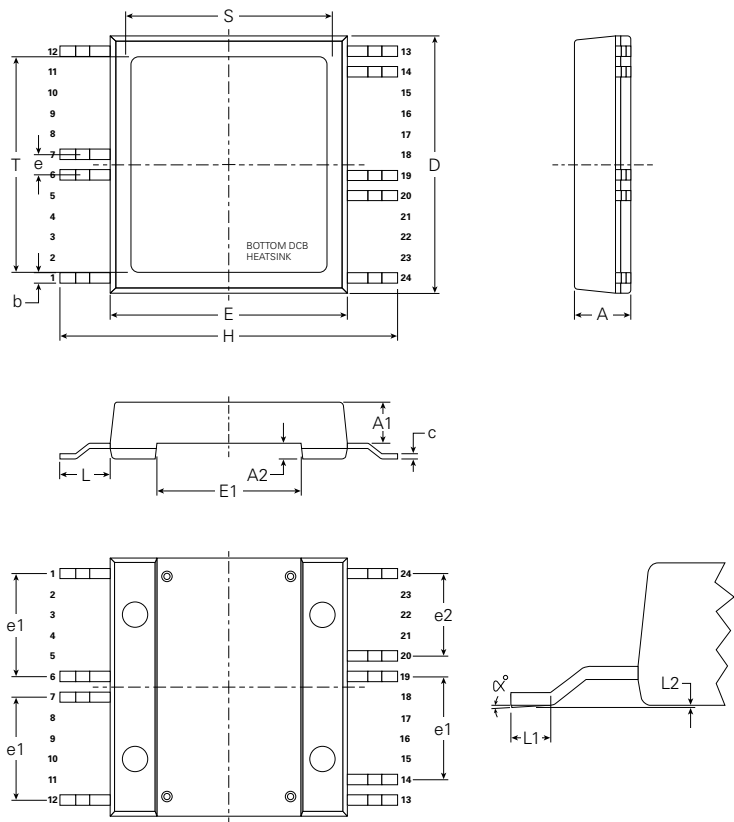


Fig. 14. Forward-Bias Safe Operating Area @ $T_c = 75\text{ }^\circ\text{C}$



Part Outline Drawing (SMPD-Y)



Symbol	Inches			Millimeters		
	Min.	Typical	Max.	Min.	Typical	Max
A	0.209	–	0.224	5.30	–	5.70
A1	0.154	–	0.161	3.90	–	4.10
A2	0.055	–	0.063	1.40	–	1.60
b	0.035	–	0.045	0.90	–	1.15
c	0.018	–	0.026	0.45	–	0.65
D	0.976	–	0.994	24.80	–	25.25
E	0.898	–	0.915	22.80	–	23.25
E1	0.543	–	0.559	13.80	–	14.20
e	0.079 BSC			2.00 BSC		
e1	0.394 BSC			10.00 BSC		
e2	0.315 BSC			8.00 BSC		
H	1.272	–	1.311	32.30	–	33.30
L	0.181	–	0.209	4.60	–	5.30
L1	0.051	–	0.067	1.30	–	1.70
L2	0.000	–	0.006	0.00	–	0.15
S	0.742	–	0.792	18.85	–	20.12
T	0.822	–	0.872	20.90	–	22.17
α	0	–	4°	0	–	4°

Ordering Information

Orderable Part Number	Package Type	Shipping Form	Shipping Quantity
MMIX4B22N300 - TR	SMPD-Y	T&R	200
MMIX4B22N300	SMPD-Y	Tube	20

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